

NIU Department of Physics  
Course Syllabus for *Physics 101* ---  
Fall Semester, 2016, Tuesdays and Fridays, 2:20-3:10 pm

**Course Description:**

Introduction to Northern Illinois University and the baccalaureate experience in physics. Exploration of factors influencing the transition into the university and the undergraduate physics programs. Introduction to department and university resources. Development of skills to enhance academic success with a focus on student responsibility for learning. Introduces the student to physics concepts including particles, forces, units, errors, and modern physics, and required skills in mathematics and computing. Substitutes for UNIV 101. Available only to first-year students. May not be repeated.

**Prerequisites :** None

**Credit hours:** 2. Class meets twice a week, 50 minutes each.

**Class room:** FR205

**Coordinator:** Laurence Lurio, chair. La Tourette 218, e-mail: [yito@niu.edu](mailto:yito@niu.edu)

**Office Hours:** Tuesdays and Thursdays, 2:00 pm – 3:00 pm; Other hours by an appointment.

**Goals:**

1. Developing student skills in collaborative learning, reflection, communication, interpersonal competencies and critical thinking.
2. Understanding the transition to college, the university and departmental resources, and what will be expected in classes as a whole and in physics in particular.
3. Introducing fundamental skills in mathematics, writing, computer-related, communication, critical thinking, and collaborative learning.

**Course Objectives:**

As a result of taking PHYS 101, students will be able to:

1. Apply various strategies to manage effectively the transition to NIU.
2. Demonstrate an awareness of key resources that support student academic success.
3. Establish an ePortfolio in Blackboard.
4. Practice foundational skills such as writing, communication, critical thinking, collaborative learning, and computing and basic mathematics skills appropriate for physics.
5. Demonstrate an understanding of fundamental aspects of unit analysis, error analysis, and issues in modern physics.
6. Demonstrate understanding and respect for the diverse values and perspectives of other cultures.

**Bibliography:**

- a) Smith, K. J. & Rode, D. L. (2015). "Essentials for success at Northern Illinois University", Plymouth, MI: Hayden-McNeil. This is an e-book.
- b) Common Read book selected for reading by UNIV 101.
- c) Selected excerpts from: Kenneth Krane, "Modern Physics", John Wiley & Sons, 2012, or Randy Harris, "Modern Physics", Addison Wesley 2007.
- d) Selected excerpts from: Mary L. Boas, "Mathematical Methods in the Physical Sciences", John Wiley & Sons, 2006.

e) Selected excerpts from: Jason Cannon, "Python Programming for Beginners", Amazon Digital Services, Inc, ASIN: B00N4IQRD4, 2014.

<https://wiki.python.org/moin/BeginnersGuide/NonProgrammers>; <https://root.cern.ch>.

f) Selected excerpts from: John R. Taylor, "An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements", University Science Books; 2nd edition (1996).

g) <http://www.aip.org/career-resources> American Institute of Physics career resources.

h) <http://www.aip.org/student-programs> American Institute of Physics student programs.

### **Items covered and graded**

1. E-mail. Students will need to respond to an initial e-mail sent via blackboard to an NIU e-mail.
2. Attendance will be taken every period.
3. Students will form "interview groups" of two (or three if needed). Students will then as a team interview a faculty member and a senior student in the Department of Physics. The interviews should be about 10-15 minutes and concentrate on asking how a student should succeed in physics, especially items which are not obvious to a freshman. Students will post a brief synopsis of the interviews on ePortfolio and discuss what was learned in class.
4. Students will meet with the Assistant Chair of the Department of Physics and make a personal plan for courses to take to complete a physics degree.
5. MAPworks. This is a program which looks at student retention. Two class periods will be spent filling in the MAPwork set of questions. (Students should bring an Internet device for those two classes). After filling in MAPworks, retention issues will be discussed.
6. NIU activities. Students are required to attend two NIU events during the term, "prove" they attended, and then make a brief entry on ePortfolio for each event. Events can be a football or soccer game (but only one athletic event can be used), attending a theater or music performance, a trip to the Anthropology or Art Museum, a visit at night to the Davis Hall Observatory, attending STEMfest, a physics department colloquium, or any other "official" NIU activity. We will then discuss what people did at the end of the term.
7. STEMfest will be held on October 8<sup>th</sup>. See <http://www.stemfest.niu.edu/stemfest/>. *Students need to contact Assistant chair and the president of SPS (Society of Physics Students)*. Students can volunteer to help and receive extra credit (plus a T shirt and lunch) at the registration page linked from that page. Note volunteering for STEMfest can also be used to satisfy one event in item 6.
8. Students will meet with the instructor during week 13 to assess how the course (and term) is going.
9. Homework sets as listed in the schedule below.

