PHYS 350 Modern Physics

COURSE INFO

Course prefix, number(s), and title: PHYS 350 Modern Physics
Number of credits: 3
Prereq: PHYS 252, Math 265
Term and year: Spring 2018

Instructor: Orven Swenson
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Office hours: 1:00-2:00 MWF or by arrangement.

BULLETIN DESCRIPTION

Breakdown of classical physics, special relativity, Bohr model, Schrodinger mechanics of simple systems, atomic structure, selected topics from nuclear and solid state physics.

REQUIRED TEXTBOOK

Paul A. Tipler and Ralph A. Llewellyn, *Modern Physics*, 6th Ed., W. H. Freeman and Company, 2012.

REQUIRED CLICKER

A TurningPoint Subscription and/or a Clicker is required. In-class correct responses will count as 25% of your group homework grade and clicker participation will count as 25% of your LON-CAPA homework grade. https://www.ndsu.edu/its/instructional_services/clickers/student_resources/

Course Objectives

Each student will develop a "scientifically literate" level of understanding of relativity and quantum mechanics and their application to 21st century science and engineering. Students will enhance their ability to think critically and solve real world problems. Students will be able to apply and understand the equations of special relativity and quantum mechanics for a variety of conditions. Students will recognize that physics is an exciting and dynamic field of study.

Classroom Expectations

Students are expected to attend all class sessions except for valid excuses such as medical situations. Active participation in lectures and group problem solving is essential. Students are expected to read the lesson prior to coming to class and to be prepared to discuss it in class. Material may be presented that is not in the text or it may be presented in a different way. Students are responsible for all material presented in class including that missed during excused absences. Attendance at exams is mandatory unless excused for a valid University approved reason.

BlackBoard

Course assignments, information, and messages will be posted to BlackBoard http://bb.ndsu.nodak.edu/

Homework

Problem solving is the primary learning method for this course. Homework will be emphasized and assigned in groups as well as individual homework assigned using LON-CAPA. Group study and homework solving is encouraged.

Group Homework

You will be assigned to a homework group, optimally 4 members, for the semester. One legible problem solution set per group will be turned in on 8 1/2" x 11" paper ONE SIDE ONLY. SHOW all work. The students in the group will present and/or discuss their solutions in class. Each group needs to decide on their group rules such as when you will meet, what the consequences are for members that don't show up/contribute, rotation for preparing the solutions to hand in, rotation for presenting solutions in class, etc.

LON-CAPA Homework

Web based homework problems will be assigned and must be completed by the due date assigned with each problem. Each student will receive an individualized version of the problem. You will receive a LON-CAPA homework score based on the percentage of the assigned course problems that you answer correctly by their due date.

http://triton.physics.ndsu.nodak.edu/adm/roles

Composition of Final Course Grade

The final grade will be determined as follows:

Group Homework 15% Correct clicker answers 5%	20%
LON-CAPA Homework 15% Clicker participation 5%	20%
Exam 1	20%
Exam 2	20%
Exam 3	20%
Final Exam	20%
Total-best five of six	100%

The final grade will be determined by your performance on: group homework, computer graded homework, in class clicker responses, 3 midterm exams and a comprehensive final exam. The best five of these six assessments will be used in calculating your final score; however, an unexcused missed exam will result in a score of zero, that is, **an exam absence without justification shall NOT be dropped**. **No make-up exams will be given** and if an exam is missed for a valid excuse, it will be the score that is dropped. The exams will include conceptual questions requiring short answers and quantitative problems similar to the assigned homework problems. The final exam will consist of problems requiring the application of principles learned throughout the course.

The final is **mandatory** and will be taken on **Monday, May 7 from 10:30 a.m. to 12:30 p.m.** A total average of 89.5% of the possible points or more ensures an A, 75.5 to 89.4% ensures a B, 59.5 to 75.4% ensures a C, 49.5 to 59.4 ensures a D and below 49.5 will be an F. Depending on the class average, curving may be applied to grades; however, the **lowest** passing final grade (C or higher) in the course will always be 50% or higher.

ATTENDANCE STATEMENT

According to NDSU Policy 333 (www.ndsu.edu/fileadmin/policy/333.pdf), attendance in classes is expected.

Veterans and student service members with special circumstances or who are activated are encouraged to notify the instructor as soon as possible and are encouraged to provide Activation Orders.

AMERICANS WITH DISABILITIES ACT FOR STUDENTS WITH SPECIAL NEEDS

Any students with disabilities or other special needs, who need special accommodations in this course, are invited to share these concerns or requests with the instructor and contact the Disability Services Office (www.ndsu.edu/disabilityservices) as soon as possible.

ACADEMIC HONESTY STATEMENT

The academic community is operated on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty .

Course description

This course is about special relativity and quantum mechanics, that is, the physics developments of the 20th century necessary to comprehend the applications and breakthroughs of the 21st century. We will explore the theory of special relativity, the Bohr model of the atom, Schrodinger mechanics of simple systems, and the quantum mechanics of atomic structure.

This is a required course for the undergraduate Physics major. The course provides a foundation for most upper level physics courses and many graduate engineering and materials science courses. Many upper level texts and instructors will assume a familiarity with special relativity, quantum mechanics, and the structure of atoms and molecules.

Tentative Course Outline

Week		Chapter
1	Relativity, Michelson-Morley Experiment	1
2	Relativity, Time Dilation, Length Contraction	1
3	Relativistic momentum and energy	2
4	General relativity	2
5	Quantization of Charge, Blackbody Radiation	3
5	Exam 1	
6	Photoelectric Effect, Compton Effect	3
7	Atomic Spectra, Bohr model	4
8	X-ray spectra, Franck-Hertz Experiment	4
9	De Broglie Hypothesis, Wave Packets	5
10	Uncertainty Principle, Wave-Particle Duality	5
10	Exam 2	
11	Schrodinger Equation	6
12	Harmonic Oscillator	6
13	Hydrogen Atom Wave Functions	7
14	Excited States and Spectra of Atoms	7
15	Classical/Quantum Statistics	8
15	Exam 3	
16	Bose-Einstein Condensation, Fermion Gas	8
17	Final May 7 10:30 a.m. to 12:30 p.m.	