PHY 099: Introduction to the mathematical methods of physical science and engineering

Syllabus
University of Rochester

Fall 2017

Instructor

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Course Overview

The main goal of this course is to refresh your memory of some important fundamental mathematical concepts that you will need in PHY 121–122 and in other science and engineering courses. Some of the topics we will cover are:

- factoring algebraic expressions
- the quadratic formula
- solving algebraic equations
- solving systems of equations
- inequalities
- length, area, and volume of regular geometric shapes
- trigonometry of triangles and the unit circle
- trigonometric identities
- graphs of trigonometric and algebraic functions

This course will force you to think about math problems differently, and this will help sharpen the critical skills required for success in science and engineering. Many problems in science and engineering will require you to use tools from more than one of the above areas; in this course, you will learn how to *combine* these different skills and methods to solve problems effectively.

Basic Math Assessment

PHY 099 is graded on a Credit/No Credit basis. In order to receive credit for the course, you must pass the Basic Math Assessment (BMA) exam. This is a pencil-and-paper exam, 45 minutes in length. The Assessment will be offered four times during the semester, each on a Wednesday morning:

- September 6 at 8:00 in B&L 106
- October 4 at 8:00 in B&L 106
- November 8 at 8:00 in B&L 106

- December 13 at 8:00 in B&L 106

If you pass the BMA at the first offering, you will have completed PHY 099 and receive credit. Otherwise, you will need to work through the WeBWorK modules (see below) before you can take the BMA again. You are encouraged to finish the modules early, in order to have as many attempts at the BMA as possible.

WeBWorK

All of the coursework will be done online through WeBWorK at `http://phlnx3.pas.rochester.edu/webwork2/phy099f17/`. Soon after the first BMA, you should be able to log in using your NetID as username and your URID as password. When you log in for the first time, you should change your password to something that you can remember and that no one else knows.

There are four WeBWorK modules that must be completed in order to qualify to retake the BMA. Each module emphasizes certain topics:

1. Algebra I (mostly single-variable problems)
2. Algebra II (multi-variable problems)
3. Geometry and Trigonometry I
4. Geometry and Trigonometry II

Note, however, that these topics should not be regarded as unrelated entities. Concepts and techniques from one module will often show up in another module, and you will frequently need to combine multiple techniques in order to solve the problems.

The WeBWorK component of PHY 099 uses the *mastery learning* approach. Each module begins with a homework set consisting of about 20 problems. You will have as many attempts at each problem as you need; once you get all the problems correct, you will have access to a mastery quiz consisting of 6 problems. Each time you take a mastery quiz, you will have limited time and a limited number of attempts at each problem. If you score a perfect 6/6, you have passed the quiz and completed that WeBWorK module, and may proceed to the next module. If your score is less than 6/6, you should review and try to learn from your mistakes, and then you can attempt another version of the quiz.

Unfortunately, the WeBWorK software is not able to open the next homework set automatically when you pass a quiz. Therefore, whenever you pass a quiz, you should notify me immediately so that I can open the next homework set manually. (And take my response time into account in your planning. I try to answer my email as promptly as I can, but plan conservatively and allow a day for me to respond.)

Once you finish all four WeBWorK modules, you will be eligible to retake the BMA the next time it is offered.

Workshops

The PHY 099 workshops are an informal environment designed to assist you in solving the WeBWorK problem sets and learning or re-learning the relevant concepts as you prepare for the BMA. You may, and are encouraged to, work in groups. I will be on hand to help you as you do this. It is not my role to do the homework for you, but I will do my best to help guide you to a deeper understanding of the material. If there is sufficient interest, I will spend part of the workshop time presenting some general problem-solving tips or solving example problems on the whiteboards. I strongly encourage you to attend regularly and bring lots of questions!

There will be two workshop sessions each week:

- Tuesdays, 11:05–13:45 in B&L 203H
- Wednesdays, 12:30–15:15 in B&L 203H

You are welcome to attend either session, or both, regardless of which one you are registered for, and feel free to attend only part of the session if it overlaps with one of your other classes.

Website, etc.

General information about PHY 099 is available at `http://www.pas.rochester.edu/~mcelmurry/phy099/`, along with some practice BMA exams and other useful study materials. BMA scores will be posted in Blackboard, and from time to time I will send announcements via Blackboard or via email. You are responsible for any information communicated via these channels.

Academic honesty

Academic honesty is of paramount importance in this course, as in all your studies. All assignments and activities associated with this course must be performed in accordance with the University of Rochester's Academic Honesty Policy, available at `http://www.rochester.edu/college/honesty/`.

This means, of course, that the solutions you submit on the BMA exams must be entirely your own. You may not receive assistance on the exam from your classmates or anyone else, and you may not use notes, calculators, or other electronic devices.

Academic honesty also applies to the WeBWorK. You are free to work together on the WeBWorK homework sets, but do not simply copy your classmates' solutions. The answers that you submit should reflect your own understanding of how to solve the problems.

If I become aware of instances of academic dishonesty, I will have to take appropriate actions as required by the College's policy. I very much hope that this will not be necessary.

Some words of advice

No doubt you are taking PHY 099 because you want to take PHY 121/121P and/or PHY 122/122P in the future. Keep this goal in mind, and work as hard as you need to in order to make it happen. This may be as easy as passing the BMA on the first attempt.

If you don't pass the BMA the first time, don't despair. But also, don't take it for granted that you will pass the next time, and don't assume that the WeBWorK will be a walk in the park; I can guarantee that some of the problems will challenge you. Start working on the WeBWorK right away, and keep at it until you finish. In most cases, students who work diligently on the WeBWorK take about 1–2 weeks per module. But of course, each student is different, and you may find that some parts of the WeBWorK are easy for you, while other parts take more time. For instance, if you breeze through Module 1, don't assume that Module 3 will be equally easy.

Don't forget that the workshops are a valuable resource as you work through the WeBWorK. If you're stuck on some of the problems, and if you come and ask me good questions, I can help you figure it out. If you're struggling with solving systems of equations, or with applying trig identities, or with some other topic, and if you come and ask me good questions, I can help you figure it out. But if I never see you in class, and at the end of the semester you complain that the problems were too hard and no one could help you with them, don't expect a lot of sympathy. I'm available for more than five hours per week to help you, and it's up to you to make use of that time.

PHY 099 is not meant as a barrier to taking PHY 121–122, but as a bridge to help you get there. If it seems that you are being asked to solve lots of difficult problems, it is because that is the only way to develop the necessary skills. We want you to succeed, but of course the course requirements are clear and will not change: to pass the BMA, you need a score of at least 16/24; and to retake the BMA, you need to master all four WeBWorK modules.

My goal for PHY 099 is for every student to pass. I will be working hard to achieve this, and I'm counting on you to do the same.