

# AMATH 402 A Wi 17: Introduction To Dynamical Systems And Chaos

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**Office hours:** M 2:30-3:30, Tu 2:30-3:30 (Lewis 220)

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**Office hours:** W 3:30-5:30 (Lewis 129)

**Email policy:** We will not answer questions about problem sets via email. Please use the discussion board (do not post answers) and office hours. For other course related questions, *please add the header [AMATH 402] in your email title.*

**We Meet:** MTWF 12:30-1:20 in LOW101

- On Mondays, Tuesdays, and Wednesdays, the instructor will cover theories and core materials.
- On Fridays, the TAs will cover relevant applications, numerical methods, and worked problem examples.

**Prerequisites:** AMATH 351, MATH 136, or MATH 307

## Schedule:

- Midterm: Friday, February 10 in class (12:30-1:20) in LOW 101.
  - Closed book, 1-sided notebook-size sheet of notes, no calculator
  - Bring a blank exam book to the midterm
- Final: Thursday, March 16, 8:30-10:20 in LOW 101
  - Closed book, double-sided notebook-size sheet of notes, no calculator
  - Bring a blank exam book to the midterm.

## Grading

- Homework 30%
- Midterm 30%
- Final 40%

## Homework policy:

- 15 points each
- Due Fridays, collected in class. Otherwise, submit electronically via Canvas by Friday 3pm.
- Homework will be graded statistically. You will receive 5/15 of the credit for handing in a complete assignment (solutions for every problem), and the remaining 10/15 will be for correct solutions to two randomly chosen problems. Late homework is not accepted. Your homework should be neat and readable. The TA's are allowed to subtract points (or fractions thereof, at their discretion) for presentation.
- The lowest homework grade will be dropped. Late homework is not accepted.

## Required Textbook

- Nonlinear Dynamics and Chaos with applications to physics, biology, chemistry and engineering by Steven H. Strogatz, 2nd edition.

*If you have an earlier version of the book and want to keep it, be aware that numeration of sections and exercises may have changed.*

- Notes by Bernard Deconinck available [\\_\\_\\_\\_\\_](#).

## Matlab On and Off Campus

There is MATLAB access at the [JCL](http://depts.washington.edu/aslab) (<http://depts.washington.edu/aslab>) lab on campus in the Communications building room B022.

A student version of MATLAB can be purchased from the University Bookstore or online at [Mathworks.com](http://www.mathworks.com/academia/student_version/) ([http://www.mathworks.com/academia/student\\_version/](http://www.mathworks.com/academia/student_version/)) for \$120.

REMINDER FOR All active UW students, faculty, and staff - YOU are eligible to download [MATLAB](#)

([https://www.mathworks.com/products/matlab/whatsnew.html?](https://www.mathworks.com/products/matlab/whatsnew.html?elqTrackId=d5902c1f40e048d48777494e867f88da&elq=c400c1f6d1d4422896dda8c60923040a&elqaid=5213&elqat=1&elqCampaignId=)

[elqTrackId=d5902c1f40e048d48777494e867f88da&elq=c400c1f6d1d4422896dda8c60923040a&elqaid=5213&elqat=1&elqCampaignId=](https://www.mathworks.com/products/matlab/whatsnew.html?elqTrackId=d5902c1f40e048d48777494e867f88da&elq=c400c1f6d1d4422896dda8c60923040a&elqaid=5213&elqat=1&elqCampaignId=) to your personal laptop. <https://itconnect.uw.edu/wares/uware/matlab/> (<https://itconnect.uw.edu/wares/uware/matlab/?elqTrackId=d0ad9b469c4840f9a09cc12a0d0a88df&elq=c400c1f6d1d4422896dda8c60923040a&elqaid=5213&elqat=1&elqCampaignId=>).

If you prefer to access MATLAB on the UW network concurrent license, or need licenses for individual lab workstations, please contact [help@UW.edu](mailto:help@UW.edu). ([http://app.go.mathworks.com/e/er?](http://app.go.mathworks.com/e/er?s=646005169&lid=13458&elqTrackId=8b8c437e6a9c4cd59df4bfb465424b5b&elq=c400c1f6d1d4422896dda8c60923040a&elqaid=5213&elqat=1)

[s=646005169&lid=13458&elqTrackId=8b8c437e6a9c4cd59df4bfb465424b5b&elq=c400c1f6d1d4422896dda8c60923040a&elqaid=5213&elqat=1](http://app.go.mathworks.com/e/er?s=646005169&lid=13458&elqTrackId=8b8c437e6a9c4cd59df4bfb465424b5b&elq=c400c1f6d1d4422896dda8c60923040a&elqaid=5213&elqat=1)).

If you have any questions, feel free to contact [Support@MathWorks.com](mailto:Support@MathWorks.com) (<http://app.go.mathworks.com/e/er?s=646005169&lid=13457&elqTrackId=17077f08a1b3424aa93faf2f6a5ff2f8&elq=c400c1f6d1d4422896dda8c60923040a&elqaid=5213&elqat=1>) or [help@UW.edu](mailto:help@UW.edu) (<http://app.go.mathworks.com/e/er?s=646005169&lid=13456&elqTrackId=6c7c682d1c3840c6806fc3c02e68b66d&elq=c400c1f6d1d4422896dda8c60923040a&elqaid=5213&elqat=1>).

### Tentative Contents

1. Introduction to dynamical systems.
2. Flows on the line.
3. Solving ODEs w/ a computer
4. Bifurcations in 1-D systems
5. Flows on the circle
6. 2-D linear systems
7. Nonlinear systems in the phase plane
8. Limit cycles
9. Bifurcations in 2D systems
10. Difference equations
11. Logistic maps
12. Fractals
13. Lorenz equations
14. Strange attractors

### Group work and Academic Honesty policy:

You are encouraged to discuss and work in groups to solve problem sets.

You must write up your own solution and your own code. Copy, pasting, and editing will be considered plagiarism. Do not be a cheater, it does not help you learn the material and I will have you do something harder to make up the grade, give you a zero, and/or report you for academic misconduct depending on the situation.

Please read the UW policy [here](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjRkOKT wobKAhWDMz4KHUc4AJcQFggdMAA&url=https%3A%2F%2Fdepts.washingto) (<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjRkOKT wobKAhWDMz4KHUc4AJcQFggdMAA&url=https%3A%2F%2Fdepts.washingto>). By staying registered in the class you indicate your acceptance of all its terms. We do not accept late homework or absence without official reasons (medical, etc.) approved by a student dean. If you miss class, please coordinate with colleagues to find out what you missed (do not email the professor to help you catch up).