



Physics 302: Computer Applications in High School Physics Autumn 2013.

Instructor: Dr. Rebecca Rosenblatt

Office: 313A Moulton Hall

Phone: (309) 438-5070 [Don't call. I will never get it.]

Email: rjrosen@ilstu.edu or Rosenblatt.rebecca@gmail.com

Office Hours: Knock on my door or make an appointment by email.

Course Meeting Times:

Lab: R Moulton Hall Room 309, 4pm - 6:50pm

Course Goals:

This course has been designed with the aim of assisting physics teacher candidates to develop a working familiarity with inquiry-oriented lab procedures, including guided, bounded, and free inquiry. The goal is to prepare teacher candidates who can:

- assess, utilize, and troubleshoot computers and associated software and hardware to teach physics using inquiry-oriented lab practices.
- create and implement inquiry-oriented labs in their own high school classrooms using standard procedures and computer-based technology.

It is not the intention of this course to make students experts in the use of all available computer-based applications and technology encountered in the most advanced physics classrooms. Rather, the goal is to familiarize students with the basic operations of computer hardware and software so they might adapt to any of a wide array of instructional technology they might encounter as teachers in their own classrooms.

Methodology:

The focus in this course is on the use of the laboratory experience as a pedagogical tool for demonstrating the experimental nature of science. Teacher candidates encounter the computer as an adjunct in the class and lab settings. In this course students become familiar with a variety of commonly used computer-based and calculator-based applications for teaching high school physics. The course concludes with capstone and research symposium projects that allow students to demonstrate that they understand the experimental nature of science. PHY 302 is not a textbook-based course; it makes extensive use of web-based resources.

During the first part of this course, attention will be focused on the Modeling Method of Instruction. More specifically, we will be using [Modeling mechanics](#) to learn not only technological applications, but to learn about this mode of instruction as well. Modeling is a research-based, inquiry-oriented method of instruction that is highly effective in increasing student learning; it is one that all new physics teachers should consider using during their first

years of teaching. Details about this method of physics instruction (including instructional resources for "second semester" physics topic as well as physical science, chemistry, biology, and earth science) can be found on the [Arizona State University Modeling web site](#). These resources will be addressed more closely in PHY 310.

Group Work:

Students are encouraged to work together to accomplish the various tasks in this course (with the sole exceptions of the capstone and symposium experiences). However, each student must turn in his or her own unique reports and/or projects. Reports with multiple names on the sheet are not acceptable, and neither are separate identical reports.

Composition Lab Notebook:

Students must keep an **Electronic** Lab Composition Notebook in which they keep and report **ALL** required work and weekly reflections. Notebooks must be kept up to date via reggienet. Notebooks will be randomly graded 3 times during the semester for completeness and quality. In addition, a final grade will be made on the entire notebook.

Grading/Assessment:

In this course, as in other Physics Teacher Education courses, emphasis will be placed on an **Assessment-for-Learning Policy**. That is, assessments of student performance will be used not only to assign scores, but to improve student performance. Unsatisfactory work will be returned to the student for improvement. A student's score can be improved by appropriate revision and resubmission so long as all deadlines are met.

Late submissions may be completed with a 20% penalty for each week that it is late. After 5 weeks the assignment receives a **zero**. NO EXCEPTIONS. This policy does NOT apply to quizzes and tests.

Grading Periods:

This course has two grading periods. This is to keep students caught up with the course and the quality of work high. The end of each grading period constitutes an absolute deadline for turning in required work; missing or late work scores **zero**. This supersedes the 5 week deadline above. So, projects due close to the end of a grading period have a shorter completion window for credit.

Weighting and Grading:

Assignment	% Course Grade
302A: Special Projects	5%
302B: SLH-based Reading Quizzes	8%
302C: Web page	10%
302D: Excel Spreadsheet	5%
302E: Interactive Simulation Worksheet	10%
302F: Modeling Method Notebook and Lab Reports	15%
302G: Inquiry Lab Project	12.5%
302H: Rollercoaster PBL Project	12.5%
302I: Capstone Lab & Report	10%
302J: Final Examination	5%
302K: Composition Notebook including weekly reflections	7%
Total:	100%

The course grade will be determined on the percentage of total score points earned according to the following schedule:

$A \geq 90\%$	$82\% \leq B < 90\%$	$74\% \leq C < 82\%$	$66\% \leq D < 74\%$	$F < 66\%$
---------------	----------------------	----------------------	----------------------	------------

The above grading scale might seem a bit high to the student, but it assumes that students will maximize both learning and accomplishments by taking regular advantage of the instructor's **Assessment-for-Learning Policy**. See your course instructor at any time to see where you stand relative to submitted assignments.

Assignments and Specific Criteria:

302A: Special Projects

Students must complete a number of projects (e.g.: readings, concept mapping, worksheets, etc. assignments that are requested of the students but are not part of the below projects are all included in these “special projects”).

