PHYSICS 211: MECHANICS
FALL 2014: SYLLABUS

Meeting times: Lectures, TuFr 1:00-2:50PM, RF 122, and Lab, TuFr, 3:00-4:50PM RF 122


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Course Webpage: https://westernonline.wiu.edu/ and then select PHYS 211 – Section Q01 – UNIV PHYS I (RABCHUK J). The login name is your ecom account name, and the password is your ecom password

Catalog description: 211 University Physics I. (4) (General Education/Natural Sciences)
Motion, Newton’s laws, forces, momentum, energy, work, rotation, and simple harmonic motion. Prerequisite or Corequisite: MATH 133. 3 hrs. lect.; 1 hr. discussion; 2 hrs. lab. IAI Physics 911.

Course Objectives:
This is the first part of our calculus-based introductory physics sequence for undergraduate students. In this course, we will study motion, force and energy. Description of the motion of point-like objects and rigid bodies, Newton’s laws, rotational motion, equilibrium and gravity are the main topics for this course. Course aims and objectives are listed below:

i. Understand how physical quantities may be represented as vectors, vector sums, and vector products.
ii. Understand the concepts and interrelationships of position, time, velocity and acceleration.
iii. Understand the concepts and interrelationships of force (including gravity and friction), inertia, work, power, energy, and momentum
iv. Describe and predict motions of bodies in inertial frames of reference in one and two dimensions in a physical system with association to the basic theories of force and motion.
v. Analyze and predict motions and interactions involving forces within the context of conservation of energy and/or momentum.
vi. Understand translational and rotational motion of particles, systems of particles and rigid bodies.
vii. Understand inertia and moments of inertia, momentum and angular momentum, and forces and torques as they apply to linear and circular motions.
viii. Demonstrate abilities to use instruments or to explain functions of the technologies used to study force and motion.
ix. Apply knowledge to explain different phenomena involving dynamics and equilibrium and solve a broad range of problems pertaining to this area of physics.

Co-requisite: MATH 133
Student Rights and Responsibilities: Your rights and responsibilities as a student at Western Illinois University can be found at the following website:
http://www.wiu.edu/provost/policies.php

Academic Honesty: Remember, any work you sign your name to will be considered your original work unless you specify otherwise. Failure to properly cite a source that you used to assist you in completing your work is considered a form of plagiarism, including failure to cite your textbook, a web site, a personal communication, etc. It is expected that all work you submit for a grade for this course will be substantially your own, with appropriate references when other’s work is used.

Below are several websites that address various University and Department Policies directly pertaining to student rights and responsibilities. You are responsible for being familiar with the information (including required forms, definitions, and time lines) contained therein.

Academic Integrity: http://wiu.edu/policies/acintegrity.php
Final Exam Policy: http://www.wiu.edu/policies/finexam.php
Final Exam Schedule: http://www.wiu.edu/registrar/exams.php
Grade Appeals Policy: http://www.wiu.edu/policies/gradeapp.php

Students with Disabilities: In accordance with University policy and the Americans with Disabilities Act (ADA), academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor’s attention, as he/she is not legally permitted to inquire about such particular needs of students. Students who may require special assistance in emergency evacuations (i.e. fire, tornado, etc.) should contact the instructor as to the most appropriate procedures to follow in such an emergency. Contact Disability Support Services at 298-2512 for additional services.

Teacher Education majors: “In accordance with Illinois State Board of Education certification rules, all candidates seeking teacher certification are required by Western Illinois University to obtain a grade of “C” or better in all directed general education course, all core courses, and all courses in the option. Note: A “C-” is below a “C”.”

TPEP vision statement: “Our graduates will be empowered educational professionals deeply committed to continuous learning and the empowerment of all learners.”

TPEP mission statement: “The WIU Teacher and Professional Education Program empowers candidates to become educational practitioners who engage in informed action that is grounded in knowledge and reflection; who are deeply committed to the highest standards of professional practice; who are able to adapt to emerging social, economic, and cultural landscapes; who are skilled in the use of technological tools that promote teaching and learning; and who are committed to empowering all learners.”
**Homework:**
Homework assignments will be given out weekly, taken primarily from your textbook. Homework is practice. It has value only to the extent that you use that practice to help you strengthen your skills in conceptual and analytical reasoning, in problem solving techniques including justification of your results, and in the clear and orderly presentation of your ideas and your work. Your work will be graded for quality in all these aspects. **The homework grade will account for 15% of your final grade.**

**Quizzes:** You will take numerous in-class quizzes related to the material presented in class. Some of these quizzes will be multiple-choice. Some will be done collaboratively. Some will be done on your own. Some of the quiz problems are representative of the kinds of test problems that I give. **Your quiz grade will account for 15% of your total grade.**

**Laboratory Experiments:**
Attendance at Labs is mandatory. All absences from labs should be cleared with the instructor prior to the activity. All missed labs should be made up before the next lab activity takes place. Unless instructed otherwise, you will be required to write up your lab report and turn it in at the beginning of the next lab. You or anyone else should be able to look at your report several days or weeks later and understand what you were doing in the lab.

