

PHYSICS 1100: UNIVERSITY PHYSICS I

Instructor:	D. A. Clarke	MM 301E, 420-5830, dclarke@ap.smu.ca
Lectures:	Burke B	T Θ , 10:00 am – 11:15 am
Labs:	MM 023	M T Θ , 2:30 pm – 5:30 pm
Help room:	MN 005	M T Θ , 1:00 pm – 4:00 pm
Office hours:	MM 301E	T, 1:00 – 4:00 pm; W, 2:00 – 5:00 pm
Textbook:	“Physics for Scientists and Engineers”, by Randall D. Knight, 1st ed.	
Assignments:	Assigned Thursdays, due one week later.	
Assessment:	Laboratory 15%	Lab Exam 10%
	Assignments 15%	Clickers! 5%
	Midterm exam 15%	Final exam 40%
Course Web Site:	http://www.ap.smu.ca/~dclarke/PHYS1100	

1. Opening remarks

In the scientific food chain, physics is the ocean plankton without which there would be no chemistry (krill), biology (fish), or medicine (orca). All scientific thought, pure or applied, is founded on the principles of physics.

Physics is the study of how and why nature works the way it does. It answers questions ranging from “Why is the sky blue?” (Why indeed!) to “How did the universe begin?” Engineers and architects cannot design their structures, doctors cannot perform their diagnostic tests, and meteorologists, astronomers, geologists, chemists, and even biologists cannot do their jobs without a fundamental understanding of physics.

If physics is the plankton, mathematics is the sunlight; mathematics is the language of physics. Moreover, physics is the *mathematisation* of our observations of the universe. To do well in this course, you will have to become comfortable with the mathematics, and this includes differential calculus which we’ll need well before your math course covers it—get used to your physics courses using math before you see it in your math courses!

You have enrolled in this course because, for whatever reason, you seek a rigorous and fundamental understanding of basic physics. While this is a challenging course—among the most demanding of all first-year courses offered at Saint Mary’s—its rewards far outweigh the effort. To paraphrase the late Carl Sagan:

If you seek a reason for your existence, then perhaps you need look no further than this: We are all “starstuff”. Eons ago, far off supernovæ fused atoms of all species in countless numbers and flung them off into deep space, only to be reorganised to form the bodies and minds of those who would dare look back up into the cosmos and ponder from where they came. In every sense, humanity is the universe becoming aware of itself.

By taking this course, you have chosen to become part of that awareness.

2. What does the text’s subtitle *A Strategic Approach* mean?

Your text book, *Physics for Scientists and Engineers; A Strategic Approach* by R. D. Knight, is

much more than a text. It is the culmination of decades of physics education research by scores of dedicated physicists and teachers working under the thesis that physics need not be *hard* so long as it's taught properly. Each element of this course—lectures, assignments, labs, on-line resources, even the clickers—has a purpose and, like a well-crafted Swiss watch, take out any composite piece and the whole thing may cease to function. By spending an honest ten hours a week on this course including lectures, labs, assignments, seeking help when needed, *etc.*, you will finish this course with a working knowledge of fundamental physics, regardless of what your experience with physics may have been in the past. But I can promise you that only if you do your part.

3. *The course web site*

The site <http://www.ap.smu.ca/~dclarke/PHYS1100> is your main source for practical information on the course. It is *not* WebCT and requires no password. It is a “cheap and cheerful” site where I will post various PDFs (*e.g.*, this syllabus, class notes, solution sets, *etc.*), dates and places for exams, and any announcements I wish to make. Please check this site regularly.

4. *Lectures*

Study after study has shown an extremely high correlation between those who attend lectures, and those who do well in the course, and there are at least two very good reasons for this. Lectures set the pace and bar for the course, and they give the student the benefit of an expert's interpretation of the material. This is probably the first time you will be taught physics by a practising physicist. It is why you have paid \$600 to sit in the class (24 tickets at \$25 a piece!), and you should avail yourself of this opportunity while you have it. You will learn things from class you will not get from the textbook—guaranteed.

5. *Clickers*

If the above doesn't persuade you to come to class, then perhaps the 5% of your grade that goes toward “Clickers!” may. For this, you will need a “Classroom Performance System” (CPS, or “clicker”) that allows me to “ask the audience”, as on *Who wants to be a millionaire?*. Numerous times throughout term, I shall put up a few quick “conceptual” questions on the current topic. Your clicker response is recorded by the computer and gives you full credit for the right answer, partial credit for any answer. It also lets me know what fraction of the class is “getting it”, and if I need to make a mid-course correction in my lecture.

