

MAT 463/563 - Ordinary Differential Equations

Syllabus

Dr. R.L. Herman

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Course Content:

Required Text: *A Second Course in Ordinary Differential Equations: Dynamical Systems and Boundary Value Problems* by Dr. R. L. Herman. This set of notes is found at the course website.

Optional Materials: Additional readings are posted at the course web site. These include references to several on-line lecture notes and applets. The course site is people.uncw.edu/hermanr/mat463. Also, you may want to look at my site for the first course in differential equations for links to review topics: people.uncw.edu/hermanr/mat361.

In this class we will cover a variety of topics in ordinary differential equations. These will include linear systems of differential equations, qualitative behavior and stability of nonlinear systems, chaos, boundary value problems, Green's functions, Fourier series, Sturm-Liouville eigenvalue problems, and possibly perturbation theory.

Course Philosophy:

You can think of this as the second half of a course in differential equations, which means that you will probably need to review some basics about solving simple initial value problems.

We will develop techniques for studying differential equations. In the process we will see deep connections between differential equations and other areas of mathematics. In particular, we will see that linear

algebra provides much of the background to the theory of linear systems and to solving some boundary value problems.

A study of differential equations would not be complete without reference to the enormous number of applications. We will see applications in physics, chemistry and biology. You will be called upon to explore some of these applications in your homework and in group projects. Hopefully, these explorations will enhance your understanding and appreciation of this field. Of course, this is only the beginning of the study of differential equations.

There are many other topics that you can explore once this course is done, such as further investigations of dynamical systems and chaos, partial differential equations, etc.

Finally, in order to fully appreciate solutions of differential equations, we will need to use a variety of software packages and modules to visualize the behavior of these solutions. So, you will be exposed to some elementary programming in Matlab and/or Maple as well as make use of applets over the web.

Group Work:

In this course you will occasionally work with other students to complete a task. For many of you group work will be a new experience. In order to make this experience both productive and enjoyable, we offer the following suggestions:

- ▶ Start the project as soon as it is assigned. Do not put it off until the last minute. Some of the assignments will take time and working in a group may require more time due to scheduling difficulties.
- ▶ Read over the entire assignment, carefully before discussing or completing any part of it.
- ▶ Initially, you may have no idea as to how to get started. Don't panic! Discuss the lab with the group and generate some ideas.

- ▶ Project work is not always as straightforward as standard homework assignments. You may need to make some assumptions and later justify these assumptions, indicating how they affect your results.
- ▶ The final report should be thoughtful, well-written and neatly organized. It should summarize your approach to the problem, present your results and conclusions, and be furnished with full explanations.
- ▶ If you have investigated the project as far as possible and still have questions, or there is a need for clarification of some point, then discuss them with your instructor before writing the report.

Course Requirements:

Homework: Homework assignments will be collected on a regular basis and you will be told when the work is due. As doing homework is very important for learning the material in this course, it will count as 35% of your grade.

Projects: One of the most important tools in applied mathematics is the use of computer software. In this class you will be exposed to more advanced techniques of using the software we have around campus. This will include Maple, Matlab and some specialized packages. You will have some assignments using this technology and at least one in-depth group project. This will count 15% of your grade.

Exams and Grades: There will be a midterm and a final for this course. These exams will cover the basic material up to the date of the exam. The tentative dates for the exams are below.

Exams	Date
Midterm	Oct 1
Final	Dec 5, 7:00 PM

Your final grade will be based on the following:

Homework	35%
Projects	15%
Midterm	25%
Final	25%

90-100	A
80-89.5	B
70-79.5	C
60-69.5	D

Plus-minus grading may be used in special cases.

Academic Honor Code: "The University of North Carolina at Wilmington is committed to the proposition that the pursuit of truth requires the presence of honesty among all involved. It is therefore the institution's stated policy that no form of dishonesty among its faculty or students will be tolerated. Although all members of the university community are encouraged to report occurrences of dishonesty, each individual is principally responsible for his or her own honesty." Student Handbook. (*This includes plagiarism, bribery and cheating.*)

Student Disabilities: UNCW Disability Services supplies information about disability law, documentation procedures and accommodations that can be found at <http://www.uncw.edu/stuaff/disability/>. To obtain accommodations the student should first contact Disability Services and present their documentation to the coordinator for review and verification. (If you feel that you should qualify for disability testing or accommodations during this course, contact the Office of Disability Services in Westside Hall or call ext. 3746.)

This syllabus is subject to change!

*Several scientists were all posed the following question:
 "What is pi ?"
 The engineer said: "It is approximately 3 and 1/7"
 The physicist said: "It is 3.14159"
 The mathematician thought a bit, and replied,
 "It is equal to pi".*