Physics 136 Course Syllabus, Spring Semester 2015

Class Meeting Times:

**Section 1 (CRN 23782)** meets Monday and Wednesday: 1:25 - 3:20; Friday: 1:25 - 2:15

**Section 2 (CRN 23783)** meets Monday and Wednesday: 3:35 - 5:30; Friday: 3:35 - 4:25

Class Meeting Location: Nielsen Physics Building, Room 207

People

**Dr. Stuart Elston, Instructor**

e-mail: selston@utk.edu --- **BUT** if it's about an assignment, please use WebAssign's *Ask Your Teacher* or *Extension Request* at the end of the assignment.

Office Hours: MWF 10:00 - 11:30, or by appointment.

Office: 216 Nielsen Physics Building

Phone: 974-7818

**Nick Roberts, Graduate Teaching Assistant**

e-mail: jrober50@utk.edu

Office Hours, other contact info TBA

**Tyler Smith, Graduate Teaching Assistant**

e-mail: tsmilt46@utk.edu

Office Hours, other contact info TBA

Catalog Description

*Introduction to Physics for Physical Science Majors and Mathematics Majors II* (4)

Calculus-based physics of thermodynamics, electricity, magnetism, and optics. (NS)

Contact hour distribution: 3 hours lecture and 2 hours lab.

(RE) Corequisite(s): Mathematics 142

Comment(s): Alternative to Physics 138 for physics majors.

Detailed Course Description

Content

This is a four credit-hour, calculus-based physics course covering basic electricity and
magnetism with extension to the role of electrons in matter and the production of electromagnetic radiation. The emphasis in this course is that a very wide range of behaviors can be described starting with a small number of fundamental principles. Using these powerful principles, models can be constructed to explain a wide variety of physical phenomena.

**Goals**

By the end of the semester, you should be able to:

- Apply a small set of fundamental physical principles to a wide variety of physical situations.
- Use these principles to explain a wide variety of behavior on both microscopic and macroscopic scales.
- Use these principles to quantitatively predict the behavior of these systems.
- Model complex physical systems by making approximations and idealizations in order to construct a simple physical model that applies fundamental principles.
- Translate a physical model into a 3D animated computer model of the physical situation.

*You should notice from the very first day that this is not your mother's or father's college physics course. Because our approach is very different from the traditional lecture-based course (with laboratory), it is very important that you read this syllabus thoroughly*, especially if you did not take Physics 135 last fall, so that there are a minimum of surprises. Understanding a little about the process will help you succeed in this environment.

**Learning Environment**

This course will emphasize rigorous problem-solving in physics using interactive instruction, educational software, computer applications important for students of science and engineering, and cooperative learning (sometimes called peer instruction).

Each class meeting will require students to be responsive, to think, and to perform hands-on tasks. (Get a good night's sleep before coming to class!) While key concepts of new material will often be discussed in short lectures, you are responsible for all of the readings outlined in the course schedule/calendar, regardless of whether it is discussed in class. Specifically, you will be responsible for learning definitions from readings, and for asking questions through the course forum, by email, or in person when you want a topic discussed more deeply in class. There will be no discrete lecture periods and lab periods -- lecture/discussion, lab work, and other hands-on activities will occur when and as appropriate to foster engagement in the course material.

**Collaborative Work**
Scientists and engineers work in groups as well as alone. Social interactions are critical to their success. Most good ideas grow out of discussions with colleagues. Research has shown that most people learn physics best from, and by working with, their peers, not from long lectures and cookie-cutter labs.

You will be assigned to work in a group for most of your class work. As you study together, help your partners with things that you understand but confuse them. Ask each other questions, and critique group homework and lab write-ups. Teach each other. There is an old saying, that "the best way to learn a subject is to (force yourself to) teach it." There is a lot to be said in favor of this piece of folk wisdom.

As the semester progresses, you should notice that the instructional team (instructor and graduate and undergraduate assistants) develops into a collaborative group as well, creating and implementing activities to help you learn. We believe so strongly in collaborative work that we are willing to run the class with that instructional model in mind!

