

# PHYSICS 152 - Spring 2011

University of Hawaii, Manoa  
Dept. of Physics & Astronomy

Instructor: Michael Nassir  
Office: Watanabe Hall, Rm. 426, (808) 956-2922  
E-mail: nassir @ hawaii.edu

[Return to PHYS 152 main page](#)

## SYLLABUS

***last updated: May 13, 2011***  
***(topics and links will continue to be updated during semester)***

- The syllabus below lists all sections of the book that you are responsible for understanding for exams. This is my *intended* schedule of topics; *actual* subject matter covered during each lecture may vary a bit, or may lag behind slightly. In that case, exams will only cover material actually discussed in lecture before the exam date. I will continue to update the table below to accommodate changes throughout the semester.
- **Reading Assignments** are intended to reinforce lecture material, provide worked examples, and prepare you for the next lecture. Exam questions may cover material from lectures, reading assignments, or any homework problem. (For sections in [[brackets]], you only need to understand the general concepts in those sections *qualitatively* -- you do not need to know any specific formulas or how to solve numerical problems for those topics.)
- **Links to Handouts & Paper Homeworks** (PDF format) will be added as they become available -- just click on the name of the handout or the "Paper HW #" below.

DATE	READING	TUTORIAL SHEETS & OTHER WORKSHEETS (just for practice -- NOT to be handed in)	HOMEWORK
Mon. Jan. 10 Lecture #1	<a href="#">Course Information &amp; Policies handout</a> <i>Review if needed:</i> <ul style="list-style-type: none"> <li>• <a href="#">Powers of 10 &amp; Scientific Notation handout</a></li> <li>• Appendix A (pp. A1-A9): Scientific Notation, Algebra, Geometry, &amp; Trig. Formulas</li> </ul>	<i>Review if needed:</i> <a href="#">Scientific Notation, Metric System, &amp; Unit Conversion Review Worksheet</a>  <a href="#">Lecture #1 Tutorial Worksheet</a>	

	<ul style="list-style-type: none"> <li>• Table 1-1 (p. 5) or Appendix F (p. A16): Metric Prefixes</li> </ul> <p>17.1 to 17.3: Charge, Electric force, Induced charge <i>Cartoon Guide</i>, Chap. 12: Charge</p>		
Wed. Jan. 12 Lecture #2	more Electric force, Induced charge 17.4: Coulomb's Law	<a href="#">Lecture #2 Tutorial Worksheet</a>	
Fri. Jan. 14 Lecture #3	17.5, 17.9: Electric field, Field lines, Shielding <i>Cartoon Guide</i> , Chap. 13: Electric Fields	<a href="#">Lecture #3 Tutorial Worksheet</a>	<a href="#">Paper HW #1 (PDF file)</a> handed out
Mon. Jan. 17	HOLIDAY -- MLK Jr. Day		
Wed. Jan. 19 Lecture #4	17.6 & 17.7: Electric field, cont'd.	<a href="#">Lecture #4 Tutorial Worksheet</a> <a href="#">Lectures #4-6 Additional Tutorial (E-field &amp; Equipotential Diagrams) Worksheet</a>	
Fri. Jan. 21 Lecture #5	[[17.8: Gauss's Law]] -- <i>optional</i>	(Lecture #5 - NO Tutorial Worksheet)	Paper HW #1 DUE <a href="#">Paper HW #1 SOLUTIONS</a> <a href="#">Paper HW #2 (PDF file)</a> handed out
Mon. Jan. 24 Lecture #6		<a href="#">Lecture #6 Tutorial Worksheet</a>	<b>Online HW #1 DUE -- 8:30am</b>
Wed. Jan. 26 Lecture #7	18.1 to 18.2: Electric Potential (Voltage) & Electric Potential Energy 18.4: "Electron-volt" unit of energy	<a href="#">Lecture #7 Tutorial Worksheet</a>	
Fri. Jan. 28 Lecture #8	more Electric Potential & Electric PE	(Lecture #8 - NO new Tutorial Worksheet)	Paper HW #2 -- extended to Monday <a href="#">Paper HW #3 (PDF file)</a> handed out
Mon. Jan. 31 Lecture #9	18.3: Equipotential Surfaces & Diagrams [[18.4: Millikan's Oil-Drop Experiment]]	<a href="#">Lecture #9 Tutorial Worksheet</a>	Paper HW #2 DUE <a href="#">Paper HW #2 SOLUTIONS</a>
Wed. Feb. 2 Lecture #10	18.5: Capacitance 18.8: Dielectrics 18.7: Energy stored in a capacitor	<a href="#">Lecture #10 Tutorial Worksheet</a>	<a href="#">Paper HW #4 (PDF file)</a> handed out