## Grading

E-mail usage	5 points
Attendance	25 points
Mapworks participation	10 points
Personal plan for completing physics BS degree	5 points
Faculty and student interviews	5 points
NIU activities	10 points
Book (reflection and in-class reports)	15 points
Homeworks (4 sets total)	25 points
Extra Credit for volunteering for STEMfest	10 points

### Grading scale

85-100	A
75-84	B
65-74	C
60-64	D
0-59	F

There will not be any “minus” grades in this class. “Plus” grades (like B+) will be awarded as appropriate, determined at the end of the term. The grade letters posted on Blackboard (if any) are not relevant, just the points. The final grade will be posted on MyNIU.

**Northern Illinois University is committed to providing an accessible educational environment in collaboration with the Disability Resource Center (DRC).** Any student requiring an academic accommodation due to a disability should let his or her faculty member know as soon as possible. Students who need academic accommodations based on the impact of a disability will be encouraged to contact the DRC if they have not done so already. The DRC is located on the 4th floor of the Health Services Building, and can be reached at 815-753-1303 or [drc@niu.edu](mailto:drc@niu.edu).

**Non-Discriminatory Language:** Nearly all professional organizations promote use of non-discriminatory language through a formal set of guidelines. Additionally the business world insists upon non-discriminatory language in its internal and external communications. Therefore, this class will try to make students aware of how the written and spoken word acts upon the audience and will promote non-discriminatory practices.

**Cell Phones/Computers in Classroom:** Cell phones are not to be used in class unless requested by the instructor for a class activity. This includes reading or sending text messages or utilizing the Internet. Always ask for permission to use a cell phone for any purpose during a class. Unauthorized use of a cell phone in class will be considered an absence. If you continue to use a cell phone in class you will be asked to leave. If a computer is being used in the classroom it must be used only to take notes or as directed by the instructor. Students should not be accessing the Internet during class time, unless requested by the instructor for a class activity.

**Class Visitation Policy:** Due to liability concerns, only NIU students are allowed to attend at classes at NIU. Guests, including family members and NIU students not registered for the course, will not be permitted to attend class except with prior arrangement with the instructor. Because university classes are not developmentally appropriate situations for young children, children will not be allowed in class except in highly unusual circumstances and with the prior approval of the instructor.

**Academic Misconduct:** For a detailed description of the university’s definition of academic misconduct, and the process by which it is adjudicated, please refer to the Student Code of Conduct. Sanctions (consequences) for committing academic misconduct include but are not limited to, failure of the assignment, failure of the course, and

suspension or expulsion from Northern Illinois University. Cheating and plagiarism of one's own or another's work will not be tolerated. Academic integrity and civility in the classroom are expected of every member of the NIU community. Please review the Undergraduate Catalog for more information on this topic.

**Late Assignments:** Assignments are due on the scheduled due date. Late papers will be accepted but will receive half credit. All assignments will be accepted via Blackboard (on E-Portfolio), unless otherwise stated in class.

**Syllabus Clause and Contract:** This syllabus may be revised and adapted throughout the semester to better serve the needs of the class. The instructor may assign additional reading and/or assignments as needed. Additionally, the decision to remain in this class upon receipt of the syllabus serves as students acceptance of the syllabus as a binding contract, meaning they agree with the terms set forth and the expectations of them as members of the class.

**Religious Observances:** Northern Illinois University, as a public institution of higher education in the State of Illinois, does not observe religious holidays. It is the university's policy, however, to reasonably accommodate the religious observances of individual students in regards to class attendance, scheduling examinations, and work requirements. Such policies shall be made known to faculty and students. Religious observance includes all aspects of religious observance and practice as well as belief. Absence from classes or examinations for religious observance does not relieve students from responsibility for any part of the course work required during the period of absence. To request accommodation, students who expect to miss classes, examinations, or other assignments as a consequence of their religious observance shall provide instructors with reasonable notice of the date or dates they will be absent.

