Notes to the Instructor

One goal in our writing has been to create flexible texts that afford the instructor a variety of topics and make available to the student an abundance of practice problems and projects. We recommend that the instructor read the discussion given in the preface in order to gain an overview of the prerequisites, topics of emphasis, and general philosophy of the text.

Supplements

Student's Solutions Manual: By Viktor Maymeskul. Contains complete, worked-out solutions to most odd-numbered exercises, providing students with an excellent study tool. ISBN 13: 978-0-321-74834-8; ISBN 10: 0-321-74834-4.

Companion Web site: Provides additional resources for both instructors and students, including helpful links keyed to sections of the text, access to Interactive Differential Equations, suggestions for incorporating Interactive Differential Equations modules, suggested syllabi, index of applications, and study tips for students. Access: `www.pearsonhighered.com/nagle`

Interactive Differential Equations: By Beverly West (Cornell University), Steven Strogatz (Cornell University), Jean Marie McDill (California Polytechnic State University – San Luis Obispo), John Cantwell (St. Louis University), and Hubert Hohn (Massachusetts College of Arts) is a popular software directly tied to the text that focuses on helping students visualize concepts. Applications are drawn from engineering, physics, chemistry, and biology. Access: `www.pearsonhighered.com/nagle`

Instructor's MAPLE/MATHLAB/MATHEMATICA manuals: By Thomas W. Polaski (Winthrop University), Bruno Welfert (Arizona State University), and Maurino Bautista (Rochester Institute of Technology). A collection of worksheets and projects to aid instructors in integrating computer algebra systems into their courses. Available in the Pearson Instructor Resource Center at `www.pearsonhighered.com/irc`.

MATLAB Manual ISBN 13: 978-0-321-53015-8; ISBN 10: 0-321-53015-2
MAPLE Manual ISBN 13: 978-0-321-38842-1; ISBN 10: 0-321-38842-9
MATHEMATICA Manual ISBN 13: 978-0-321-52178-1; ISBN 10: 0-321-52178-1

Computer Labs

A computer lab in connection with a differential equations course can add a whole new dimension to the teaching and learning of differential equations. As more and more colleges and universities set up computer labs with software such as MAPLE, MATLAB, DERIVE, MATHEMATICA, PHASEPLANE, and MACMATH, there will be more opportunities to include a lab as part of the differential equations course. In our teaching and in our texts, we have tried to provide a variety of exercises, problems, and projects that encourage the student to use the computer to explore. Even one or two hours at a computer generating phase plane diagrams can provide the students with a feeling of how they will use technology together with the theory to investigate real world problems. Furthermore, our experience is that they thoroughly enjoy these activities. Of course, the software, provided free with the texts, is especially convenient for such labs.

Group Projects

Although the projects that appear at the end of the chapters in the text can be worked out by the conscientious student working alone, making them *group* projects adds a social element that encourages discussion and interactions that simulate a professional work place atmosphere. Group sizes of 3 or 4 seem to be optimal. Moreover, requiring that each individual student separately write up the group's solution as a formal technical report for grading by the instructor also contributes to the professional flavor.

Typically, our students each work on 3 or 4 projects per semester. If class time permits, oral presentations by the groups can be scheduled and help to improve the communication skills of the students.

The role of the instructor is, of course, to help the students solve these elaborate problems on their own and to recommend additional reference material when appropriate.

Some additional Group Projects are presented in this guide (see page 10).

Technical Writing Exercises

The technical writing exercises at the end of most chapters invite students to make documented responses to questions dealing with the concepts in the chapter. This not only gives students an opportunity to improve their writing skills, but it helps them organize their thoughts and better understand the new concepts. Moreover, many questions deal with critical thinking

skills that will be useful in their careers as engineers, scientists, or mathematicians.

Since most students have little experience with technical writing, it may be necessary to return *ungraded* the first few technical writing assignments with comments and have the students redo the the exercise. This has worked well in our classes and is much appreciated by the students. Handing out a "model" technical writing response is also helpful for the students.

Student Presentations

It is not uncommon for an instructor to have students go to the board and present a solution to a problem. Differential equations is so rich in theory and applications that it is an excellent course to allow (require) a student to give a presentation on a special application (e.g., almost any topic from Chapters 3 and 5), on a new technique not covered in class (e.g., material from Section 2.6, Projects A, B, or C in Chapter 4), or on additional theory (e.g., material from Chapter 6 which generalizes the results in Chapter 4). In addition to improving students' communication skills, these "special" topics are long remembered by the students. Here, too, working in groups of 3 or 4 and sharing the presentation responsibilities can add substantially to the interest and quality of the presentation. Students should also be encouraged to enliven their communication by building physical models, preparing part of their lectures with the aid of video technology, and utilizing appropriate internet web sites.

Homework Assignments

We would like to share with you an obvious, non-original, but effective method to encourage students to do homework problems.

An essential feature is that it requires little extra work on the part of the instructor or grader. We assign homework problems (about 5 of them) after each lecture. At the end of the week (Fridays), students are asked to turn in their homework (typically, 3 sets) for that week. We then choose at random one problem from each assignment (typically, a total of 3) that will be graded. (The point is that the student does not know in advance which problems will be chosen.) Full credit is given for any of the chosen problems for which there is evidence that the student has made an honest attempt at solving. The homework problem sets are returned to the students at the next meeting (Mondays) with grades like 0/3, 1/3, 2/3, or 3/3 indicating the proportion of problems for which the student received credit. The homework grades are tallied at the end of the semester and count as one test grade. Certainly, there are variations