	<i>Cartoon Guide</i> , Chap. 14: Capacitance		
Fri. Feb. 4 Lecture #11	18.6: Capacitors in parallel & series	<a href="#">Lecture #11 Tutorial Worksheet</a>	Paper HW #3 -- extended to Monday
Mon. Feb. 7 Lecture #12		<a href="#">Lecture #12 Tutorial Worksheet</a> (used during Lecture #15)	Paper HW #3 DUE <a href="#">Paper HW #3 SOLUTIONS</a>
Wed. Feb. 9 Lecture #13	<i>Lecture CANCELED (instructor illness)</i>	<a href="#">Lecture #13 Tutorial Worksheet</a> (distributed & used during Lecture #16)	
Fri. Feb. 11	MIDTERM EXAM #1 -- all assigned sections of Chaps. 17 to 19 (and part of section 22.1) completed to date in lecture	see <a href="#">Past Exams webpage</a> for sample midterms see <a href="#">Exam Results</a> webpage for solutions and score histogram	Paper HW #4 -- extended to next Friday
Mon. Feb. 14 Lecture #14	19.1: Current, Motion of charges/electrons 19.3: Voltage/Emf 19.2: Resistance, <a href="#">[[Resistivity]]</a> , & <a href="#">[[Superconductivity]]</a> , 19.2: Ohm's Law <i>Cartoon Guide</i> , Chap. 15: Electric Currents	(Lecture #14 - NO new Tutorial Worksheet)	
Wed. Feb. 16 Lecture #15	<a href="#">[[19.7: Ammeters and Voltmeters]]</a> 19.4: Power 19.5: Resistors in series & parallel 19.6: Kirchhoff's rules <i>Cartoon Guide</i> , Chap. 16: Series and Parallel 19.10: Household circuits <a href="#">[[22.1: Brief intro to Alternating Current (AC)]]</a> -- <i>we'll return to this section later</i>	(Lecture #15 - NO new Tutorial Worksheet)	
Fri. Feb. 18 Lecture #16		<a href="#">Lecture #16 Tutorial Worksheet</a> (used during Lecture #17)	Paper HW #4 DUE <a href="#">Paper HW #4 SOLUTIONS</a> <a href="#">Paper HW #5 (PDF file)</a> handed out
Mon. Feb. 21	HOLIDAY -- Presidents' Day		
Wed. Feb. 23 Lecture #17	19.8: R-C Circuits 19.9-19.10: Electrical hazards & household circuit safety/grounding	<a href="#">Lecture #17 Tutorial Worksheet</a> (used during Lecture #19)	

Fri. Feb. 25 Lecture #18	20.1-20.2: Magnets and magnetic field, Geomagnetism 20.11: Ferromagnetism 20.2: Magnetic force on moving charge & Mag. Force RH Rule  <i>Cartoon Guide</i> , Chap. 17: Magnetic Fields <i>Cartoon Guide</i> , Chap. 18: Permanent Magnets  video: " <a href="#">Understanding Magnetism</a> " from <a href="#">Discovery/Science Channel</a> (entire 50-minute video)	(Lecture #18 - NO new Tutorial Worksheet)  <a href="#">"Magnetic Right-Hand Rules" Reference Sheet</a>	Paper HW #5 DUE <a href="#">Paper HW #5 SOLUTIONS</a>  Paper HW #6 (PDF file) handed out
Mon. Feb. 28 Lecture #19	brief review of <i>Understanding Magnetism</i> video topics  20.3: Motion of charges in magnetic fields	<a href="#">Lecture #19 Tutorial Worksheet</a> (used during Lecture #20)	
Wed. Mar. 2 Lecture #20	20.2 & 20.4: Velocity selectors & Mass spectrometers	(Lecture #20 - NO new Tutorial Worksheet)	
Fri. Mar. 4 Lecture #21	20.5: Magnetic force on current-carrying wire & Mag. Force RH Rule again [[20.6: Torque on current-carrying loop; Motors]]	<a href="#">Lecture #21 Tutorial Worksheet</a>	Paper HW #6 DUE <a href="#">Paper HW #6 SOLUTIONS</a>
Mon. Mar. 7 Lecture #22	20.7: Magnetic field around current- carrying wire & Mag. Field RH Rule 20.9: Current loops & solenoids [[20.10: Biot-Savart Law & Ampere's Law - <i>optional - not covered in lecture</i> ]]	(Lecture #22 - NO new Tutorial Worksheet)	<a href="#">Paper HW #7 handed out</a>
Wed. Mar. 9 Lecture #23	[[How loudspeakers work -- <i>not in textbook</i> ]] 20.8: Force between parallel wires  21.1 to 21.3: Induction & Faraday's Law	<a href="#">Lecture #23 Tutorial Worksheet</a> (used during Lecture #24)	
Fri. Mar. 11	<i>Classes CANCELED (tsunami warning)</i>  MIDTERM EXAM #2 -- postponed to Wednesday March 16		
Mon. Mar. 14 Lecture #24	21.1 to 21.3: more Induction & Faraday's Law <i>Cartoon Guide</i> , Chap. 19: Faraday Induction  21.5: "Sliding-bar generator" & motional emf	(Lecture #24 - NO new Tutorial Worksheet)	Paper HW #7 DUE <a href="#">Paper HW #7 SOLUTIONS</a>  <a href="#">Paper HW #8 handed out</a>

