

**Math 311 Chaotic Dynamical Systems Syllabus**  
**Agnes Scott College, Fall 2024**  
**Jim Wiseman, [jwiseman@agnesscott.edu](mailto:jwiseman@agnesscott.edu), Buttrick 327**

Monday, Wednesday, Friday, 11:30-12:20 in Buttrick 213

Office hours: Mon 2:00-3:00, Tues 2:00-3:00, and by appointment.

Textbook: Johnson, Madden, and Sahin, *Discovering Discrete Dynamical Systems*, MAA Press.

Plan: We will cover Modules 1-9 and 11-13. Each student will choose one of the projects and give a final presentation and paper at the end of class. There's a more detailed schedule below, but it's subject to change.

We will spend three class days on each module. The first day you will work in groups on the Exploration for that module. On the second day, you will present your findings, and, time permitting, I will talk briefly about the material in the Exposition. On the third day, you should bring questions on the homework and the Exposition, and we will try to answer them as a group.

Homework: For each module, I will assign homework exercises from the textbook. I strongly encourage you to start working on them well in advance of the due date; you can ask questions about them in class on the third day of the module. Math 311 is a 4-credit course. In addition to in-class time, you will be spending time outside of class on various activities. The first and most important activity is to regularly read the text and to work through and understand the material in each section. You should try to spend time on this every day.

Final project: At the end of each textbook module is a Project. Your final project will be to choose one of them and, at the end of the semester, give a 10-minute class presentation and turn in a paper.

Honor code and group work: All students are expected to follow the honor code throughout the semester; all assignments should be pledged.

I strongly encourage you to work on the homework in groups. I suggest that you work on the problems by yourself first, making a note of anything giving you trouble; then meet with your group and work through the remaining problems together; and finally submit the solutions by yourself. Every group member must submit her own solutions independently; just copying the group's answers is plagiarism and is unacceptable.

Getting help: Chances are that sooner or later you'll get stuck on something, so don't get frustrated. Think hard, and if you're still stuck, do something else for a while. (It's amazing how often that works.)

My office hours are above - these are times when I'm guaranteed to be in my office waiting to talk to someone. If you want to see me at other times, please let me know and we'll find a time. Finally, I can't emphasize enough that your classmates are your best source of help.

Course goals:

Understand, define, describe, and apply the ideas of discrete dynamical systems

Develop persistence and skill in mathematical exploration, conjecture, proof, and generalization

Communicate mathematics effectively, both orally and in writing

Assessment: Homework 40%, Exploration presentations 30%, final paper draft 5%, final paper 15%, final presentation 10%

Late work: Late work won't be accepted. In the case of a conflict that you absolutely can't resolve (for example, a religious holiday), you may arrange to work on an Exploration outside of class.

Attendance and participation: I expect you to be at every class meeting on time, unless you've talked to me about having to be absent or late. The in-class Explorations and the presentations of your findings are part of your grade. Aside from that, absences will have no (direct) effect on your grade.

Dates and deadlines:

Submit project preferences (top 5): 10/30

Paper draft: 12/2

Presentations: 12/6-12/11

Final paper: 12/11

Final exam: none.

| Date     | Topic                                            |
|----------|--------------------------------------------------|
| Wed 8/28 | Introduction                                     |
| Fri 8/30 | Exploration - Module 1, Fixed Points             |
| Mon 9/2  | <b>Labor Day - no classes</b>                    |
| Wed 9/4  | Present Exploration; Exposition                  |
| Fri 9/6  | Discussion: Exploration, Exercises               |
| Mon 9/9  | Exploration - Module 2, Classifying Fixed Points |
| Wed 9/11 | Present Exploration; Exposition                  |
| Fri 9/13 | Discussion: Exploration, Exercises               |
| Mon 9/16 | Exploration - Module 3, Cycles                   |
| Wed 9/18 | Present Exploration; Exposition                  |
| Fri 9/20 | Discussion: Exploration, Exercises               |
| Mon 9/23 | Exploration - Module 4, Fractal dimension        |
| Wed 9/25 | Present Exploration; Exposition                  |
| Fri 9/27 | Discussion: Exploration, Exercises               |
| Mon 9/30 | Exploration - Module 5, Chaos                    |
| Wed 10/2 | Present Exploration; Exposition                  |
| Fri 10/4 | Discussion: Exploration, Exercises               |
| Mon 10/7 | Exploration - Module 6, Sharkovskii's Theorem    |

