Science 225  Fall 2012

GENERAL PHYSICAL SCIENCE

INSTRUCTOR: Diane Friend
Office: CHCB 129, Phone: 243-4299
E-mail: diane.friend@umontana.edu
Office hours: M 3-4, T 11-noon, W 3-4, F 11-noon in CHCB 129
I will also hold a weekly help session on Fri. from noon-1 in CHCB 13.
If you can’t make my regular office hours, please make an appointment for an alternate time.

T.A.s: T,Th 8-10: Leah Burrell Leah.Burrell@umontana.edu
T,Th 10-noon: Tiffany Emmons Tiffany.Emmons@umontana.edu
T, Th 1-3: Katy Manley Katy.Manley@umontana.edu
For all TA’s: Office location and hours will be announced the first week of classes

LECTURE: MWF 2:10-3:00 p.m. in ISB 110
LABS: T and Th at 8-10, 10-noon, or 1-3 in CHCB 13

Part of Pearson custom bundle through UC bookstore (bright magenta cover, labeled with class title)- includes text, MasteringPhysics access, and iClicker coupon

other materials: In addition to the textbook, you will also need-
MasteringPhysics access
Linked below the syllabus on Moodle is a one-page instruction sheet that will guide you through getting started with MasteringPhysics. Please read through this carefully and follow the instructions EXACTLY. It is especially important that you register with a first and last name that is IDENTICAL to your official UM records and that you use your UM Student ID# (790xxxxxx) for your MasteringPhysics student ID.

IF you purchase the text at the UC Bookstore, it will come bundled with an access code for MasteringPhysics. This will give you access to online tutorials, online homework that will be a required component of the class, and an e-copy of the full text. Follow the directions on the MasteringPhysics registration handout (posted on the course Moodle site) to correctly complete your registration.

IF you acquire your textbook from another source, you will need to buy a stand-alone copy of MasteringPhysics online at http://www.MasteringPhysics.com/site/index.html. NOTE: This alternative will probably cost you MORE than purchasing everything at the bookstore- unless you already have a textbook or can get one for free. To register- click on the “Students” button under “Register” in the upper left corner. Under Step 1, choose “No”. Make sure you read through the MasteringPhysics registration handout linked on Moodle- you will need to use the course ID# given in that handout along with your 9-digit UM ID# (starts with 790…) for your MasteringPhysics student ID.

iClicker: You will need to have an iClicker for this class and you will need to bring it to class with you every class meeting. iClicker questions comprise 20% of your grade.

Calculator: You will need a calculator that is capable of doing scientific notation. Please bring your calculator to all class meetings (lectures and labs).

Course site: Moodle
You can log in to Moodle at UMonline: http://umonline.umt.edu/. Once logged in, you will have access to the Science 225 course. Course materials, readings, assignments, due dates, handouts, links, and grades will all be posted on Moodle. You will be responsible for downloading required materials from this site and bringing them to class on the specified day(s).
COURSE CONTENT
This course will explore our current understanding of some of the physical processes that define the way our universe works. From our macroscopic, everyday experience, to the fundamental matter and forces that make all that we see possible, this course will encourage you to take a deeper, more insightful look at the world around you. This course will encourage you to explore how we investigate the way things work, as well as what’s been discovered.

You will be expected to fully participate in this exploration with your curiosity, your questions, and your insights. **Come prepared to be involved!**

LEARNING OBJECTIVES
One physical science content course cannot adequately prepare you for either the breadth or depth of topics that you may need to know in a K-5 classroom (let alone grades 6-8). However, this course should give you a basic background on which you can build. Upon completion of this course you should:

- understand and be able to explain how science is a very specific way of knowing that has fundamental differences from other ways of knowing.
- have some direct experience with working with children and science, have learned that children love science, and that all competent K-5 teachers, as well as middle school science teachers, have the obligation to encourage and develop this interest by modeling in themselves an enthusiasm for science and a curiosity about the way the world works.
- be familiar with state and national standards guiding science instruction in grades K-8.
- have a working knowledge (both conceptual and simple quantitative) of basic physical science concepts in physics (motion, force, energy, thermodynamics, electricity and magnetism, waves, and light), astronomy (motions of the Earth, Moon, and Sun, solar system formation, our place in the universe), and chemistry (the nature of matter, chemical bonds, and chemical reactions) and develop a deep enough understanding of these concepts that you will be able to competently teach material related to these ideas in your own classroom someday.
- have experience looking for the connections between physical laws and between physical systems.
- have developed some experience and facility with the application of simple mathematical concepts to describe, understand, and predict how things work.
- have developed enough familiarity with the course material and the scientific process that you will feel comfortable seeking out future experiences and professional development opportunities that will allow you to expand your physical science knowledge. If you are planning to teach, this should be a life-long process!
- have developed experience with and an understanding of science as a process informed by a variety of activities such as: observation, physical modeling, computer modeling, critical informed discourse, etc., rather than a collection of facts and figures.
- Have developed critical thinking skills that are essential not only in science but also in many other aspects of life.