Wed. Mar. 16 Lecture #25	RESCHEDULED MIDTERM EXAM #2 in ***PSB 217*** -- all assigned sections of Chaps. 19 & 20 (Chap. 21 postponed to Midterm #3)	see <a href="#">Past Exams webpage</a> for sample midterms  see <a href="#">Exam Results</a> webpage for solutions and score histogram  (Lecture #25 - NO new Tutorial Worksheet)	
Fri. Mar. 18 Lecture #26	21.4: Lenz's Law 21.6: Eddy currents & counter-emf [[21.3: Generators]] 21.9: Transformers  [[21.7: Mutual inductance]] 21.8 & 21.10: Inductors 21.11: R-L circuits <i>Cartoon Guide</i> , Chap. 21: Inductors  21.12: L-C circuits & resonance 22.2: L & C Reactance (Impedance) in AC circuits 22.3: R-L-C series circuits <i>Cartoon Guide</i> , Chap. 22: AC and DC (and Transformers)  [[Maxwell's equations (not in textbook) & EM radiation]] EM radiation & the EM spectrum Inverse-square law & Doppler Effect <i>Cartoon Guide</i> , Chap. 23: Maxwell's Equations and Light  [[Frequency Allocation of the EM Spectrum (not in textbook)]] [[EM Shielding (not in textbook)]] Rays & reflection	<a href="#">Lecture #26 Tutorial Worksheet</a> (used during Lecture #27)	<a href="#">Paper HW #9 handed out</a>
Mon. Mar. 21	SPRING RECESS		
Wed. Mar. 23	SPRING RECESS		
Fri. Mar. 25	SPRING RECESS HOLIDAY -- Kuhio Day		
Mon. Mar. 28 Lecture #27	Refraction & Snell's Law; total internal reflection	(Lecture #27 - NO new Tutorial Worksheet)	<a href="#">Paper HW #8 DUE Paper HW #8 SOLUTIONS</a>
Wed. Mar. 30 Lecture #28	Refraction & TIR, continued	<a href="#">Lecture #28 Tutorial Worksheet</a>	