## Course schedule [Fall 2016]:

Week 1 Aug 23, 26. [Taught by Assistant chair or Chair]

Class 1: Overview of course, e-mail, blackboard, E-portfolio, web pages.

Class 2: Overview of Physics Major. Survey catalog requirements for Physics BS degrees, Emphases, typical course schedules, important classes and what they cover, Society of Physics Students. Students then meet with undergrad advisor and make a personal plan for courses to take through BS degree.

Week 2 Aug 30, Sept 2. [Assistant chair or Chair]

Class 1: Overview of Common Read book and chapter assignments. Form interview teams to then jointly meet with a physics faculty member and a senior physics major.

Class 2: Overview of the major branches of Physics research and their goals. Representation at NIU, Fermilab, and Argonne. Physics careers and graduate school possibilities.

Week 3 Sept 6, 9. [Assistant chair or Chair]

Class 1: Mapworks: entries and why important. Discuss factors determining success in college and physics

Class 2: Faculty research at NIU I. Faculty guest speakers speak for 15 minutes about their research, and undergrad research opportunities.

Week 4 Sept 13, 16. [Assistant chair or Chair]

Class 1: Common Read book #1 (first few chapters and perhaps overview video)

Class 2: Faculty research at NIU II. Faculty guest speakers speak for 15 minutes.

Week 5 Sept 20, 23. [Assistant chair or Chair]

Class 1: Common Read Book #2 (next few chapters). Personal course plan after meeting with undergraduate physics advisor due (ePortfolio entry).

Class 2: Faculty research at NIU III. Faculty guest speakers speak for 15 minutes.

Week 6 Sept 27, 30. [Assistant chair or Chair]

Class 1: Interviews with faculty, assistant chair, and senior physics major discussion (and ePortfolio entry on this due).

Class 2: Pause Off (Safety Skit/Health Enhancement)

Week 7 Oct 4, 7.

Class 1 [Assistant chair or Chair]: Common Read Book #3 (next few chapters).

Class 2 [Martin]: Dimensional and unit analysis I. Metric system and other systems of units. Units of important physics quantities. Conversions of units. Dimensionful and dimensionless quantities, functions of dimensionless quantities, and rules for valid relations between dimensionful quantities.

Week 8 Oct 11, 14.

Class 1 [Martin]: Dimensional and unit analysis II. Using dimensional analysis to make order-of-magnitude estimates. Fermi problems. Natural units with  $c = \hbar = 1$ . (Homework on unit analysis, due week 9 class 1.)

Class 2 [Assistant chair or Chair]: Common Read Book #4 (final chapters)

Week 9 Oct 18, 21.

Class 1 [Martin or Hedin]: Special relativity and modern physics. Basic ideas and formulas of

special relativity. Particle lifetimes.

Class 2 [Martin or Hedin]: More special relativity (Homework due week 10 class 2)

Week 10, Oct 25, 28.

Class 1 [Assistant chair or Chair]: Mapworks 2, discussion on succeeding at college; ePortfolio entry on Common Read book due.

Class 2 [Hedin]: Matrices and linear algebra I.

Week 11, Nov 1, 4.

Class 1 [Hedin]: Matrices and linear algebra II. (Homework due week 12, class 1.)

Class 2 [Adelman]: Computer skills I. Computing facilities available at NIU.

Week 12, Nov 8, 11.

Class 1 [Adelman]: Computer skills II. Programming in Python. Simple examples from Newtonian physics and linear algebra. (Homework due before end of semester.)

Class 2: Tour of engineering building.

Week 13,

Nov 15, 18.

Class 1: Individual conference with instructor.

Class 2 [Adelman]: Computer skills III. Presentation of data (histograms, fits, statistics). (Homework due before end of semester.)

Week 14, Nov 22, 25(*during Thanksgiving break*).

Class 1 [Assistant chair or Chair]: NIU events discussion (ePortfolio entry on this due)

Class 2 [Alley]: Visit Davis Hall Observatory (in evening). **Other dates**

Week 15, Nov 29, Dec 2. [Assistant chair or Chair]

Class 1: Research opportunities for undergrads at NIU or summer programs elsewhere.

Class 2: Final discussion and evaluations