

PHYS 253 Syllabus

Fall Semester 2015

Course: Fundamental of Physics I: Mechanics

Section: 0001

Meeting Time: M-W-F, 12:00 PM – 12:50 PM

Location: Faraday Hall 143 ([click here](#) for NIU interactive map)

Instructor: Juan A. Colón Santana, Ph.D.

Office: [Faraday Hall](#) 223 (or FR 223)

Office hours: Wednesdays from 10:30 PM- 11:30 PM (or by appointment)

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This syllabus is a guide and every attempt is made to provide an accurate overview of the course. However, circumstances and events may make it necessary for the instructor to modify the syllabus during the semester and may depend, in part, on the progress, needs, and experiences of the students. Changes to the syllabus will be made with advance notice.

Course Description:

Physical laws governing motion, force, energy, rotation, and vibration using calculus. Primarily for majors in the physical and mathematical sciences and engineering. One three-hour laboratory a week. Not available for credit to students with credit in PHYS 210, PHYS 250, or PHYS 250A.

The general content of the course comprise topics on kinematics, dynamics, gravitation, work, energy, momentum, conservation laws and rotational motion. See the course content section for a detailed list of topics.

Course Prerequisites:

MATH 229.

Learning Outcomes

By the end of the course the students will be able to:

- 1) Apply the basic laws of physics in the areas of kinematics, dynamics, gravitation, work, energy, momentum, rotational motion and conservation laws.
- 2) Analyze and solve problems or situations involving fundamental physics principles in the areas of kinematics, dynamics, gravitation, work, energy, momentum, rotational motion and conservation laws.
- 3) Strengthen their understanding and intuition of basic concepts in Mechanics.

- 4) Present physical concepts, sound mathematical reasoning and the results of laboratory experiments through effective writing skills.
- 5) Use laboratory data analysis techniques like error propagation, data acquisition, data plot and graphical analysis.
- 6) Constructively question results presented by the scientific community and engage in a reasonable debate on the facts of the issue.
- 7) Gain experience at relating physics concepts to real-world applications

Instructional Methods

This course is taught using a variety of instructional methods including power point lectures, in-class and online discussions, demonstrations and simulations.

Textbooks and Course Materials:

- 1) Physics for Scientists and Engineers with Modern Physics: 4th Edition, Douglas C. Giancoli Volume I (Chapters 1-20) or the full version of the book.
- 2) A laptop, tablet or smartphone.
- 3) Active [Tophat](#) account. If you have not registered yet, [click here](#) to see a tutorial on how to create an account. The join code for this course is **549236**.
- 4) Active Sapling Learning account. If you have not registered or created an account yet, [click here](#) and follow the instructions to create an account or register.
- 5) Additional materials posted on Blackboard.
NIU Blackboard Link: <https://webcourses.niu.edu/webapps/portal/frameset.jsp>

Student Responsibilities

The students enrolled in this course are expected to:

- 1) Engage in active participation in every class.
- 2) Attend all lectures.
- 3) Complete weekly homework assignments on time.
- 4) Discuss with fellow students specific physics problems and/or situations during the lecture as instructed.
- 5) Participate in the online discussions on Blackboard.
- 6) Take the required examinations at the assigned dates.
- 7) Bring their electronic devices **ONLY** for the purpose of class participation using their Tophat account.
- 8) Behave in a responsible and adequate manner at all times

Resources

There are several resources that students can take advantage of:

- 1) Recitations – this is a weekly hour devoted for problem solving or for answering questions that students may have. The recitation time will take place at the laboratory

section, immediately after the experiments are completed (yes... expect to be in laboratory the whole time).

- 2) Tutoring hours – there are several teaching assistants assigned to offer free tutoring hours each week in the tutoring room (Room 251 in Faraday Hall). They can help you with questions and doubts regarding the material. Please, keep in mind that tutors are not required to solve a problem for you, their responsibilities are to guide you in reaching a solution on your own.
- 3) Tutoring Center – the College of Engineering & Engineering Technology provides free tutoring. While this is a resource for all engineering and engineering technology students, non-engineering majors are welcome to schedule an appointment. For more information and tutor availability click on:
<http://www.niu.edu/ceet/CurrentStudents/Tutors/index.shtml>

Course Content

This course will adhere to the following topics (for the exact content and order see the course schedule):

Part I - Kinematics

Kinematics in one-dimension:

Reference Frame and displacement, average velocity, acceleration, motion at constant acceleration and freely falling objects.

Kinematics in two or three dimension; vectors:

Vectors and scalars, addition of vectors, subtraction of vectors, multiplication of a vector by a scalar, adding vectors by components, unit vectors, vectors kinematics and projectile motion.