302B: SLH-based Reading Quizzes

Students must complete a number of quizzes that will test the student’s knowledge, comprehension, and (to a lesser extent) application of important problem solving and lab techniques. Students are expected to learn the quiz material through independent study where their previous knowledge is

insufficient. While the quiz material is take home, students should prepare themselves sufficiently to sit similar questions as part of an in class final exam.

302C: Web Page

Students must independently design and upload to an Internet server an html-based web page. For the web page project, you can use DreamWeaver on the computers in MLT 307-B. This is no longer an ITPS requirement. However, I feel that with the growing use of web based instruction this is an opportunity for students to learn the basics of how to use the web to host instructional material which is available to many students at once.

302D: Excel Spreadsheet

Students must complete a number of Excel-based exercises that deal with the use of descriptive statistics, data analysis, statistical testing, simulations, and graphing. See the [Excel Project](#) for specific guidelines. Students must include this project in the Lab Composition Notebook.

302E: Interactive Simulation Worksheet

Students must familiarize themselves with a variety of [Interactive Simulations for Physics](#). They will then develop two (2) simulation worksheets following specific guidelines. They will then have at least one classmate complete each exercise, eliciting comments for improvement. The worksheet will then be submitted to the course instructor to be scored with the use of a [worksheet scoring rubric](#). A [sample simulation worksheet](#) that generally meets all scoring criteria at the highest level is available for inspection.

302F: Modeling Method Notebook and Lab Reports

Students must complete a variety of inquiry-oriented Modeling Method lab activities, included in the Lab Composition Notebook in which daily reflections are kept (see below). Modeling activities will include use of multiple modes of representation (through whiteboarding, Socratic dialogues, and worksheets) including: written, graphical, motion maps, graphs, and so forth. **Two** written lab reports will be required from the labs we do. To complete each of these lab reports, students need to familiarize themselves with and use guidelines found in the following documents: Lab Report Rubric, Lab Report Scoring Sheet, Lab Report Cover Sheet, and Sample Lab Report. Each lab report must include a self-scored rubric as the first page. All lab reports must be completed within the week following the lab. Reports turned in later than this will be graded as late. (E.G. We will do a constant motion lab in week 2. This lab report is due in week 3 then. If a student wants to use this as a lab report but does not turn it in until week 4 the best he/she can score is 80% on this lab. (Labs which occur earlier in the semester tend to be easier to both do and write up.)

302G: Inquiry Lab Guidelines Project

Students must convert a standard "cookbook" lab into a high school level guided inquiry lab using provided resources and [specific guidelines](#). The [differences between cookbook and inquiry labs](#) are numerous; make certain that you know the differences before you begin your project. Student must

actually have another students implement the lab in class. The writer will then revise the guidelines on the basis of this experience before submitting the assignment. The quality of the written lab guidelines will be assessed using an [Authentic Inquiry Lab Scoring Rubric](#). Students must include this project in the Lab Composition Notebook.

302H: Rollercoaster Project

Students must design a 3 to 4 week project based lesson around the pvc rollercoasters. They will create the learning goals and teacher handouts, the projects tasks and student handouts, and materials explaining, and supporting, the student tasks and how they address the learning goals and incorporate best practices of teaching.

302I: Capstone Seminar Presentation & Capstone Lab Report

Students must design and conduct a bounded-inquiry capstone experiment and complete an extensive and highly detailed report. See the [Capstone Project Guidelines](#), [Lab Report Requirements](#), and [Capstone Written Report Scoring Rubric](#) for details. Students must include these reports in the Lab Composition Notebook and deliver a presentation about the Capstone Project Symposium. Students will be limited to 10 minutes for the presentation, and this will be followed with 5 minutes of questions and answers from the class members and instructor. Presentations will be scored by both peers and the course instructor using a [Symposium Representation and Oral Defense Rubric](#). Note: The capstone project is an NSTA-mandated student performance assessment. Failure to adequately demonstrate the required competency at a mastery level (82% or above) will result in the teacher candidate being barred from student teaching.

302J: Final Examination

Students will, during finals week, complete a final examination. The test is based on assigned readings and experiences in this course.

302K: Weekly Reflections

Students must keep course notes for all class activities in an Electronic Notebook. Notebooks must include all lab work and take-home assignments. In addition, they must include 3-paragraph reflections on each weekly class. The reflections will be both open and directed and should explain what the candidate has learned as a student of physics (paragraph 1), as a prospective teacher of physics (paragraph 2), and as a reflective practitioner (paragraph 3). Topics for directed reflection include role of technology in the classroom, impact of technology on student learning, how to incorporate technology to maximize student learning, how technology can best be used to gets students to work together in groups productively, factors that influence the motivation and engagement of students, and so on. These reflections should be specific to each class and show thought and reflection! **These reflections must be kept up to date and are due weekly.**

Guidelines for Weekly Directed Reflections

One each week – 3 paragraphs based upon the following questions. The reflections need not be addressed sequentially, but all 12 questions should be addressed at some point during the semester. Be certain to include the number and the topic you are addressing clearly labeled with each reflection.