Fri. Apr. 1 Lecture #29	Dispersion; prisms & rainbows	<a href="#">Lecture #29 Tutorial Worksheet</a>	Paper HW #9 extended to Monday, Apr. 4  <a href="#">Paper HW #10 handed out</a>
Mon. Apr. 4 Lecture #30	Polarization <a href="#">[[Animation of linear &amp; circular polarization]]</a> Brewster's angle	<a href="#">Lecture #30 Tutorial Worksheet</a>	Paper HW #9 DUE <a href="#">Paper HW #9 SOLUTIONS</a>
Wed. Apr. 6 Lecture #31	Thin lenses Refractive power (diopters) <a href="#">Lens &amp; Mirror interactive demo</a> (Java applets)	(Lecture #31 - NO new Tutorial Worksheet)	
Fri. Apr. 8 Lecture #32	Lenses, continued Curved mirrors	<a href="#">Lecture #32 Tutorial Worksheet</a>	Paper HW #10 extended to Monday, Apr. 11  <a href="#">Paper HW #11 handed out</a>
Mon. Apr. 11 Lecture #33	Wave superposition & interference Two-slit interference	<a href="#">Lecture #33 Tutorial Worksheet</a>	Paper HW #10 DUE <a href="#">Paper HW #10 SOLUTIONS</a>  <a href="#">TAKE-HOME MIDTERM EXAM #3 handed out</a> -- all assigned sections of Chaps. 21-24  (see <a href="#">Past Exams webpage</a> for sample midterms)
Wed. Apr. 13 Lecture #34	Diffraction; Single-Slit Diffraction <a href="#">Single-Slit Diffraction interactive demo</a> (applet)	<a href="#">Lecture #34 Tutorial Worksheet</a>	
Fri. Apr. 15 Lecture #35	Diffraction gratings 26.3: Thin-film interference	(Lecture #35 - NO new Tutorial Worksheet)	Paper HW #11 extended to Monday, Apr. 18  TAKE-HOME MIDTERM EXAM #3 extended to Wednesday, Apr. 20
Mon. Apr. 18 Lecture #36	27.1: Reference frames; Michelson-Morley experiment; Postulates of Special Relativity 27.2: Simultaneity 27.3: Time Dilation 27.4: Length contraction	<a href="#">Lecture #36 Tutorial Worksheet</a> (used during Lecture #38)	Paper HW #11 DUE <a href="#">Paper HW #11 SOLUTIONS</a>

	27.6: Relativistic momentum & mass increase [[ <i>Cartoon Guide</i> , Chap. 20: Relativity - optional]]		
Wed. Apr. 20 Lecture #37	27.5: Relativistic addition of velocities 27.7: Mass-energy equivalence [[27.8: General Relativity - <i>not covered in lecture</i> ]]	(Lecture #37 - NO new Tutorial Worksheet)	TAKE-HOME MIDTERM EXAM #3 DUE <a href="#">TAKE-HOME MIDTERM EXAM #3 Solutions</a>  see <a href="#">Exam Results</a> webpage for solutions and score histogram
Fri. Apr. 22	HOLIDAY -- Good Friday		
Mon. Apr. 25 Lecture #38	Blackbody radiation Photoelectric effect Wave-particle duality of light: photons	(Lecture #38 - NO new Tutorial Worksheet)  <a href="#">Lens &amp; Mirror Ray-Tracing Worksheet</a>  <a href="#">Lens &amp; Mirror Ray-Tracing Worksheet Solutions</a>	<a href="#">Paper HW #12 handed out</a>
Wed. Apr. 27 Lecture #39	Wave-particle duality of matter: DeBroglie wavelength Heisenberg uncertainty principle	<a href="#">Lecture #39 Tutorial Worksheet</a>	<a href="#">Paper HW #13 handed out</a>
Fri. Apr. 29 Lecture #40	Atomic structure, energy levels, & spectra Electron orbitals & structure of the periodic table	<a href="#">Lecture #40 Tutorial Worksheet</a>	
Mon. May 2 Lecture #41	30.1: Structure of the nucleus; Binding energy 30.2: Stable & Unstable nuclei 30.3: Radioactive decay: alpha, beta, gamma	(Lecture #41 - NO new Tutorial Worksheet)	Paper HW #12 DUE <a href="#">Paper HW #12 SOLUTIONS</a>
Wed. May 4 Lecture #42 (final lecture)	30.3: Half-lives & radioactive dating [[30.4: Hazards of radioactivity]] 30.5-30.7: Nuclear fission & fusion 30.8-30.9: Subatomic particles: leptons, mesons, baryons; Matter & antimatter; Quarks [[ <i>Cartoon Guide</i> , Chap. 24: Quantum Electrodynamics - optional]]	<a href="#">Lecture #42 Tutorial Worksheet</a>  <a href="#">Chaps 28 &amp; 29 Summary - Photons, Atoms, and Quantum Physics</a>	Paper HW #13 NOT due (know Q#1-4 for final exam)
Fri. May 6	STUDY PERIOD		
Mon. May 9	FINAL EXAM: 7:30 am to 9:30 am -- all prior material, with emphasis on assigned sections of Chaps. 23, 24, 26, 28 (Chaps.	see <a href="#">Past Exams webpage</a> for sample final exams	

27 & 30 omitted)

see [Exam Results](#) webpage for solutions and score histogram

pau! congratulations!