Part II- Dynamics

Newton Laws of Motion:

Force, Newton's laws of motion, body diagrams, weight and normal force.

Friction, Circular Motion, Drag Forces:

Applications of Newton's law, uniform circular motion, dynamics of circular motion and highway curves.

Gravitation:

Newton's law of universal gravitation, gravity near the Earth's surface, satellites, weightlessness, Kepler's law and Newton's synthesis, type of forces in nature, gravitational fields and the principle of equivalence.

Part III – Work, Energy, momentum and Conservation Laws

Work and Energy:

Work done by a constant force, scalar product of two vectors, work done by a varying force, kinetic energy and the work energy principle.

Conservation of Energy:

Conservative and non-conservative, potential energy, mechanical energy and its conservation, the law of conservation of energy, energy conservation with dissipative force, gravitational potential energy, escape velocity and power.

Linear Momentum:

Momentum and its relation to force, conservation of momentum, collision and impulse, conservation of energy, momentum in collisions, elastic and inelastic collisions, collisions in two or three dimensions, center of mass and translational motion.

Part IV – Rotation, Angular momentum and equilibrium

Rotational Motion:

Angular quantities, vector nature of angular quantities, constant angular acceleration, torque, rotational dynamics, moments of inertia and rotational kinetic energy.

Angular Momentum:

Angular momentum, objects rotating about a fixed axis, vector cross product, angular momentum of a particle, torque for a system of particles, torque for a rigid object and conservation of angular momentum.

Static equilibrium:

The conditions for equilibrium, solving statics problems, stability and balance.

Methods of Assessment:

Exams: 45%

There will be a total of four exams during the semester (3 partial exams and 1 comprehensive final examination). Each partial exam constitutes 10% of the final grade and the final examination constitutes 15% of the final grade.

The format of the exams will be discussed a week prior the examination date (each exam may have a different format). See the course schedule for the exact dates of the exams.

Students will be granted with a failing grade (0% F) on the exam if any device other than a calculator is seen during the testing period. Please make sure that such devices are stowed away. Similar outcome will apply if a student is seen copying from a neighbor or from any source.

Note: The partials and final examination grades will not be dropped under any circumstances. In addition, students who do not complete the final examination will receive a failing grade and will not pass the course. The examinations may be rescheduled only in case of a well-documented and serious emergency.

Homework: 15%

The homework grade will be based on (but not limited to) homework problems, assigned readings and Blackboard discussions.

There will be a total of 14 assignments worth 100 points each. The homework problems will be available through Sapling Learning a week prior the assignments due dates. Students should expect about ten homework problems each week. Once you successfully logged into your Sapling Learning account, look for the course name which appears as "[Northern Illinois University - PHYS 253 - Fall15 - COLON](#)".

Note: The Homework deadlines are rigid and as such, late homework will not be accepted.

Participation: 20%

The students are expected to participate in class via [Tophat](#) and by interactive communication. In general, most of the questions will require a response using an electronic device of your choice (smartphone, tablet or laptop). However, the instructor reserves the right to ask question to the students at any time during the lecture. The number of points obtained for answering the questions will be determined by the instructor and will be announced before the question is asked.

Keep in mind that this grade is not only determined by the points obtained for answering questions, there will be other factors that will contribute to the grade (random absence checks, tardiness, etc).

Note: Tardiness is disruptive and rude to your instructor and your fellow students. Students are expected to be in their seat by 12:00 pm and remain in the lecture room at least until 12:50 pm. Students who arrive to the classroom late or leave early will be penalized by points (or percent) subtraction from the participation grade. If your personal and/or professional schedules prevent you from arriving to class on time, please discuss this with the instructor immediately.

Laboratory Sessions: 20%

There will be a three hours laboratory session each week. A minimum average lab grade of 60% is required to pass the course. Students with lab score below this mark will fail the course. Likewise, students will fail the course if all coursework requirements as described here and throughout the syllabus are not satisfied. Please, refer to the Laboratory Syllabus for more information about the laboratory.

Extra Credit:

There may be a possibility for extra credit. If extra credit is assigned, it will be through in class participation. There will be no extra credit assigned for special projects, essays, research papers, etc.

Letter Grades:

The letter grades will be assigned based on the following percentage:

| Letter Grade | Percentage (%) |
|--------------|----------------|
| A | 100 – 93.0 |
| A- | 92.99 – 90.0 |
| B+ | 89.99 – 87.0 |
| B | 86.99- 83.0 |
| B- | 82.99 – 80.0 |
| C+ | 79.99 – 74.0 |
| C | 73.99- 70.0 |
| D | 69.99- 60.0 |
| F | 59.99 - 0 |

Attendance

Students are strongly encouraged to attend every lecture. It is very likely that the example problems in the lecture will be different than those in the textbook, so it is in your best interest to attend. Also, students must understand that there will be no one-on-one instruction for a missed class and no lecture notes will be provided to those who miss the class.