Clickers may be purchased from the bookstore for \$30 new, \$20 used, and there is a \$15 buy-back if you choose. Further, bundled with your new textbook is a “clicker rebate coupon” which you can mail in and save a few bucks on your new clicker. While you can use the same clicker for as many classes as may need it, you must [register your clicker](#) for each class separately, once per semester. Registration fees are either US\$10 on-line or, if you don't have a credit card, C\$15 at the bookstore. Either way, you must register your clicker for each class on-line. **For this class, please register your clicker by Tuesday, September 16** as this will be the first day we use them. *You will not be able to participate in this part of the class until you register your clicker!*

6. Assignments and practice problems

Every week I will assign 5–10 problems from <http://www.masteringphysics.com>. Books bought from the bookstore will include a *MasteringPhysics student access code*, which you will need the first time you log onto this site. If you got your textbook elsewhere, you can buy the access code separately from the bookstore for yet another fee. The first time you access the MasteringPhysics (MP) site, follow the detailed instructions carefully so that you may log on, be recognised as a member of my class (course ID is **MPCLARKE67338**), determine what problems are assigned, and submit your answers all on-line.

Assignments are available for only one week, and thus assignments cannot be handed in late! Pay attention to the “gotchas”. Asking for too many hints will reduce the credit you get for the right answer. Asking for the answer itself (which you can do!) will mean you get zero for the problem. If you get stuck on a problem, don’t give up. Come and ask me or one of the tutors (next section) for help, and then go back on-line to complete the assignment.

I have also set about ten practice problems per chapter from the text (not through the MP site) with worked solutions posted on the course web page. These problems are not to be handed in. They are meant to be representative of the homework and exam problems, and are completely voluntary. I cannot advise strongly enough, however, that you do these problems. More than any other subject I know, practice in physics is essential to learning. If you have to look at the solutions before doing most of the practice problems, this may be a sign you need extra help; seek it out.

7. Free tutors!

Every time I teach this course I am invariably asked about tutors, so let me answer that now in the best possible way: we have *free* tutors! For once, no extra fees! The *help room* (MN005; ask someone!) will be open 1:00–4:00 Mondays, Tuesdays, and Thursdays. Everyone is available for at least one of these sessions since everyone is registered for a lab section, and labs meet only every other week. The help room will be populated by a course TA (a senior physics major or a graduate student) who is there to help you with anything from a specific problem, to understanding a concept you aren’t getting. Use this service at the first sign of confusion. Letting it go thinking “somehow it’ll all get cleared up” is a major reason why some students do poorly in this class.

8. Exams

The midterm exam is near the end of October, and based on Part I (chapters 1–8) of the text. There will be three problems, one consisting of five “conceptual” clicker-type questions requiring very short answers, and two which will require worked solutions each fitting easily on a single page.

The final exam, to be scheduled later in the term, will be comprehensive, based on all we cover in Parts I, II, and III. Here I give you six problems of which you must do five.

9. Laboratory

The laboratory is an integral, yet independent portion of the course. You will have a different instructor for this (*i.e.*, not me), and there will be a separate lab syllabus given out at your first lab. You will need to purchase a Physics A90 lab notebook from the bookstore (less than \$10) and a lab manual from the Astronomy and Physics Majors Room (MM014A), also for under \$10.

Everyone should be registered for one of five lab sections, labelled A–E. Your lab will meet only six times this semester—five labs and one lab exam—and you will need to check the [lab schedule](#) to know when your lab meets. On the days you don't have a lab or before your lab starts, you can avail yourself of the help room, if needed.

10. Cheating

If you're reading this, this almost certainly doesn't apply to you, but this has to be said. In this new electronic age of ours, there are ample ways to cheat in a course like this and, to be frank, nothing will be scrutinised except for the exams. So go for it! I dare you! In fact, let me tell you one of the best scams I've heard. Student X registers for the course, gets his (most cheaters are, alas, guys) MP access code, and then promptly drops out of the course. He's relying on the instructor not noticing he's gone (a good bet!) and thus hasn't disconnected his access code. Mr. X continues to go on line every week, "does" the assignment by asking the site to give him all the answers (he gets zero for each, but so what?), and then sells or gives the answers to all his buddies still enrolled in the course. Neat, huh? The sad part is, this happens all the time, and it works.