1. What do you see as the role of technology in the modern science classroom?
2. What do you feel is the impact of technology on student learning in a modern science classroom?
3. How can a teacher best incorporate technology so as to maximize student learning?
4. How should technology be used so as to get students to work together in groups productively?
5. What technological factors do you believe influence the motivation and engagement of students in the modern science classroom?
6. How do diverse student characteristics and abilities of students affect the processes of inquiry and influence the pattern of learning in a modern science classroom?
7. How would you adjust the practice of a lab activity (please identify and describe) encountered in this course to better meet the needs of each student in the content area?
8. What benefits arise from the use of instructional technology in the modern science classroom?
9. How can technology be used to provide for differentiated instruction that takes into account diversity among learners?
10. Describe and explain argument(s) can you make that scientific technology in the classroom (probes, Graphical Analysis, etc.) has value for student learning?
11. What role might the use of scientific technology in the classroom play in the recruitment of the next generation of scientists and/or teachers?
12. What role does the use of scientific technology in the classroom play in achieving scientific literacy among all students?

Academic Integrity:

As you work your way through the course projects, you will encounter a large amount of proprietary software. This means that the software that you will be using is the intellectual property of someone else. This software is copyrighted, and may be used only after the appropriate fees have been paid and agreements consented to. ISU has obtained a license for each of the programs that you will encounter in this course. It is expected that students will comply with both legal and ethical obligations while using this software. This implies that students will not make unauthorized copies of or disseminate proprietary software. Students are expected to comply fully with the directives addressed in this requirement.

Students are expected to be honest in all academic work. A student's name on any in academic exercise shall be regarded as assurance that the work is the result of the student's own thought and study. Offenses involving academic dishonesty include, but are not limited to the following: cheating, computer dishonesty, plagiarism, grade falsification, and collusion.

Resources used in this course (applications, books, CD's, sensors, calculators, computer interfaces, etc.) should not be removed from the MLT 307B under any circumstances without the instructor's permission. Course materials are limited, and a number of students have need for these materials at various times outside of the usual and ordinary lab hours. These resources must remain available to all students at all times.

Important Caveats:

Please make a habit of regularly backing up your computer work -- e.g. make multiple copies. Missing computer files or crashed hard drives are not legitimate excuses for lost work or missed deadlines. **Backup, Backup, Backup!** When updating versions of work, avoid overwriting earlier versions. The later version might be flawed in some significant way. When making updated versions, label successive projects Job1, Job2, Job3, Job4, etc. You can throw away the very earliest versions if you run out of memory, but be certain to retain the latest two versions at a bare minimum. Make backups of diskettes or flash memories that you will be carrying around. A little bit of effort at the right time now can save a lot of extra effort later (and even a poor grade). Please back up regularly! There is no excuse for doing otherwise.

Also, consider bringing a flash memory to every lab session for backing up course work. If you don't have one, you might want to purchase one. Alternatively, be prepared to save your files to a remote server or copy onto a 100 Meg ZIP disk or similar. Contact your course instructor for a ZIP disk if you would like to borrow one.

Caution: Keep in mind as you progress toward student teaching that as a student teacher your students will have an interest in finding out about you. This will lead them to Internet searches. Don't put anything on a web page, YouTube, Facebook, MySpace, etc., that you wouldn't want students, parents, teachers or administrators to see.

Important Note: NOW is the time to learn more about both the Physics Teacher Education and Professional Studies programs at Illinois State University. Be certain to visit the PTE home page and follow all important links.

Disposition Concerns: The College of Education, in an effort to ensure top quality graduates, provides faculty members and interested others with the opportunity to provide input into the teacher preparation process. One of these inputs is in the area of disposition concerns. Education faculty, in particular, are encouraged to bring to attention of CECP any significant problems associated with the following major areas. If three or more filed disposition concerns have not been resolved, the teacher candidate will be blocked from advancing in Professional Studies.

- *Collaboration Issues:* The ability to work together, especially in a joint intellectual effort.
- *Honesty/Integrity:* The ability to demonstrate truthfulness to oneself and to others; demonstrate moral excellence and trustworthiness.
- *Respect:* The ability to honor, value, and demonstrate consideration and regard for oneself and others.
- *Reverence for Learning:* Respect and seriousness of intent to acquire knowledge.
- *Emotional Maturity:* The ability to adjust one's emotional state to suitable level of intensity in order to remain engaged with one's surroundings.
- *Reflection:* The ability to review, analyze, and evaluate the success of past decisions in an effort to make better decisions in the future.
- *Flexibility:* The willingness to accept and adapt to change.
- *Responsibility:* The ability to act independently, demonstrating accountability, reliability and sound judgment.