Late Work:

Please use the course schedule to accomplish your academic, personal, and professional goals. Late work will not be accepted.

Office Hours:

While I can be reached at my office hours, students are strongly encouraged to contact me with questions related to the course anytime via email or phone. Students are welcome to stop by my office out of the office hours; however, I cannot guarantee my availability to answer questions.

Special Notes:

- 1) Cheating and plagiarism are serious offenses. Offenders will be referred to the University's judicial office.
- 2) No electronics devices are allowed on the tests and final exam other than a calculator.
- 3) The example problems used in the lecture may be different than those in the textbook. It is your responsibility to solve and understand all solved strategic examples and problems found within each chapter of the textbook as well for all equations derived in those problems. Of course, you are welcome to ask if in doubt!
- 4) I strongly encourage that you submit your homework at least a day before the due date. This will ensure that if there is an issue with the Sapling Learning website, you will have enough time to solve it. Claims that homework was not submitted due website issues or that a different answer to a problem was submitted (or other claims of such nature) will

be investigated. If the issues are found to be illogical, there will be no changes in the grade of the homework.

Severe Weather and Cancellation Notices

To check for campus severe weather closing call: 815.752.6736 (local) or 1.888.648.9847. If classes are cancelled by the University or by the instructor for any reason, an announcement will be made at the earliest opportunity possible on Blackboard and all students will be emailed regarding the cancellation.

From the University

Withdrawal from a Course

All requests for withdrawal from a course must be initiated and processed through the central advisement office of the college in which the student is pursuing a major, or the **Academic Advising Center**, if the student has no college affiliation. (Nondegree students initiate withdrawals through their college of academic interest.)

A student may withdraw from a course up to the end of the eighth week of a semester, or the fourth week of a half-semester course or eight-week summer session course. For courses of other lengths, the withdrawal deadline is the end of the first half of the course. A W is recorded for course withdrawals properly processed prior to the established deadlines. (A W is a clerical symbol, not a grade. It has no effect on semester or cumulative GPA.)

A student may withdraw from a course after the established deadlines only in exceptional cases supported by acceptable evidence of serious illness or other major nonacademic personal difficulty. Approval of a course withdrawal after the deadline may be granted only by the dean (or the dean's delegate) of the student's college, or by the Vice Provost (or the Vice Provost's delegate) for any student who has no college affiliation. If such approval is given, W will be recorded for the course if the student is passing at the time of withdrawal; if the student is not passing at that time a grade of F will be recorded and included in both the term and cumulative GPA.

Students seeking a withdrawal from a course for medical reasons must initiate the withdrawal process with Health Services during the semester in which the medical condition is diagnosed, and complete the process no later than the end of the subsequent academic term.

New students and transfer students are limited in the number of semester hours from which they can withdraw. Students with fewer than 7 transfer hours are allowed to withdraw from a total of 17 semester hours during the pursuit of the baccalaureate degree.

The maximum number of hours from which a transfer student may withdraw during pursuit of a baccalaureate degree at NIU is determined by the number of hours of transfer credit accepted at the time of enrollment at NIU plus all hours earned at NIU prior to enrollment, as indicated in the following table.

| <i>Transfer Plus Pre-enrollment NIU Hours</i> | <i>Maximum Withdrawal Hours</i> |
|---|---|
| 1-6 | 17 |
| 7-15 | 15 |
| 16-30 | 12 |
| 31-45 | 9 |
| 46 or more | 6 |

All exceptions to this policy must be approved by the dean of the appropriate college.

Students who cease to attend a course in which they are enrolled without officially withdrawing as explained previously will receive an F for that course.

Incompletes

A grade of I (incomplete) is assigned at the discretion of the instructor, when illness, death in the immediate family, or other unusual and unforeseeable circumstances not encountered by the other students in the class prevent completion of the course requirements by the end of the semester. Under these circumstances, a grade of I (incomplete) may be assigned when a student is unable to complete the course requirements but only when it is possible that the completion of the remaining work could result in a passing grade.

An I (incomplete) grade received during the fall semester, the spring semester, or the summer session must be cleared no later than 200 calendar days from the end of the term in which the student received the grade unless the incomplete is extended by the instructor. All incompletes, whether extended or not, must be cleared within a year of when the grade was assigned.

