Physics 1BA3:
Introduction to Modern Physics

DESCRIPTION:

This course contains three main parts. In the first part, we will build on what you have learned in Physics 1B03 (Mechanics and Waves) and learn about circular motion and angular momentum. In the second part, we will learn about electromagnetic forces and fields. In the third part, we will go beyond classical physics and learn some basic quantum physics concepts, which will help us understand the microscopic world of atoms and molecules.

INSTRUCTOR INFORMATION (SECTION C01):

Name: Dr. Alan Chen **Email:** chenal@mcmaster.ca

Office location: ABB-260A

Office hours: Tu. 1 - 3pm.

CLASS SCHEDULE:

Class meeting times: Mon., 1:30am - 2:20pm **Room:** ABB-271
Wed., 1:30am - 2:20pm
Thu., 1:30am - 2:20pm

INSTRUCTOR INFORMATION (SECTION C02):

Name: Dr Duncan O'Dell **Email:** dodell@mcmaster.ca

Office location: ABB-330

Office hours: Tu. 2 - 4pm.

CLASS SCHEDULE:

Class meeting times: Tue., 11:30am - 12:20pm **Room:** ABB-271
Thu., 11:30am - 12:20pm
Fri., 11:30am - 12:20pm

RESOURCES:

Textbook:

Physics for Scientists and Engineers with Modern Physics 2nd Edition, R.D. Knight, Addison Wesley

Lab Manual:

Lab Manual, Physics 1BB3 Laboratory Manual, January 2009

WEBSITE:

The course website can be accessed through http://webct.mcmaster.ca

UNDERGRADUATE ADVISOR:

If you have questions about course scheduling, please email our Level 1 Physics undergraduate advisor:

Dr. Brian King, ABB-239, Ext. 24851, Email: Brian.King@mcmaster.ca.

PHYSICS DROP-IN-CENTRE:

If you have a question about the course material or need help with a physics problem, one possibility is to use the Physics drop-in-centre, situated in the basement of the Thode library, rooms B108 and B110. This centre is a service provided by the department of Physics and Astronomy for students enrolled in first-year physics courses. It is open every day of the week from 9am to 5:30pm, and you can just drop in at anytime. For details about the centre see http://physwww.physics.mcmaster.ca/?page=dropin_centre.

COURSE GOALS:

On completion of the course, you should be able to:

1) Understand the physical concepts introduced in class (e.g. angular momentum, electric potential, etc…). These concepts will become familiar to you as long as you make the effort to carefully read your textbook and actively review the material presented in class. The experimental work you will be doing in the labs will also help because it will give you the opportunity to see these concepts at work. Your conceptual understanding will be tested during the mid-term exams and final exam.
2) Be able to answer questions and solve problems relating to the topics presented in class. You will acquire these problem-solving skills by working on exercises proposed in class and by doing regular homework. Many exercises and problem sets are also available in your textbook, and I encourage you to take advantage of it. The secret to solving problems quickly and reliably is practice. The more exercises you

solve, the faster and better you will become. Your problem-solving skills will be tested through home assignments, and during the mid-term and final exams.

3) See how the Physics concepts learnt in class relate to the real world. Through your work in the lab and through examples and demos presented in class, you should gain an understanding of how the laws of Physics apply to practical situations as well as to different fields.

ASSESSMENT:

CAPA assignments: 10% **Labs:** 15% **Midterms:** 30% **Final exam:** 45%

CAPA ASSIGNMENTS:

You will be given home assignments, each in the form of a series of short questions that you will have to answer using the software CAPA (Computer-Assisted Personalized Approach), accessible through WebCT. Home assignments are due by midnight on Thursdays (please refer to the WebCT site for deadlines).

LABS:

You have been assigned to one of three lab sections. Labs will take place every other week (please refer to the lab schedule that will be posted shortly), on a different day for each section, in BSB-B110.

In order to pass the course, you must attend all 5 labs and submit a formal report for each of them. Lab reports are due by 2:30pm exactly one week after the lab took place. They should be deposited in the drop-box found in the hallway outside of BSB-B110. If you miss that deadline, you will need to contact the head TA in charge of your section.

