Syllabus and Lab Assignments

Physics 230 Lab: Introduction to Maple
Department of Physics and Astronomy
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Maple is a powerful symbolic manipulation language that allows you to analyze and solve physics problems. It is widely used in upper-division physics classes and in physics research. The objective of this class is that you develop fluency in formulating and solving simple problems using Maple. To achieve this goal you will be coached in using the algebraic, graphical and logical functions of Maple. You will be successful if you can demonstrate these skills during the labs and on a final evaluation.

The one-credit-hour course consists of 14 computer labs. Each lab is 3 hours long and there is no assigned work outside of this period. The text is a computer program written in Maple, divided into several worksheets. You can download these worksheets from the Physics 230 link on the Physics Department web site. You and your lab partner are assigned to read the text, execute the examples, and solve the assigned problems by using Maple, following the schedule given below. You complete each problem by showing a TA what you have produced on your computer screen and having them record the problem as completed. Your final grade will be determined by how many of the assigned problems you complete and by your performance on a final examination at the end of the course. You are also required to use Maple to solve 3 significant homework problems from physics or math courses you are taking this semester. If you are not sure what significant means, ask your instructor.

The in-class assignments are the most important part of the course, and contribute the most towards your final grade. Each lab assignment is worth one point, for 13 possible lab points. The three significant problems each are worth 1 point, and the final exam will be worth 4 points. Final scores of at least 14 of the 20 possible points are guaranteed passing grades.

Warning: some of you will be tempted to miss class and just work through the book on your own because the class feels so much like independent study. Do not do this. You will find yourself staring at a piece of Maple code that should work, but doesn’t, and not have a clue about what is wrong. This happens in class too, but there you can raise your hand, a TA comes over and says, “You need a comma right there.”, the code works, and you are underway again. By yourself this comma can take a long time to find. So please: come to class.

Also: watch for the checkpoints listed below after Labs 4, 9, and 14. They are there to keep you from getting behind and trying to finish the whole course in the last week.
Lab 1: Chapter 1

(a) Log on to a PC with a partner and download the Physics 230 Maple worksheets. The worksheets are found through the course web page on the Physics and Astronomy Department server (http://www.physics.byu.edu/courses).

Start Maple and use Open under the File menu to go to the directory where you placed the Maple Worksheets.
(b) Open the Introduction and read it together.
(c) Open the Index and look at it. Click on a topic, then figure out a way to get back to the Index.
(d) Open Chapter 1 and work through each section, executing all of the Maple commands and doing what the text tells you to do.

Lab 2: Chapter 1

Continue through Chapter 1 until you have finished all the problems.

Lab 3: Chapter 2

(a) Go to Chapter 9 and study the symbolic algebra commands listed there, running the examples as you go. Don’t work through the long exercise at the end, but just try to become familiar with the commands and what they do. As you work the other problems in this course you will probably refer to this chapter often as you try to talk Maple into giving you results in the form you want.

(b) Work through the sections of Chapter 2 from x-y Plotting to Plotting Data, skipping the advanced topics. Work the following problems and show your work to your TA.
2.1, 2.2, 2.3, 2.6, 2.7, 2.8, and the Plotting Data example.
(c) Present your choice for significant problem # 1 to the instructor for approval.

Lab 4: Chapter 2

(a) Work through the sections of Chapter 2 from Parametric Plots to 3-D Plotting and do the following problems:
2.10, 2.12, 2.13, 2.14, 2.16, 2.18, 2.20, 2.24.
Also work through and experiment with the commands in the 3D Plotting section. Especially become familiar with the items available on the toolbar at the top of the plot frame.
(b) Pass off the first significant homework problem done in Maple from one of your other classes.
(c) Not required, but a good idea: If you have time, do the advanced material on wave packets in the section on animations and do problems 2.21-23.

CHECKPOINT 1: Labs 1-4 (Chapters 1-2)

Labs 1-4 must be finished now; no late work will be accepted after the end of the Lab 4 class period.

Lab 5: Chapter 3

Work through Limits, Differentiation, and part of Integration in Chapter 3, up through Elementary Integrals. Show a TA your work on Problems 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, and 3.11.
Lab 6: Chapter 3
Work through the rest of Integration in Chapter 3, and show Problems 3.12, 3.13, 3.14, 3.16, and 3.17 to a TA.

Lab 7: Chapter 3

Lab 8: Chapter 4
(a) Work through Chapter 4 on Complex Analysis, doing Problems 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, 4.8, 4.11, 4.12, and 4.13.
(b) Present your choice for significant problem # 2 to the instructor for approval.

Lab 9: Chapter 5
(a) Work through Chapter 5 on Linear Algebra, doing Problems 5.1, 5.2, 5.3, 5.4, 5.5, and 5.6.
(b) Pass off the second significant homework problem done in Maple from one of your other classes.

CHECKPOINT 2: Labs 5-9 (Chapters 3-5)
Labs 5-9 must be finished now; no late work will be accepted after the end of the Lab 9 class period.

Lab 10: Chapter 6
(a) Work through Chapter 6 on Solving Equations, doing problems 6.1, 6.2, 6.3, 6.4, 6.5, and 6.7. (If you have time, tackle 6.6.; it is difficult, but you will gain experience with a problem that is similar to those that show up in research all the time.)

Lab 11: Chapter 8
Work through the first two sections of Chapter 8 on Procedures, Loops and Logic, and do problems 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, and 8.7.

Lab 12: Chapter 8
Work through the last two sections of Chapter 8, doing problems 8.8, 8.9, 8.10, 8.13, and 8.14.

Lab 13: Chapter 9
(a) Work through Chapter 9 again and do Problems 9.1 and 9.2. Then do two of the three problems 9.3, 9.4, and 9.5.
(b) Present your choice for significant problem # 2 to the instructor for approval.

Lab 14: Chapter 9
(a) One-hour written exam
(b) Pass off the third significant homework problem from your other physics or math classes.

CHECKPOINT 3: Labs 10-14 (Chapters 6, 8, and 9)
Labs 10-14 must be finished now; no late work accepted after the last lab period.