# PHYSICS 152 — COLLEGE PHYSICS II

## UH MANOA — Spring Semester 2011

### Course Information & Policies

**Lecture** MWF 8:30–9:20 a.m.  
Physical Science Building (“PSB” or “PhySci”), Rm. 217

**Instructor** Mr. Michael Nassir  
E-mail: [nassir@hawaii.edu](mailto:nassir@hawaii.edu)  
Course Web page: <http://www.phys.hawaii.edu/~nassir/phys152/>  
Office: Watanabe Hall, Rm. 426, (808) 956-2922

Help Hours: • Wednesday afternoons 3:00–4:30 p.m. in PSB 217  
• Thursday afternoons 3:00–4:30 p.m. in PSB 217  
• By appointment in Watanabe 426 (office)

**Required Materials** TEXTBOOK: Young & Geller, *College Physics*, 8<sup>th</sup> ed. (2007), Volume 2 only (Chaps. 17–30) WITH *Mastering Physics Access Kit*  
ONLINE HOMEWORK ACCESS: *Mastering Physics* website — requires access code (valid for one calendar year): <http://www.masteringphysics.com>

various options:

- Partial Book (152 only): • **Vol. 2 paperback**, bundled with *MP Access Kit* (and iClicker rebate coupon?): approx. \$136 new at UH Bookstore
- Full Book (151 & 152): • **Vols. 1&2 bound hardcover**, bundled with *MP Access Kit* (and iClicker rebate coupon?): approx. \$217 new at UH Bookstore
- Full Book (151 & 152): • **Vols. 1&2 looseleaf** (requires 3-ring binder, cannot be resold), bundled with *MP Access Kit*: approx. \$146 new at UH Bookstore
- If already have book: • *Mastering Physics Access Code* only: available online for \$54 at <http://www.masteringphysics.com> — be sure to click on image of “Young/Geller, College Physics, 8/e” cover (photo of swimming dolphins). Access is valid for one calendar year.
- eBook (151 & 152): • Full text + *MP Access Code* for \$94 — follow same steps as above for online purchase. Access is valid for one calendar year only.

SCIENTIFIC CALCULATOR with scientific notation, trig functions, exponents, & logarithms — bring to lab & exams (necessary!) and lectures (needed for occasional in-class questions). *Graphing or programmable calculators are allowed, but are NOT necessary.*

iCLICKER — approx. \$39 new at UH Bookstore (This is the same iClicker that is used in other UH Manoa classes. Used iClickers are fine.)

**Optional Books** Ford, *Student Solutions Manual for Young & Geller 8<sup>th</sup> ed.*, Vol. 2 only (Chaps. 17–30 only) (2007), paperback: approx. \$34 new, \$26 used at UH Bookstore

Gonick & Huffman, *The Cartoon Guide to Physics* (1990), paperback: approx. \$18 new, \$14 used at UH Bookstore

## **Course Description**

This course continues a two-semester introduction to the fundamentals of physics begun in Physics 151, and will cover electricity, magnetism, optics, special relativity, and atomic & nuclear physics. Lectures and problem-solving will regularly use the mathematical tools of algebra, geometry, trigonometry, and vectors, but *not* calculus.

### ***Prerequisites:***

- A grade of “C” or better in **PHYS 151**
- A grade of “C” or better in **MATH 140 (trigonometry & pre-calculus) or higher**; or instead, a passing score on the Mathematics Department’s Math Assessment Exam ( $\geq 14$  on Part I &  $\geq 10$  on Part II).

**Lab:** If you also need to take PHYS 152L lab, it is strongly recommended that you do so concurrently with the lecture; the lab provides a hands-on way of reinforcing and complementing many of the topics presented in lecture. However, concurrent enrollment in PHYS 152L lab is *not* mandatory for all students in PHYS 152 lecture.

## **Grading & Course Work**

- **Final grades** will be computed on a **curve** (to be decided), based on your **overall course percentage** relative to the other students in the class. Your overall course percentage will be computed as follows:

<b>iClicker In-Class Questions</b>	<b>5%</b>
<b>Homework (Paper + Online)</b>	<b>20%</b>
<b>Midterm Exams #1 &amp; #2</b>	<b>19% each</b>
<b>Take-home Midterm Exam #3</b>	<b>7%</b>
<b>Final Exam</b>	<b>30%</b>

After each major exam, I will post online grade sheets (listed by your “roster numbers,” not names) displaying all of your scores, and I will provide a histogram showing the relative scores of everyone in the class. I urge you to double-check your scores on my grade sheets, as well as the score tallies on your individual papers. While I apologize in advance for any errors, they may well happen with such a large class — please help me to correct them. Final exam scores and final grades will be posted outside my office and will be available for viewing on MyUH shortly after the term ends.