But here is what the cheaters never "get". The schmucks who receive the answers for the assignments may get the full 15% on the assignments but, guess what? They *always* fail the exams (no practice!) and *never* get more than a D in the course, and usually an F. (And here is the amusing part for me: MP also records *when* the answers are submitted. Thus I can tell who takes five minutes to complete an assignment in the last hour it's available on line and gets 100% each time, yet somehow manages to get 10% on the exams!) So, as far as I'm concerned, Darwin takes care of those who seek the easy out, and I don't need to worry about the small fry.

On the other hand, those caught cheating on exams—and we do invigilate that very carefully—are thrown out of the exam hall in the most undignified manner imaginable, and reported to the registrar for possible expulsion from the university. Mr. X: *it just ain't worth it!*

11. Words of advice

Physics doesn't *need* to be difficult. Student frustration usually stems from not seeking help when it is needed. So here are some tips.

- Attend all lectures and *read the portion of the text to be covered in class before coming to class* (see course schedule in the next section).
- Do all practice problems. Only you can know if you really understand something, and doing the practice problems is the best way to find out.
- In answering any problem, always ask yourself "Is this answer sensible?" Check the units, make a useful diagram (model), and assess all your assumptions.
- To prepare for the exams, make sure you understand and can do all assigned and practice problems. Being able to do a problem doesn't mean memorising the solution. Physics is entirely about *understanding*, and nothing to do with *memorising*.
- Find a study partner; I strongly encourage students to study and do the assignments together.
- Don't give up or sit for hours trying to do the homework. Come and see me or visit the help room. You will often find you were much closer to the solution than you thought.

- Don't cheat—you only cheat yourself out of an education that you are paying good money for! Note that using another student's clicker for the in-class CPS questions is considered cheating too; please use only your own.
- Have fun and allow yourself to wonder. Physics is all about acquiring a certain “clarity of thought” about the world and universe around you. If you put the effort into this class, I think you'll be amazed at its affect on how you think about everything else, and how much of it sticks with you long after you leave university life.

12. *An approximate lecture schedule (updated, Sept. 23, 2008)*

The table below gives an approximate schedule for what we'll be talking about in class, and the reading you ought to do before coming to each class. Use this as a guide; there will no doubt be a few mid-course changes along the way. Your reading assignments are to have read the chapter(s) in green before class.

Tuesday		Thursday	
Sept. 2	No classes	Sept. 4	Chapter 1 course overview; motion diagrams
Sept. 9	Chapter 1 velocity, acceleration	Sept. 11	Chapter 2 uniform motion
Sept. 16	Chapter 2 accelerated motion	Sept. 18	Chapter 2 examples
Sept. 23	Chapter 4 Newton's laws, forces	Sept. 25	Chapters 4 & 5 free body diagrams
Sept. 30	Chapter 5 friction, force problems	Oct. 2	Chapter 6 motion in 2-D; projectiles
Oct. 7	Chapter 6 relative motion	Oct. 9	Chapter 7 circular motion
Oct. 14	Chapter 7 circular motion; fictitious forces	Oct. 16	Chapter 8 Newton's 3rd law; ropes and pulleys
Oct. 21	Chapter 8 more force problems	Oct. 23	Chapter 9 momentum; inelastic collisions
Oct. 28	midterm	Oct. 30	Chapters 9 & 10 angular momentum; energy
Nov. 4	Chapter 10 potential energy; elastic collisions	Nov. 6	Chapter 11 work, variable forces
Nov. 11	Remembrance day	Nov. 13	Chapter 11 conservation of energy
Nov. 18	Chapter 13 rigid bodies; torques	Nov. 20	Chapter 13 equilibrium; rolling motion
Nov. 25	Chapter 14 simple harmonic motion	Nov. 27	Chapter 14 pendulum; damped driven oscillators

13. Checklist for course materials

For this course, you will need to get:

- Text: *Physics for Scientists and Engineers*, by Knight
→ bookstore
- “Classroom Performance System”, *a.k.a.* a “clicker”
→ bookstore
- register clicker
→ [instructions](#)
- MasteringPhysics student access code
→ comes with text bought at bookstore; otherwise purchase separately at bookstore
- A90 physics lab book
→ bookstore
- PHYS1100/1101 lab manual
→ MM014A (Astronomy and Physics majors room)
- bring to lab: scientific calculator, pen, pencil and eraser, transparent ruler, protractor
→ bookstore
- a major loan...