Of course, while collaboration is the rule in technical work, evaluations of individuals also play an important role in science and engineering. Tests and exams are to be done without help from others. To ensure that you are prepared for individual assessments, it is absolutely critical that you play an active role in the group work, and not passively let your teammates do the work for you.

**Course Requirements**

**Pre- and Corequisites**

It is very important that you have a good, working grasp of mathematics at the pre-calculus level, that you have taken the equivalent of Mathematics 141 or 147 (Calculus I), and either have taken the equivalent of Mathematics 142 or 148 (Calculus II), or are taking one of these two courses in parallel with this course. We will quickly progress to using integral calculus in our description of electric and magnetic fields, so the material in this course should help to reinforce the practical aspects of the calculus you have learned or are learning, but the fancy detail that makes mathematics professors happy will not get much attention here.

No prior experience with computer programming is required. We will teach you everything you need to know for the computer modeling that is an important component of the course.

**Attendance and study requirements**

Class meets 5 “hours” (50-minute “hours”) per week. Attendance (**both physical and mental**) is **vitaly important**. In addition to 5 in-class hours weekly, you should expect to spend about 8 hours per week studying outside class. If you typically spend much less than 8 hours weekly of outside study, you are unlikely to be able to learn the material. If you find yourself spending much more than 12 hours weekly on outside study, you should consult with the instructor about ways to study more efficiently.

It is very important to keep up with the class. Make sure you read the assigned material, so
that you are introduced to key definitions before we use them in class. Each new concept introduced in this course builds on earlier ones, so mastering key ideas is critical. If you get behind, it is your responsibility to seek help right away! Talk to your teammates or the instructional team. Everyone wants you to succeed, but it is up to you to take advantage of the assistance that is available.

Bring the textbook and a scientific calculator to class every day. If you must miss class, it is your responsibility to find out what you missed; get this information from your group members. Additionally, if you are going to be absent, inform your team members so they can be prepared to be short-handed that day. If a member of your team is absent without notifying you, contact them to let them know that they were missed.

Be a full participant during the in-class activities. You'll be amazed how familiar the quiz and exam questions will be if you do this!

Textbook

Matter and Interactions, 3 ed., Chabay and Sherwood (John Wiley & Sons, Inc.)

This is the official textbook for this course. See below/later for alternatives.

Please: I understand and agree that textbooks seem outrageously overpriced, especially at college bookstores, and I think that you should get the best price you can. However, it is important to have your textbook SOON, because it is very easy to fall behind in a physics class. So please make getting this textbook, from somewhere, a priority and do your best to have it by the second day of class.

Note: price information needs updating; is from Spring, 2013. Volume 2 of this text costs $152.95 in the UC Bookstore (new price; the publisher's online retail price is $147.95); the UC Bookstore used price is $114.70. On January 7, there were 12 used copies and 0 new copies on the shelves. There may be copies available online; on January 7, I found copies in stock (claimed to be new) at www.amazon.com for $68.20 and from other online merchants from about $58 and up and used copies for $51 and up. It is not clear what kind of delivery time you can expect from these sources.

(For the record, last year, the used UC Bookstore price was $105.70, and the new price was $140.95. The previous year (spring 2011), the UCBS used price was about $101, and the publisher’s retail price was $134.)

Alternatives to the official textbook

e-book: WebAssign, the online homework system that we will be using (more about this later), offers an upgrade beyond normal access for the third edition of Matter and Interactions, for a price of $17.25 (per semester). The normal WebAssign access cost is $25.95/semester, so this yields a total cost for WebAssign plus the e-textbook of $43.20. The e-book is delivered via Adobe/Macromedia FlashPaper, and you read it on a computer display. You can also print it out and put the pages in a binder. You may find that the inconvenience of having to read the text on your laptop display or to print it and
keep track of all the pages may be worth the lower price of the e-book.

**Earlier editions:** There are first and second editions of the Matter and Interactions textbook volumes. I don’t recommend the first edition, because many improvements were made in the second and third editions. The second edition is acceptable, but some material is presented in a different order. I have provided a mapping, or cross-reference, between the second and third editions, in the Course Materials section of the course Blackboard site; this cross-reference can be used to convert chapter-and-section references in the third edition to (roughly) comparable material in the second edition. There are probably lots of used copies of the second edition available.