- **iClicker Questions** will be asked during many lectures. Partial credit (1 point) will be given for any response at all (i.e., credit for “participation”); full credit (3 points) will be given for a correct response.

- **Paper Homework** sheets will usually be due on Fridays in lecture (with some exceptions due to holidays or exams), and will be graded either by our class grader or by me; please see me outside of class with any questions about grading. **Late paper homework** will **NOT** be accepted *for any reason after solutions* for that assignment have been posted online, usually at the end of lecture on the due date. All paper homework assignments will be worth the same number of points, and your **TWO lowest paper homework scores** will be **dropped**.

- **Online Mastering Physics Homework** will usually be due on Mondays and will be graded automatically on the *Mastering Physics* website. Your scores likewise will be reported to me automatically. **Late homework** is allowed, at a penalty of  $-5\%$  per day. Details on how to log in at <http://www.masteringphysics.com> will be provided in a separate handout.

- Three **Midterm Exams** will test you on material from each month of the course. Roughly half of the **Final Exam** will cumulatively review all of this material, while the other half of the final exam will test new material from the last month of the course. The first two midterm exams will be 50 minutes long (given during regular class periods), and the third midterm will be take-home with no time limit:

Midterm #1	Friday, <b>February 11</b>	Chaps. 17–19
Midterm #2	Friday, <b>March 11</b>	Chaps. 20–22
Midterm #3	out Monday, <b>April 11</b> , due Friday, <b>Apr. 15</b>	Chaps. 23–26
Final Exam	Monday, <b>May 9, 7:30 – 9:30 a.m.</b>	Chaps. 27–30 & cumulative review

You are allowed to bring 1 sheet of **handwritten notes** (no printouts or photocopies) to the first and second midterms, and 2 sheets to the final exam. However, do NOT let your “cheat sheet” become a substitute for learning formulas and practicing problems! (Graduate school exams, like the MCAT or GRE, do NOT allow open notes — you must memorize your formulas.) You will be allowed to retain your “cheat sheets” after each exam to build upon for later exams. *You must take all midterms and the final exam to avoid a failing grade in the course.*

- **Reading assignments** will be assigned on my course website. The listed reading assignments are the specific sections of the text that will be covered in lecture and that you will be responsible to know for exams. *ActivPhysics Online* examples will also be assigned as “reading” — these are short tutorials with interactive applets and audio & video clips. You can browse them anytime (for free) at: [http://www.aw-bc.com/young\\_geller](http://www.aw-bc.com/young_geller)

### **Solving Physics Problems**

- You will need a **calculator** with **scientific functions** (trigonometric & exponential/logarithmic functions, and power-of-10 notation) for homework AND EXAMS. (Graphing calculators are not necessary.)

- On all assignments and exams that call for free-response answers, you must **SHOW YOUR WORK**. Writing only the correct final answer without showing your steps is *not* acceptable and will result in little or no credit. It is a central notion in science to show your method along with your results, so that others can follow your reasoning and can question any steps or assumptions. Also, clear and complete explanations will only help you later when you review your own work and study for exams. It is never possible to “show too much work,” but it is easy not to show enough!

Always display your major mathematical steps from your initial formula(s) to your final answer, and annotate your reasoning with sketches and verbal explanations where appropriate. Mathematical steps should read sequentially and logically. Final answers must include **UNITS** and use an appropriate number of **SIGNIFICANT FIGURES**, and sometimes should be written in **SCIENTIFIC NOTATION**. To receive full credit, your answers to **free-response problems** MUST contain the following:

1. **initial formula**, followed by major algebraic rearrangement steps (if necessary)
2. **substitution** (“plugging in” known values), followed by major calculation steps (if necessary)
3. **final answer**, underlined or boxed, with proper **units**, **sci. notation** (if needed), & **significant figures**
4. additional **diagrams** or **comments**, as needed to define quantities (...a picture is worth  $10^3$  words!)

- **Organization** and **neatness** matter! Both should result naturally if you follow the above format. Disorganized or illegible work will be penalized.

- Please do NOT use **red ink** on any assignments or exams — we reserve that color for grading.