COURSE COMPONENTS
To encourage different styles of thinking and learning, we will engage in a wide variety of activities:

LECTURES: Frequently participatory in nature, lectures often include both visual and hands-on components. Interactive exercises, think-pair-share activities, and demonstrations will require you to apply your knowledge and probe common misconceptions. Specific learning objectives will be posted on Moodle to help you focus your studies and have a good idea of what will be covered on exams.

READINGS: Required readings from the text are listed in the Course Schedule. I will assume that you have read this material BEFORE coming to class. (i.e. Concepts from the reading will be fair game for iClicker questions.) For many topics, a number of supplementary web links (interactives, applications, resources) will be listed in Moodle under the appropriate week. These links are very helpful and you should make a habit of perusing them regularly!

HOMEWORK: Science is a problem solving discipline and that takes practice. There will be homework assignments due frequently. This will keep you up to date with the course material, give you some problem-solving experience, and encourage you to actively experiment with some of the course topics. Homework assignments will be assessed a late fee of 10% per hour late. To help you deal with the unforeseen, you may drop your two lowest homework grades.
LABS: Twice weekly lab sections will give you a chance to explore the course material in more depth. Fully participating in these is crucial to your success in this course! If you miss no more than two of these meetings during the semester, I will give you a 10% bonus on the semester final. (i.e. I will increase your final exam score by 10% of the total points possible on the final exam.) If you miss more than four of these meetings, I will impose a 10% penalty on your final exam grade. Lab due dates will be announced at the beginning of each lab. Lab due dates are absolute. No late labs will be accepted without PRIOR permission from your lab instructor. Permission will only be granted for documentable emergencies of a serious nature.

Please note: It is your responsibility to download lab write-ups from Moodle and bring them to class with you on the appropriate day.

PROJECTS: These assignments are more in-depth than the homework and require extended periods of time for their completion. Two of these will be astronomical observing projects (the Sun and the Moon) and one will be a quality science presentation of your creation to a group of elementary age school children in an after-school science club. Since most of you are thinking about becoming K-8 teachers, the presentation project will provide a wonderful opportunity for you to experience how much fun it is to teach science to children, as well as to discover just how smart and curious children are! This project will give you a chance to be creative, excite children about science, develop materials, and gain valuable experience as you prepare and present a science lesson to a small group of enthusiastic young learners.

EXAMS: The three evening exams and the final will contain multiple choice, conceptual, and quantitative problems. To give you time to think about the quantitative problems, I will give you 3-5 problems the Friday before the exam. The quantitative problems on the exam will be slight variations of a subset of these problems. Note that you may use any resource you wish while working on the problems before the exam (except your instructors!), but you will want to feel confident in your ability to solve such problems on your own in order to do well on the exam. Because the topics in this course are so interrelated, the final will be comprehensive. To give you a break on your lowest midterm score, I will count it significantly less than your other two midterm scores.

GRADING

Your grade for this course will be based on the following:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>EXAMS: Exams 1, 2, and 3</td>
<td>40%</td>
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<tr>
<td>(15% for two highest, 10% for lowest)</td>
<td></td>
</tr>
<tr>
<td>FINAL EXAM: Wed., Dec. 16th, 10:10-12:10</td>
<td>20%</td>
</tr>
<tr>
<td>LAB ACTIVITIES:</td>
<td>15%</td>
</tr>
<tr>
<td>PROJECTS:</td>
<td>10%</td>
</tr>
<tr>
<td>HOMEWORK:</td>
<td>15%</td>
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Grade Distribution:

<table>
<thead>
<tr>
<th>Grade Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>88 - 100%</td>
<td>A- to A+</td>
</tr>
<tr>
<td>78 - 87%</td>
<td>B- to B+</td>
</tr>
<tr>
<td>68 - 77%</td>
<td>C- to C+</td>
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<tr>
<td>50 - 67%</td>
<td>D- to D+</td>
</tr>
<tr>
<td>Below 50%</td>
<td>F</td>
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ADD/DROPS: The last day to add/drop on Cyber Bear is Monday, Sept. 17. The last day to drop with your instructor's and advisor's signature, is Monday, Oct. 29. A drop, or change of grading option after Monday, Oct. 29 requires the signature of the Dean and written documentation of exceptional circumstances.

Academic integrity: All students taking this course must adhere to the University of Montana’s academic dishonesty policy as presented in the Student Conduct Code at http://life.umt.edu/vpsa/student_conduct.php. Any actions that include, but are not limited to, copying another student’s exam, allowing another student to copy from your exam, sharing information with another student during testing sessions, and/or using another student’s iClicker to enter question responses for them, are reasons for pursuing academic and university sanctions. Students will be subject to a charge of academic dishonesty for any breach of these standards. This will result in a grade of zero on the particular assignment and a distinct possibility of a failing grade in the course as well as the possibility of expulsion from the university.