**Text study**

*You cannot read a physics text the way you read a work of literature! Your reading pace will (and should be) much slower in a physics text, and it is not uncommon to find yourself reading some sentences and/or paragraphs several times. It takes time and patience to develop this reading skill, but it is a skill that is transferrable to other technical subjects. If you are a student majoring or hoping to major in any field of science, math, or engineering, it is well worth your time to learn to effectively read a physics textbook.*

Review the course schedule/calendar carefully to see what textbook sections to study and what topics are being discussed during the upcoming week. Read the assigned text sections thoughtfully, **before they are covered in class**.

Do the "stop and think" activities marked by QUESTION in the text, and attempt the exercises labeled by “CC.X.NN”, where “CC” is the chapter number and “NN” is an exercise number – sometimes these exercises show up in the homework in a slightly modified form. Identify the most important concept in each section of the text.

Get help with any definition, concept, or reasoning that was not clear to you from the reading. After studying the textbook sections, work through the assigned WebAssign questions to check your understanding. Some students find it helpful to take notes from the textbook reading.

It will usually take you much longer to complete the WebAssign work if you do not first read the textbook sections and do the exercises in the text, because you won't be properly prepared and will find yourself thrashing around, trying one answer after another.

**Assignments**

**Readings**

You are responsible for reading the textbook and working assigned problems. You may be assigned homework problems on material that has not been covered in class. There may also be short reading quizzes (which may not be announced in advance) at various times in the semester. You should start the homework early and get help if needed before the problems are due. Check the course schedule/calendar regularly for due dates.

**Homework**
Individual homework will be submitted via the WebAssign online homework system. You will be introduced to WebAssign during the first class. It will be necessary for you to purchase access to WebAssign, but there will be a free grace period during the first 2 weeks (approximately) of class. Assignments will on average consist of 4 to 8 exercises from the textbook. You will be allowed a limited number of submissions (or attempts to get the correct answer). Your task is to make certain that you understand how to solve the problems by getting help before they are due or asking about them in class.

There will be homework discussion forums available on WebAssign, as well as a forum for general discussion of non-homework, course-related topics – labs, VPython, relevant stuff found on the web, etc. Please read the opening message in the general forum about what is appropriate to post in the Homework Discussion Forum.

**The major advantage of an online homework system:** WebAssign will tell you immediately if your answers are correct, and you get (immediately, or later, at your choice) several chances to get the answers correct.

**The major disadvantage of an online homework system:** you do not automatically get a printed or written record of how you solved a given problem unless you write out your solutions on paper. This is important because you probably need a mechanism for remembering how you solved a given problem when it comes time to study for a quiz or exam. We therefore strongly recommend that you solve the problems on paper before entering answers into the WebAssign system, and accumulate those solutions in a notebook (see the Notebook section, below). *Homework solutions will not be posted.*

**Late homework:** You may request an extension for a past due homework assignment, but there will be a point penalty (typically 5%). When the due date has passed, a link will appear at the end of the online assignment that you can use to request an extension. The extensions are automatically granted during a limited period following the due date/time; after that you will have to ask the instructor (and provide a plausible excuse, as well as a reasonable new, extended due date). *Under no circumstances whatsoever will a due-date extension be approved if the WebAssign log shows that you have seen the key for the assignment.*

**WebAssign**

Access to the WebAssign online homework system is required and can be obtained through an access-code-card at textbook stores or online at [www.webassign.net](http://www.webassign.net). Note that there is a free-access grace period for approximately 2 weeks at the beginning of the semester, after which purchase is required. At the time of this writing, code cards at the UC Bookstore were priced at $32.50/semester. Online access may be more convenient (you don’t have to enter a code number from a card) and more economical ($25.95/semester), but requires an online credit or debit card transaction. *Caution:* there are some access-code-cards available at the bookstore (for some math courses, for example) that are incompatible with the Physics 136 access. The difference is in what is called the code prefix. For more information, see [http://www.webassign.net/user_support/student/cards.html](http://www.webassign.net/user_support/student/cards.html).
Notebook