An I (incomplete) must be resolved within the appropriate time limit or it will automatically be changed to an F. The student is responsible for seeing that incompletes are made up before the expiration date.

Before submitting grades to the **Office of Registration and Records**, an instructor who assigns a grade of I (incomplete) will provide the chair of the department with a written statement of the remaining work to be completed to remove the incomplete. Upon request, the student may obtain a copy of that statement from either the instructor or the department chair.

Academic Integrity:

Good academic work must be based on honesty. The attempt of any student to present as his or her own work that which he or she has not produced is regarded by the faculty and administration as a serious offense. Students are considered to have cheated if they copy the work of another during an examination or turn in a paper or an assignment written, in whole or in part, by someone else. Students are responsible for plagiarism, intentional or not, if they copy material from books, magazines, or other sources without identifying and acknowledging those sources or if they paraphrase ideas from such sources without acknowledging them. Students responsible for, or assisting others in, either cheating or plagiarism on an assignment, quiz, or examination may receive a grade of F for the course involved and may be suspended or dismissed from the university.

A faculty member has original jurisdiction over any instances of academic misconduct that occur in a course which the faculty member is teaching. The student shall be given the opportunity to resolve the matter in meetings with the faculty member and the department chair. If the facts of the incident are not disputed by the student, the faculty member may elect to resolve the matter at that level by levying a sanction no greater than an F for that course. The faculty member shall notify the student in writing whenever such action is taken, and the Office of Community Standards and Student Conduct shall receive a copy of the Academic Misconduct Incident Report indicating final disposition of the case, which will be placed in the student's judicial file. In all matters where the charge of academic misconduct is disputed by the student or if the

faculty member feels a sanction greater than an F in the course is appropriate (such as repeated offenses or flagrant violations), the faculty member shall refer the matter to the Office of Community Standards and Student Conduct making use of the Academic Misconduct Incident Report. Additional sanctions greater than an F in a course can be levied only through the University Judicial System. With regards to finding the student either responsible or not responsible for his or her action, the ruling of the Judicial Hearing Board shall be binding. In cases where there is either a finding of responsibility or an admission of responsibility by the student, any recommendations by the hearing board regarding the course grade are non-binding on the instructor, who remains solely responsible for assigning a course grade, consistent with the policies set forth in the course syllabus.

Attendance:

The university does not use a "cut" system. Each instructor decides whether to excuse class absences and determines how to permit make-up work. If a student will be absent from classes for a week or more because of an accident, illness, or other emergency, instructors will be notified of the absence only if students or their parents request it through the Division of Student Affairs. Health Services will not release information about students unless they provide a written request. Leaves of absence will be granted for volunteer services related to disaster relief in accordance with applicable Illinois statutes or executive orders issued by the State of Illinois in response to emergency situations. To initiate a leave of absence, students should contact their College Dean's office, or the vice provost (or the vice provost's delegate) for any student who has no college affiliation. Following the period of volunteer service, Registration and Records will facilitate reenrollment of the student. Students are expected to comply with each individual instructor's established attendance policy. It is recommended that students avoid registering for classes in which they would amass significant absences. In the case of an absence due to required attendance at a university-sponsored event such as a department trip, performing arts activity, ROTC function, or athletic competition, reasonable attempts shall be made by faculty members to allow the student to make up missed work. Students are responsible for completing the work assigned and/or due on the days they are absent for university sponsored events. Both the sponsoring unit and the student should inform the faculty member as soon as possible in the semester in order for arrangements to be made for completing missed assignments, examinations or other required course work. The student is required to provide each instructor with an official notification in advance of the absence (e.g., a letter from the chair of the sponsoring department, the head of the sponsoring unit, or the coach).

Accommodations for Students with Disabilities:

A student who believes that reasonable accommodations with respect to course work or other academic requirements may be appropriate in consideration of a disability must (1) provide the required verification of the disability to the Disabilities Resource Center, (2) meet with the Disabilities Resource Center to determine appropriate accommodations, and (3) inform the faculty in charge of the academic activity of the need for accommodation. Students are encouraged to inform the faculty of their requests for accommodations as early as possible in the semester, but must make the requests in a timely enough manner for accommodations to be appropriately considered and reviewed by the university. If contacted by the faculty member, the staff of the Disabilities Resource Center will provide advice about accommodations that may be indicated in the particular case. Students who make requests for reasonable accommodations are

expected to follow the policies and procedures of the Disabilities Resource Centering this process, including but not limited to the Student Handbook.

A wide range of services can be obtained by students with disabilities, including housing, transportation, adaptation of printed materials, and advocacy with faculty and staff. Students with disabilities who need such services or want more information should contact the Disabilities Resource Center (815-753-1303).