The lab write up should contain the following elements:
- A statement of the relevant concepts being examined during the lab activity
- A statement of the equipment and procedures to be used in order to carry out the investigation
- An orderly and clear presentation of all data obtained during your experiment in tabular and/or graphical form
- Explicit sample calculations of all calculated quantities and a presentation of the results of your analysis of the data
- A conclusion that states clearly whether the results of your experiments support the conceptual ideas being investigated. This requires that you argue from the evidence that the theoretical predictions are supported, acknowledging and attempting to account for all deviations from the predicted behavior

The order of the lab exercises is as follows (and may be different from the order of labs in your manual):
Lab 1  Graphing and Curve Fitting
Lab 2  Motion I
Lab 3  Motion II
Lab 4  2D-Motion (Projectile Motion and Circular Motion)
Lab 5  Force Table and Vector Addition
Lab 6  Newton’s 2nd law
Lab 7  Interactive Physics
Lab 8  Work and Energy
Lab 9  Collisions (Impulse and Momentum conservation)
Lab 10 Rotational Motion
Lab 11 Torque
If a lab report is turned in late, 10% of the credit will be lost for each day late. Each student must complete all 11 lab exercises and turn in all 11 lab reports. **The lab component will be worth 15% of your grade.**

**Exams:**
There will be three in-class exams and a final exam. Each in-class exam will cover one unit of material. **The in-class exams will be worth 10% each. The final exam will be comprehensive and worth 25% of your grade.**

**Grading Policy:** The labs, homework and quizzes will be graded using the ± system on a 92, 90, 88, 82, 80, 78, 72, 70, 68, 62, 60, 58 scale. Exams will be graded on a curve, with an anticipated scale of 85, 72, 60, 48, with the ± grades 2 percentage points above or below the cut off. The final grade will be determined using a weighted average of the homework, lab, quiz, in-class and final exam scores.

**For example,** if you scored an 85% on HW, 80% on lab, 80% on quizzes, 75% on each of the in-class exams and 85% on your final, the final percentage would be:

\[
\left[(.15) \times .85 + (.15) \times .8 + (.15) \times .8 + (.15) \times .75 \times 2 + (.25) \times .85\right] = .805.
\]

The grade is found by doing the same calculation for the cut off scores for an A±, B±, C±, D±, etc., and comparing your score to the cutoff scores. The exam scores are the only variable, since the cut offs will be determined based on the curve for each exam.
<table>
<thead>
<tr>
<th>Mn</th>
<th>Tuesday Lecture/Lab</th>
<th>Wd</th>
<th>Th</th>
<th>Friday Lecture/Lab</th>
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</thead>
</table>
| Aug 25: | **26**: Rd. Ch. 1 Math and Physics | **27**: | **28**: | **29**: Rd. Ch. 2.1-3 Motion along a line  
**Lab 1: Graphing** |
| Sep 1: | **2**: Rd. Ch. 2.4-5 Constant Acceleration  
**Lab 1: Graphing** | **3**: | **4**: | **5**: Rd. Ch. 2.6 Slopes, Areas and the Calculus of Motion  
**Lab 2: Motion I** |
| 8 | **9**: Rd. Ch. 3 Vectors  
**Lab 2: Motion I** | **10**: | **11**: | **12**: Rd. Ch. 3.1-2 Motion in 2- and 3-D  
**Lab 3: Motion II** |
| 15: | **16**: Rd. Ch. 3.3-4 Projectile and Circular Motion  
**Lab 3: Motion II** | **17**: | **18**: | **19**: Rd. Ch. 3.5 Relative Motion  
**Lab 4: Projectile Motion** |
| 22: | **23**: Rd. Ch. 4.1-2 Force and Inertia  
**Lab 4: Projectile Motion** | **24**: | **25**: | **26**: **Exam I**  
Rd. Ch. 4.3-4 Newton’s 2nd Law  
**Lab 5: Force Table and Vector Addition** |
| 29: | **30**: Rd. Ch. 4.5-6 Newton’s 3rd Law  
**Lab 5: Force Table and Vector Addition** | **Oct. 1**: | **2**: | **3**: Rd. Ch. 5.1-2 Equilibrium and Dynamics  
**Lab 6: Newton’s 2nd Law** |
| 6: | **7**: Rd. Ch. 5.3 Frictional Forces  
**Lab 6: Newton’s 2nd Law** | **8**: | **9**: | **10**: Fall Break |
| 13: | **14**: Rd. Ch. 5.4-5 Dynamics of Circular Motion | **15**: | **16**: | **17**: Rd. Ch. 6.1-3 Interactions: Work  
**Lab 7: Interactive Physics** |
| 20: | **21**: Rd. Ch. 6.3-4 Energy and Power  
**Lab 7: Interactive Physics** | **22**: | **23**: | **24**: **Exam II**  
Rd. Ch. 7.1 Gravitational Potential Energy |
| 27: | **28**: Rd. Ch. 7.2-5 Elastic Potential Energy  
**Lab 8: Work and Energy** | **29**: | **30**: | **31**: Rd. Ch. 8.1-2 Momentum and Impulse  
**Lab 8: Work and Energy** |
| Nov. 3: | **4**: TBD | **5**: | **6**: | **7**: Rd. Ch. 8.3-6 Collisions, Explosions, and Rockets  
**Lab 9: Momentum** |
| 10: | **11**: Rd. Ch. 9.1-3 Angular Kinematics  
**Lab 9: Momentum** | **12**: | **13**: | **14**: Rd. Ch. 9.4-6 Rotational Energy and Moments of Inertia  
**Lab 10: Rotation** |
| 17: | **18**: Rd. Ch. 10.1-4 Torque and Rotational Dynamics  
**Lab 10: Rotation** | **19**: | **20**: | **21**: **Exam III**  
Rd. Ch. 10.5-6 Angular Momentum  
→ Thanksgiving Break! |
| Dec 1: | **2**: Rd. Ch. 11.1-3  
**Lab 11: Torque** | **3**: | **4**: | **5**: Rd. Ch. 11.4-5 Rigid Body Equilibrium, Stress and Strain  
**Lab 11: Torque** |
| 8: | **9**: Rd. Ch. 12.1-3 Density and Buoyancy | **10**: | **11**: | **12**: Rd. Ch. 12.4-6 Fluid Flow  
**Review** |
| 15: | **16**: **Final Exam 1PM** | **17**: | **18**: | **19**: |