### **Collaboration**

Working in pairs or groups is common in science, and indeed is encouraged: teamwork can help you to make more efficient measurements and to catch errors, and explaining something to another person is a great way to learn it yourself. However, if you are working with a classmate while completing a physics assignment (or while making measurements in lab), there are a few guidelines to follow:

(1) You are strongly encouraged **first to attempt each homework problem YOURSELF, individually** (or, in lab, to make some of your lab measurements yourself). That way, you will get the educational value and the experience that comes from working the problem (or using the equipment) and “seeing for yourself.” Then, after you have tried first on your own, you can compare your answer (or lab results) to others’ work as a “sanity check.”

*On homework:* If you are stuck on a homework problem, you should seek just enough help to get unstuck. It is unwise to let someone simply feed you the entire solution, since you lose the educational value of working through the problem on your own. If necessary, try changing the numerical values in the problem and attempting it again by yourself, to ensure that you understand completely how to do the problem if you were to encounter it again on your own... say, on an exam.

*In lab:* If your results differ from other students’ results by only a bit, then *you should keep your own results* — most scientific measurements vary slightly due to “random error” (this will be discussed in lab), so you should *not* change yours to match your classmates’ results exactly. After all, how do you know which result is “correct,” yours or your classmates’? Record what *you* see or measure. (If your results differ *wildly*, then it is appropriate to try to figure out “what went wrong.” Small variations, however, are common and are a natural part of the random error inherent in making measurements.)

(2) All free-response solutions on all submitted assignments should ultimately be **in your own words**, reflecting **your own understanding** of the problems. You should plug numbers into your calculator and attempt (or re-attempt) all calculations *yourself*, even if you received assistance from others along the way.

Any passages or calculations that are **directly copied or plagiarized** from another student (or portions lifted from any other uncited source) will be given a score of **zero**. Again, your submitted work should reflect *your own understanding* of the problems.

*In lab:* If you make measurements together with a lab partner, make a note in your lab report of who your lab partner was for any particular experiment. Then, be sure that your calculations and the written passages of your lab reports are *in your own words*, even if your initial data or measurements are identical to your partner's.

(3) During **in-class exams**, **NO collaboration** of any sort is allowed; exams must be *entirely your own work*. Exams copied from another student, even partially, will be given a score of **zero**. Cases of cheating or plagiarism may be referred to the Office of Judicial Affairs for disciplinary review.

### **Getting Help**

- **Regularly-scheduled help sessions** (solving homework problems, answering questions, etc.) will be held every week. Times and places will be announced soon.

- The **Physics Learning Center in Watanabe 421** is open whenever Watanabe Hall is open, for all students to use to study (alone or together) on physics homework. There are tables, sofas, blackboards, and computers available for your use.

All Physics lab TAs will schedule at least one of their two weekly office hours in Watanabe 421 as **tutoring hours** — FREE help with any physics homework problems or other physics questions (although lab TAs will give first priority to their own students with lab-related questions). Go to Wat 421 and check the posted schedule for tutoring times.

- You may also drop by to see me in **my office, Watanabe 426**, during afternoons at times other than the regularly scheduled help sessions. However, I suggest that you call first to make sure that I am in, and please forgive me if I happen to be busy and ask you to return at another time. You may also make an appointment with me if you wish.

- The Department of Physics & Astronomy Office (Watanabe 416) maintains a list of grad students and others who are available for hire as **private tutors** — please stop by Wat 416 and ask the Department secretary for a copy of the list.

### **Lecture Notes**

- **Electronic scans** of my overhead transparencies during the semester may be made available on the Web as **PDF files** — to be decided. I will try to update the notes roughly once a week, and I will create a link to each scanned lecture from the PHYS 152 Syllabus webpage as the PDFs become available. Most Web browsers can automatically display and print PDF files, or you can download a free PDF viewer like Adobe's *Acrobat Reader* or Apple's *Preview*.

### **Extra Handouts**

**Extra copies of all handouts** from the one or two previous lectures will be brought to every lecture and help session. Almost all handouts will be available shortly after lecture as PDF files, and will be linked from the course Syllabus page — you can download them anytime.

### **Graded Papers**

**Graded papers** will be circulated in lecture once they are graded. Any papers that are not picked up in lecture will be left in the **wooden cubby boxes outside the rear of our lecture hall, PSB 217**. Look for "PHYS 152 Spring 2011," and find the box for your roster number. Please leave the boxes tidy and organized for your classmates' benefit.