| Date                  | Topic                                              |
|-----------------------|----------------------------------------------------|
| Wed 10/9              | Present Exploration; Exposition                    |
| Fri 10/11             | Discussion: Exploration, Exercises                 |
| Mon 10/14             | <b>Fall break</b>                                  |
| Wed 10/16             | Exploration - Module 7, Bifurcations               |
| Fri 10/18             | Present Exploration; Exposition                    |
| Mon 10/21             | Discussion: Exploration, Exercises                 |
| Wed 10/23             | Exploration - Module 8, Conjugacy                  |
| Fri 10/25             | Present Exploration; Exposition                    |
| Mon 10/28             | Discussion: Exploration, Exercises                 |
| Wed 10/30             | Exploration - Module 9, 2D Systems                 |
| Fri 11/1              | Present Exploration; Exposition                    |
| Mon 11/4              | Discussion: Exploration, Exercises                 |
| Wed 11/6              | Exploration - Module 11, Complex dynamics          |
| Fri 11/8              | Present Exploration; Exposition                    |
| Mon 11/11             | Discussion: Exploration, Exercises                 |
| Wed 11/13             | Exploration - Module 12, Julia and Mandelbrot sets |
| Fri 11/15             | Present Exploration; Exposition                    |
| Mon 11/18             | Discussion: Exploration, Exercises                 |
| Wed 11/20             | Exploration - Module 13, Symbolic dynamics         |
| Fri 11/22             | Present Exploration; Exposition                    |
| Mon 11/25             | Discussion: Exploration, Exercises                 |
| Wed 11/27 - Fri 11/29 | <b>Thanksgiving break</b>                          |
| Mon 12/2              | Additional topics                                  |
| Wed 12/4              | Additional topics                                  |
| Fri 12/6              | Project presentations                              |
| Mon 12/9              | Project presentations                              |
| Wed 12/11             | Project presentations                              |

Course evaluation: Your feedback on the course is extremely valuable to me, the math department, and the administration. In particular, I take your comments very seriously and use them to improve the course the next time I teach it. You are responsible for completing an evaluation of the course at the end of the semester.

Title IX: Agnes Scott is here to help you if you have experienced any form of sexual harassment or violence, dating or domestic violence, or stalking. Please talk to any faculty or staff member with whom you feel comfortable. Faculty and staff members want to support you and have been trained to help. They will also inform the Title IX office so that you learn about options available to you. If you do not want college administrators to know what you have experienced, you may talk to the chaplain, as well as nurses or counselors in the Wellness Center with complete confidentiality. They will not tell anyone what you share with them unless you give your express permission. You may contact the Title IX Coordinator directly at [T9Coordinator@agnesscott.edu](mailto:T9Coordinator@agnesscott.edu).

Inclusion: This course adheres to the principles of diversity and inclusion integral to the Agnes Scott community. We respect people from all backgrounds and affirm people's decisions about gender expression and identity. Please let me know your preferred name or gender pronoun if different from the class roster. The Gay Johnson McDougall Center for Global Diversity and Inclusion is centered and grounded in dismantling systems of oppression, including structural and systemic racism, as well as empowering each individual to take action that uplifts and builds community. Students can contact them at [diversity@agnesscott.edu](mailto:diversity@agnesscott.edu) or 404.471.6118.

ADA: Agnes Scott College seeks to provide equal access to its programs, services and activities for people with various abilities. If you will need accommodations in this class, please contact the Office of Academic Advising and Accessible Education (404-471-6150) to complete the registration process. Once registered, please contact me so we can discuss the specific accommodations needed for this course.