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Brock University ● PHYS 1F20/1F25 ● Physics Department

## *Physics for Life Sciences*

Instructors: E.Sternin (Fall) and D.Crandles (Winter)

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### 1. What is this course all about?

#### What **Brock calendar entry** says:

Fundamental classical physics phenomena and concepts; mechanics, optics, electromagnetism and thermal physics. This material should be of interest and use to students who plan to major in the physical or life sciences.

#### What do I need to bring into the course?

This course is suitable for students with a high school science background. High school calculus or OAC Physics are *not* required, but skills in elementary algebra, geometry, and trigonometry are necessary; the course is *quantitative* in nature. A good scientific calculator is required.

#### Textbook

*Physics*, by Cutnell and Johnson, 5th Edition, John Wiley and Sons, 2001 *Student Study Guide*, *Student Solutions Manual*, CD-ROM version of the textbook, and additional web resources (see [www.wiley.com/college/cutnell/](http://www.wiley.com/college/cutnell/)) are also available from the publisher, if desired.

### 2. Lectures and tutorials

**Lectures:** in AS203, M W F 12:00-12:50

**Instructor:** E.Sternin (Fall) and D.Crandles (Winter)

**Tutorials** are conducted every week (starting in the second week of classes), Tuesday in AS 217 or Thursday in AS215, 12:00-13:50. The students review the problems assigned the previous week. Tutorials are conducted by several TAs. Tutorials consist of two distinct phases:

#### Phase 1: review of assigned problems(80 mins)

Problem-related questions are answered by the TA's.

#### Phase 2: in-class test(30 mins)

Two problems similar to (*but not necessarily from*) the ones just solved.

The tutorial test marks contribute a significant fraction of the final grade in the course, so their **attendance is mandatory**. There will be **no** alternative test times. As per University regulations, **only** valid medical excuses will be accepted, with the marks scaled accordingly.

### 3. PHYS 1F25 laboratories

PHYS 1F25 labs are in MC H200, 14:00-17:00, during alternate weeks. There will be an orientation session during the regular lab period in the first week of classes (meaning the week of Sept.9-13 for L1,L3,L4,L6; the week of Sept.16-20 for L2,L5). Frank Benko (B210A, [fabenko@newton.physics.brocku.ca](mailto:fabenko@newton.physics.brocku.ca)) is the senior lab demonstrator, and should be contacted for all details.

Computer-based data acquisition is an integral part of the labs; you may want to consult <http://www.physics.brocku.ca/physica/> in advance. Under the "Get data" menu selection, select "demo" and click "go"; the demo mode allows you to try the tools without being in the lab.

### 4. Other sources of help

#### Office hours

Edward Sternin (B206, ext.3414, [edik@brocku.ca](mailto:edik@brocku.ca)): Sept-Dec, 2002, M W F 13:00-14:30

David Crandles (B202, ext.3539, [dcrandle@newton.physics.brocku.ca](mailto:dcrandle@newton.physics.brocku.ca)): Jan-Apr, 2003, TBA

Frank Benko (B210A, ext.3417, [fabenko@newton.physics.brocku.ca](mailto:fabenko@newton.physics.brocku.ca)): TBA

Phil Boseglay (B211, ext.4109, [bosegla@newton.physics.brocku.ca](mailto:bosegla@newton.physics.brocku.ca)): TBA

#### Computer-Assisted Learning in Physics (CALiPh)

Self-paced tutorial modules are installed on a Macintosh computer in MC B203. They cover most of the topics presented in class. There is no instructor, no mark, no pressure. Reported by some students to double their test performance.

#### Physics Club

Senior students have been known to run informal problem-solving tutorials for the members of BURPS, usually in MC B203 during lunch hours.

#### On-line electronic documentation

This course description, overheads of summaries presented in class, weekly tutorial problem assignments (*i.e.*, homework), and some selected supplementary materials will be made available on-line via the Web server of the Physics Department <http://www.physics.brocku.ca/> (follow the link to 1F20/1F25).

### 5. Topics to be covered

As time permits, some topics not listed below may be added, while some other topics from the listed chapters may not be covered during lectures and tutorial sessions. The examinations will be only on the material covered in each term.

#### Fall term (E.Sternin)

##### 1. Kinematics: motion in one and two dimensions (Ch.1-3)

- Displacement vectors
- Algebra of vectors
- Mathematical tools
- Speed, velocity, and acceleration

- Kinematics in 2D
- 2. Dynamics (Ch.4)
  - Newton's Laws
  - Gravity
  - Contact forces
- 3. Rotational motion: (Ch.8,5,9)
  - Kinematics of rotational motion
  - Dynamics of uniform rotation
  - Torque
- 4. Work, energy, momentum (Ch.6-7)
  - Work and energy
  - Linear momentum
- 5. Solids and fluids (Ch.11)
  - Mechanical and bulk properties of matter; stress and strain
  - Hydrostatics
  - Hydrodynamics

**Winter term:** (D.Crandles)

- 6. Oscillations and waves (Ch.10,16-17)
  - Simple harmonic oscillator
  - Waves in elastic media
  - Sound waves
- 7. Electrostatics (Ch.18-19)
  - Electrons, protons, and matter
  - Coulomb's law for point charges
  - Electric field and electric potential
  - Capacitors and dielectrics
- 8. Electric circuits (Ch.20)
  - Ohm's law
  - Energy/power in electric circuits
  - Series and parallel circuits; Kirchhoff's rules
- 9. Magnetism, induction, electromagnetic fields (Ch.21-22)
  - Magnetic forces and magnetic fields
  - Magnetism, magnetic materials
  - Magnetic force on an electric current
  - Magnetic fields produced by electric currents
  - Electromagnetic induction
- 10. Light and Optics (Ch.24-27)
  - Electromagnetic waves; EM spectrum
  - Polarization of waves
  - Light reflection and refraction
  - Lenses and optical instruments
  - Interference and diffraction
- 11. Quantum Physics (Ch.27,29-30)
  - Light is an EM wave
  - Light is a stream of "particles"
  - Structure of the hydrogen atom
  - Quantum mechanics

**6. Tests and the marking scheme**

Component	PHYS 1F20 each term	PHYS 1F25 each term	Comments
tutorial tests	50%	40%	Conducted during regular tutorial time slots.
midterm exam	20%	15%	Fall: October 22 and 24, 2002; Winter: March 4 and 6, 2003
term exam	30%	25%	You must pass both term exams (50% or more) in order to pass the course.
laboratories	-	20%	<i>Both</i> attending the lab <i>and</i> submitting a written report is required to complete a lab. All labs must be completed to obtain a final mark <i>in the course</i> .

The final mark for the course will be the average of the two term marks (December and April marks).

This page is: <http://www.physics.brocku.ca/faculty/sternin/120/120.html>

Last reviewed by: [edik@www.physics.brocku.ca](mailto:edik@www.physics.brocku.ca) on 05-Sep-02 at 10:23

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