If you miss a lab, because you are sick or have some other special circumstance, you will have to bring documentation proving your condition to the Dean of Sciences office. You will then need to organize a make-up session by contacting the TA in charge of your section or Jake Vanderwal (BSB-B117, ext: 24251, email: jakev@mcmaster.ca).

EXAMS:

The midterm and final exams will combine multiple-choice questions with a problem set (where you will have to justify your answers in writing). You will be tested on the material covered in your reading assignments, in class, and in the labs.

Only the McMaster standard calculator will be allowed during these exams.

Practice exams are available on the website, which can be accessed through WebCT.

CLASS SCHEDULE:

The following week-by-week schedule might be slightly modified as we get through the semester (in particular, the lab schedule is still tentative).

WEEK	BEGINS	TOPIC	READING*	LAB
1	Jan. 5th	Circular motion	8.1-7	
2	Jan. 12th	Rigid body motion, angular momentum	12.1-11	
3	Jan. 19th	Electric fields	26.1-6; 27.1-6	Conical pendulum
4	Jan. 26th	Electric potential	29.1,2,4-7; 30.1-3	
5	Feb. 2nd	Magnetic field	33.1,2,7	Moment of Inertia
6	Feb. 9th	Photoelectric effect, photons, matter waves, Bohr atom	39.1-7	
	Feb. 16th	Break Week		
7	Feb. 23rd	Wave properties	40.1-4	Electric potential
8	Mar. 2nd	Quantum mechanics	41.1-4,6,7,10	
9	Mar. 9th	Atomic Physics	42.1-4	Stefan's law
10	Mar. 16th	Atomic Physics (cont'd); Nuclear Physics	43.1-6	
11	Mar. 23rd	Nuclear Physics (cont'd)		Hydrogen atom
12	Mar. 30th	Makeup; additional topics		
13	Apr. 6th	Makeup, revision		Catch-up

* The numbers in this column refer to chapters and section of the 2nd edition of Knight's textbook. Again, this might be slightly modified as we go on. Below we give the same table but with the reading schedule given for the 1st Edition of Knight's book:

WEEK	BEGINS	TOPIC	READING (1st Edition)	LAB
1	Jan. 5th	Circular motion	7.1-6	
2	Jan. 12th	Rigid body motion, angular momentum	13.1-10	
3	Jan. 19th	Electric fields	25.1-6; 26.1-6	Conical pendulum
4	Jan. 26th	Electric potential	29.1,2,4-7; 30.1-2	
5	Feb. 2nd	Magnetic field	32.1,2,7	Moment of Inertia
6	Feb. 9th	Photoelectric effect, photons, matter waves, Bohr atom	38.1-7	
	Feb. 16th	Break Week		
7	Feb. 23rd	Wave properties	39.1-4	Electric potential
8	Mar. 2nd	Quantum mechanics	40.1-4,6,7,10	
9	Mar. 9th	Atomic Physics	41.1-4	Stefan's law
10	Mar. 16th	Atomic Physics (cont'd); Nuclear Physics	42.1-6	
11	Mar. 23rd	Nuclear Physics (cont'd)		Hydrogen atom
12	Mar. 30th	Makeup; additional topics		
13	Apr. 6th	Makeup, revision		Catch-up

SCIENTIFIC HONESTY:

Physics is not to be done in solitary confinement. Seeking help when you have difficulties and discussing physics with your colleagues is encouraged. However, work that you submit (lab reports, homework, etc…) **must be** your work. Consult your instructor if there is any doubt about what is acceptable. In general, hints from others are permitted but not complete assignment solutions or laboratory reports.

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. *the grade of zero on an assignment, loss of credit with a notation on the transcript* (notation reads "Grade of F assigned for academic dishonesty"), *and/or suspension or expulsion from the University*.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, which is available on the web and located at www.mcmaster.ca/senate/academic/ac_integrity.htm.

The following examples illustrate three forms of academic dishonesty:

- Plagiarism, e.g. submission of work that is not one's own or for which other credit has been obtained.
- Improper collaboration in group work. Although you work in the lab in groups, the laboratory reports are to be the result of individual efforts and not the result of teamwork.
- Copying or using unauthorized aids in tests and examinations.