

# Course Information Sheet: Math A4500, Section PR

**Course Title:** Dynamical Systems

**Pre-requisite:** C or better in Math 32404.

**Catalog Description:** Dynamical systems arise naturally from connections to the sciences and many mathematical subjects both pure and applied. Students will be able to apply techniques learned in this course to these interrelated subjects. This course provides an introduction to important classes of dynamical systems and exposure to the most important phenomena which appear in the subject.

**Meeting time and place:** Tuesdays and Thursdays 2-3:40pm in NAC 6/113.

## Instructor Information:

- **Name:** Prof. Patrick Hooper
- **Office hours:** Tuesdays and Thursdays 1-1:50pm (on any day our class meets). Appointments are also accepted.
- **Office:** NAC 6/282
- **Email:** whooper@ccny.cuny.edu
- **Office Phone:** (212) 650-5149

**Course Textbook:** *An Introduction To Chaotic Dynamical Systems* by Robert L. Devaney, 2nd edition.

**Topics covered:** We will complete most of the first two chapters of the course textbook. We will cover each section in the ranges 1.1 through 1.15, and 2.1 through 2.6. We hope to cover most of the rest of chapters 1 and 2, but this will depend on time constraints. For reference, the table of contents of the course textbook has been reproduced at the end of this document.

**Grades:** Grades will be computed from the following:

- Attendance
- Homework (20%)
- First Midterm (20%).
- Second Midterm (20%).
- Final exam (40%).

Your final score will be tabulated out of 100% as indicated by the percentages above, with attendance taken into account. (See the attendance section below.) A letter grade will be assigned to you according to the table below.

A+	97-100	B+	87-89	C+	77-79	F	below 70
A	95-96	B	84-86	C	70-76		
A-	90-94	B-	80-83				

**Course website:** Course information, homework assignments, and documents can be found on the website:

<http://wphooper.com/teaching/2013-spring-dynamics/>

**Blackboard:** You will be able to access your grades on Blackboard, which can be accessed at <http://bbhosted.cuny.edu/>. I also use blackboard to send out emails to students. You will be held responsible if you miss an important email, so make sure your email address is up to date. To change or update your email address go to <http://portal.cuny.edu>, click “Portal login” from the bottom left menu, then login, and select “My profile” on the left menu. (This email information may now be out of date, with CUNY’s switch to CityMail.)

**General expectations:** For each hour spent in the classroom, I expect you to spend at least three hours reading and understanding the book, understanding lecture notes, and doing homework. Practice (doing problems and proofs) is an important part of understanding mathematics. Only adequate practice will guarantee that you can complete midterm and exam problems in a timely manner.

**Expectations of written work:** Mathematical computations and proofs will be graded partially on presentation. In order to receive full credit, a student who reads your answer should be able to easily understand how you solved the problem. Written work is expected to be legible and arguments are expected to be well articulated.

**Final exam:** The final exam will be held on Thursday, May 23rd from 1-3:15pm according to the university’s final exam schedule (available at <http://www.ccny.cuny.edu/registrar/spring-2013-final-exam-schedule.cfm>.) Ensure that you have no time conflicts. A makeup for the final exam is offered only under extremely compelling circumstances. Notify me as soon as you know you will have to miss the final.

**Midterms:** You will be given the full class to complete each midterm. If a midterm is missed under extremely compelling circumstances, a makeup midterm will be given. If a midterm is missed under well documented and sufficiently compelling circumstances, then a makeup can be taken. Notify me ahead of a midterm you expect to miss to be sure your circumstances are sufficiently compelling. The makeup must be taken within one week of the originally scheduled midterm. A grade of zero will be assigned to anyone who does not take a midterm or a makeup.

**Homework assignments:** Homework will be assigned approximately once a week and will have a due date. Homework assignments will be made available on the course website at least one week before the assignment is due. I encourage you to work in groups on the

homework problems, especially if this best suits your learning style. Nonetheless, you should be confident that you understand how to do each problem, and should be able to solve similar problems independently. Failure to ensure that you can solve problems independently will surely have a negative effect on exam grades.

**Late homework:** Late homework will not be accepted for any reason. If you need to miss class, please scan it and email your assignment to me as a PDF document.

**Attendance Policy:** As students, class time is extremely important for learning. For this reason, attendance is mandatory. **Three or more unexcused absences will likely result in the reduction of your final grade by 5% (or half a letter grade).** Excused absences include illness with a doctor's note and many religious observations.

**Lateness:** Lateness to class is unacceptable because it disrupts the learning process of the whole class. For this reason, any student who arrives more than 5 minutes after class begins will be considered late. Three late attendances are considered the equivalent of one absence. Thus, sufficiently many late attendances will result in actions as described in the Attendance Policy. In addition, any student who arrives 15 minutes after a class begins will be considered absent from that class period.

**Departmental website:** The departmental website is <http://math.sci.ccny.cuny.edu/>. Almost anything else you could want to know about the department can be found here.

**Academic integrity:** You are expected to adhere to the CUNY Policy on Academic Integrity. This policy is posted at <http://www1.ccny.cuny.edu/upload/academicintegrity.pdf>.

**Accommodations for Students with Disabilities:** Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the AccessAbility Center (AAC). Prior to granting disability accommodations in this course, the instructor must receive written verification of a student's eligibility from the AAC, which is located in NAC 1/218. It is the student's responsibility to initiate contact with the AAC and to follow the established procedures for having the accommodation notice sent to the instructor.

**An Introduction to Chaotic Dynamical Systems,  
by Robert Devaney, 2nd edition.**

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- 1.10: Sarlovskii's Theorem
- 1.11: The Schwarzian Derivative
- 1.12: Bifurcation Theory
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- 1.14: Maps of the Circle
- 1.15: Morse-Smale Diffeomorphisms
- 1.16: Homoclinic Points and Bifurcations
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