You will be required to keep a graded "homework journal" which shows how you solved the problems from the assignments. The purpose of the journal is two-fold: it enhances your reflective learning by improving your organizational skills, and it allows us to monitor your progress in problem-solving, something that is difficult to do with WebAssign alone. Written work must include labeled diagrams, defined variables, general physics equations, algebraic solution, numerical solution, units, and a statement or conclusion about how the problem contributes to your learning. We encourage you to use a good problem-solving strategy, and will discuss strategies in class. Note that, on exams, you must often demonstrate the structure required in the homework journal in your solution of exam problems, in order to receive full credit.

Group work

You will be assigned to a group (during the second or third class day). Many class activities will require you to work together with your team, utilizing appropriate group roles. On each group work assignment, your group must designate a manager to organize the work and make certain everyone understands who is supposed to be doing what, a recorder to prepare the final solution, and a skeptic/checker to verify the final solutions for correctness and to ensure that everyone in the group understands all the solutions.

These roles must rotate for every new assignment.

You are welcome to work on WebAssignments with your team, but each team member should set up and solve the assignment individually. Then the team should get together to check results and resolve conflicts.

You are encouraged to study with your team as much as possible. Work together to prepare for tests and quizzes. If your team’s average score on a test is 80% or better, each team member will get an extra 5 points added to their score for "teamsmanship."

When groups are assigned, group members will be encouraged to negotiate and sign a group contract. Sample contracts will be available. If you are not satisfied with the way your group is working, first try to discuss it with your group members. If you can not arrive at a satisfactory solution, then discuss it with your instructor. Groups will periodically change throughout the semester.

Laboratory

You will be offered hands-on, inquiry-based activities during the class periods that allow you to uncover various aspects of a physics concept. Labs will vary in length and complexity. Some labs may require formal lab reports that should follow basic scientific report guidelines. Labs will be done in groups.

Computation has become an indispensable part of “doing science”, to the extent that most branches of science now recognize computation as being on equal footing with theory and experiment. Accordingly, some lab exercises will involve the construction and application of a computer simulation, using VPython, as a means of exploring and visualizing the
consequences of a particular theoretical prediction. VPython is a freely-available variant of the open-source programming language, Python, and will be available through a link on the course Blackboard site.

Lab reports must be a Word or similar document and submitted (by the group recorder) electronically. Some labs may be submitted via WebAssign.

There will only be a few formal lab reports due during the semester. On the other hand, there will be many in-class informal lab write-ups consisting of diagrams, formulas, tables, graphs, etc. that will become part of your class notes.

You must attend class during the day the lab is done in order to receive credit for it. If you have an excused absence, you may be able to reschedule a time to make up the lab. In any case, the lab must be completed within one week of the original date.

To receive credit for the lab report, you must have an assigned role and contribute to the lab report. If a member of the group does not contribute to the report, that person's name must not appear on the group lab report. You may receive partial credit for a lab if you write it up on your own, but before this is done, you must have the permission of the instructor.

Notes

You should keep notes of all of your class work, including hands-on activities. This will help you when you review for quizzes and tests. Examples of good class notes are available. Tips from previous students (at one of the pioneering institutions) on how to take good notes are worth reviewing. The instructor may periodically collect your notes for grading. This will count toward your class participation grade.

Facility Rules

Interactive learning requires a number of resources. Classroom computers will be used for some of the activities. Because it is easy to get off track while doing activities, it is necessary to restrict access on the computers. The following rules will be enforced during class whether using a classroom computer or your own in Room 207. Students who need to use a computer for any of the restricted functions will be asked to use some other facility.

1. No instant messaging.
2. No email, except to send yourself class-related files.
3. No accessing non-class related URLs.
4. No cell phone use, except to take photos of whiteboards or of apparatus for lab reports.
5. No food or drinks (this includes water and gum) are allowed in Room 207 at any time.
Testing

Testing will consist of hour exams and quizzes. Quizzes may be administered using WebAssign. Hour Exams will be traditional paper exams.