Course accessibility: If you are a student with a disability who will require reasonable program modifications in this course, please meet with Disability Services for Students in Lommasson 154 for assistance in developing a plan to address program modifications. If you are already working with Disability Services arrange to meet with me during my office hours to discuss reasonable modifications that may be necessary. For more information, visit the Disability Services website at http://www.umt.edu/disability.
**SOME IMPORTANT THINGS TO KEEP IN MIND**

*Your success in this course will depend much more on your ability to think critically than on your ability to memorize!*

This course covers a lot of ground. It can be very difficult to catch up if you fall behind. The good news is, there are LOTS of resources at your disposal- instructors who love the chance to work with you one-on-one, physical science simulation software that allows you to explore at your own pace and outstanding web resources. Avail yourself of these resources early, and often.

The **standard** expectation for college courses is that two hours outside of class will be required for every one credit hour in class. This is a five credit course, so you should expect to spend an average of 15 hours/week on this course.

For those of you planning to become teachers, it is important that you realize that this is primarily a science content class. C&I 404 will address the latest educational research on effective methods of science teaching in K-8.

**COURSE POLICIES**

1. Exams must be taken at the scheduled times unless a make-up time is arranged BEFORE the exam. Make-up exams will only be given for exceptional emergencies for which written documentation can be provided. The final MUST be taken at the time scheduled by the registrar.

2. Homework assignments are due at the BEGINNING of the lecture or lab period on the date specified. LATE ASSIGNMENTS WILL RECEIVE ZERO CREDIT.

3. You cannot switch workshop sections without prior permission from the instructors.

4. Attendance will be taken at workshop sections. Absences may be excused at the discretion of the instructor with proper written verification of an unusual responsibility or emergency. Students who show up for the first few minutes of the class and then leave will be counted as absent.

5. For excused absences from workshop sections, notification by phone, e-mail, etc. MUST be given BEFORE the section begins (except for documentable emergencies). Excused workshop absences can be made up at the discretion of the instructors. If the equipment for the missed activities is not available, other activities may have to be substituted.

6. You must attend the workshop sessions in order to write and submit activity write-ups. An unexcused workshop absence will result in zero credit for any activities done that day.
# COURSE SCHEDULE

A detailed course schedule with all relevant assignments and materials will be posted on Moodle. Please check this site frequently for announcements, new posts, and ancillary materials.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics</th>
<th>Textbook Readings</th>
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</table>
| 1    | Aug. 27-31 | Introduction to the Course  
Exploring the Night Sky  
Getting a Sense of Scale  
Our Place in the Universe | Ch. 1             |
| 2    | Sept. 3-7  | Mass and Inertia  
Force  
Motion | Ch. 2             |
|      | Holiday Sept. 3 |                                      |                   |
| 3    | Sept. 10-14| Newton's Laws of Motion  
connecting force and motion | Ch. 3             |
| 4    | Sept. 17-21| Momentum  
Work and Energy | Ch. 4             |
| 5    | Monday, Sept. 24 | EXAM 1: 7-9 p.m. in ISB 110                                      |                   |
|      | Sept. 24-28| Gravity  
Projectile Motion | Ch. 5             |
| 6    | Oct. 1-5   | Pressure  
Thermal Energy  
Thermodynamics | Ch. 6  
Ch. 7         |
| 7    | Oct. 8-12  | Heat Transfer  
Phase Change | Ch. 8             |
| 8    | Oct. 15-19 | Static and Current Electricity | Ch. 9             |
| 9    | Monday, Oct. 22 | EXAM 2: 7-9 p.m. in ISB 110                                      |                   |
|      | Oct. 22-26 | Magnetism  
Waves | Ch. 10  
Ch. 11       |
| 10   | Oct. 29-Nov. 2 | Light  
Geometric Optics | Ch. 12             |
| 11   | Nov. 5-9 Holiday Nov. 6 | Modeling the Appearance and Motion of the Moon | Ch. 20             |
| 12   | Nov. 12-16 Holiday Nov. 12 | Modeling the Motion of the Earth | Ch. 20             |
| 13   | Monday, Nov. 19 | EXAM 3: 7-9 p.m. in ISB 110                                      |                   |
|      | Nov. 19-23 | Atoms and the Periodic Table | Ch. 13             |
|      | Holiday Nov. 21-23 | Happy Thanksgiving! |                   |
| 14   | Nov. 26-30 | How Atoms Bond | Ch. 16             |
| 15   | Dec. 3-7   | How Chemicals React  
Putting it all together-  
Origin of the Earth and life | Ch. 18             |
| 16   | Thursday, Dec. 13 | FINAL EXAM: 1:10 – 3:10 in ISB 110 |                   |