Hour Exams

Three hour exams are scheduled throughout the semester. Dates for the hour exams are February 13, March 13, and April 29. Exam dates are also listed in the course calendar. The first two exams utilize the Friday class meeting time; the third exam will be given during the University-mandated time and date for a final exam period. The third (and final) exam will concentrate on material from the last third (approximately) of the course, but may be partially comprehensive --- i.e. it may cover some material from the entire course over the semester, especially to the extent that physics is a subject that builds on itself. Similarly, the second hour exam may depend to some extent on material covered in the first third of the course.

Note that, as stated earlier, if your team’s average score on an exam is 80% or better, each team member will get an extra 5% points added to their score as a “teammanship” bonus.

Quizzes

Periodic (and possibly unannounced) quizzes will consist of a few short problem-solving and descriptive questions designed to take you 10 minutes or less, if you are prepared. They may (or may not) be administered with WebAssign (online). They are to be taken with no books or notes. A class equation sheet may be used. The quizzes will usually be given on Fridays, but not on scheduled exam days. There will be no make-up opportunities; however, the lowest quiz score will be dropped.

Academic Integrity

All testing is performed under the University of Tennessee’s academic integrity policy as expressed in the Honor Statement (see Hilltopics) or any undergraduate catalog). On the hour exams, you will be implicitly pledging that your work complies with the Honor Statement by placing your name on the exam cover sheet.

Grades

Final course grades will be determined by a weighted average, as shown in the table below. Grades will never be curved downward – if everyone in the class does well, everyone can get an A. It may happen that a particular exam is unexpectedly difficult and no one does well; in that case, the grades for that exam may be curved upward, or the grades may be left as is, and consideration of a curve left for final grade time. The letter grade breakpoints are fairly conventional, and are applied to the final course score determined from the weighting scheme table. Grades will be maintained using the WebAssign online gradebook.

Course Grade Weighting Scheme

<p>| | | |
|  |  |  |</p>
<table>
<thead>
<tr>
<th>Component of grade</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hour exams (3 @ 15% each)</td>
<td>45%</td>
</tr>
<tr>
<td>Quizzes (drop 1)</td>
<td>10%</td>
</tr>
<tr>
<td>WebAssign homework</td>
<td>20%</td>
</tr>
<tr>
<td>Homework journal</td>
<td>5%</td>
</tr>
<tr>
<td>Lab</td>
<td>15%</td>
</tr>
<tr>
<td>Classroom participation</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

The classroom participation component of the above table depends on in-class activities, clicker questions, group cohesiveness, attitude, etc. Attendance is required, even though there is no explicit grade for it. You will need to read before coming to class and arrive with questions ready to be asked. Doing so will lead to a higher participation score and probably to a higher overall grade.

**Grade Breakpoints**

<table>
<thead>
<tr>
<th></th>
<th>+</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>n/a</td>
<td>93-100</td>
</tr>
<tr>
<td>B</td>
<td>87-89</td>
<td>83-86</td>
</tr>
<tr>
<td>C</td>
<td>77-79</td>
<td>73-76</td>
</tr>
<tr>
<td>D</td>
<td>67-69</td>
<td>63-66</td>
</tr>
<tr>
<td>F</td>
<td>0-59</td>
<td></td>
</tr>
</tbody>
</table>

**Resources**

**Tutorial Center**

The Physics Department operates a tutorial center on the second floor of Nielsen. See [http://www.phys.utk.edu/tutorial_center/](http://www.phys.utk.edu/tutorial_center/) for an up-to-date listing of dates, times, and places of operation.

**Student Success Center**

If you are having academic difficulties beyond what can be handled in the Tutorial Center
or by visits to office hours, consider consulting with the Student Success Center at 812 Volunteer Blvd. Phone: 974-6641; email: studentsuccess@tennessee.edu; web: http://studentsuccess.tennessee.edu.

Disability Services

Reasonable efforts will be made to accommodate students with certified disabilities. For more information, see http://ods.utk.edu, phone the Office of Disability Services at 974-6087, or visit their office at 2227 Dunford Hall.