Physics 120 FUNDAMENTALS OF PHYSICS Spring 2021

This syllabus was last updated on **January 08, 2021**

Instructor: Sylvio May, South Engineering 216A
email: Sylvio.May@ndsu.edu, web: https://www.ndsu.edu/faculty/symay/

Bulletin Description: Application of physics concepts and principles to the real world. Topics selected from mechanics, heat, optics, electricity, and magnetism. Astronomy and modern physics will also be surveyed.

This course has been approved for the General Sciences category in general education because "Students will learn to comprehend concepts and methods of inquiry in science and technology, and their application for society." and "Students will learn to integrate knowledge and ideas in a coherent and meaningful manner."

Objectives: The goal of this course is to provide students with the knowledge and understanding of basic physical principles that will aid them in their everyday lives, careers, and personal decision making as scientifically literate and technologically informed members of society. Students attain an appreciation for the impact of science on society and history and for the interplay between experiment and reasoning to describe, explain, and predict physical phenomena.

Course objectives are met by readings, lectures, in-class discussions, and homework through the development of conceptual understanding and the ability to quantify concepts in specific physical situations. Students demonstrate their level of comprehension in LON-CAPA homework and exams.

Prerequisites: High-school algebra

Meetings: Tuesday and Thursday 3:30pm-4:45pm in *NDSU A.G.Hill building, Rm 122*. You can attend *in person* or *remotely* (synchronous course participation) via Zoom. The Zoom address will be emailed at the beginning of the course.

Office hours: Mon 10am-11am and Fri 11am-12pm through Zoom; additional zoom or face-to-face option may be specified during the course

Textbook: Art Hobson, *Physics: Concepts & Connections*, 5th edition, Pearson, 2010

Topic Outline and Timing: The chapters in the textbook to be discussed in this course are listed below, along with the tentative exam dates.

Chapter 1: Scientific method, early astronomy, and the solar system
Chapter 2: Matter, units, unit conversion
Exam 1 (Ch. 1-2): Tuesday, February 02 (3:30-4:00pm)
Chapter 3: Motion: speed, velocity, acceleration
Chapter 4: Force, Newton's laws of motion
Chapter 5: Gravity, stellar evolution
Exam 2 (Ch. 3-5): Tuesday, February 23 (3:30-4:00pm)
Chapter 6: Work, energy, conservation of energy, power
Chapter 7: Second law of thermodynamics, entropy, energy efficiency
Exam 3 (Ch. 6-7): Thursday, March 11 (3:30-4:00pm)
Chapter 8: Electricity, atomic structure, magnetism
Chapter 9: Waves, electromagnetic radiation, atmospheric issues
Exam 4 (Ch. 8-9): Thursday, April 08 (3:30-4:00pm)
Chapter 10: Special theory of relativity, mass-energy equivalence
Chapter 11: General theory of relativity, cosmology
Exam 5 (Ch. 10-11): Tuesday, April 27 (3:30-4:00pm)
Chapter 12: Introduction to quantum mechanics, quantization of light & matter
Chapter 13: Quantum uncertainty & nonlocality, quantum model of the atom
Chapters 14-17: Selected topics in nuclear & particle physics (time permitting)
Final Exam (comprehensive): Tuesday, May 11 (10:30am-12:30pm)

Format: This is a Hyflex class. The instructor plans to be physically present in the classroom. Course material will be discussed in class, with the option for students to attend in person or remotely. Class meetings will be recorded and made available through Lon-Capa. The in-class activities involve some traditional lecture plus discussions with a focus on critical thinking and problem solving. Paper flash cards may be distributed and used. Students are encouraged to engage in in-class discussions and ask questions at any time during or after class. Class announcements will be made though email.

How to succeed: Attending class (in person or remotely), reviewing lecture notes, reading the textbook, taking part in class activities and discussions, and completing homework problems are keys to success. Each student is encouraged to contact the instructor with any concerns, questions, and suggestions. If desired, review sessions will be held prior to exams.

LON-CAPA: This course does not use Blackboard. Instead, the LON-CAPA course management system will be used to post homework, lecture notes, grades, and other information. LON-CAPA can be accessed by selecting the appropriate server at **http://www.ndsu.edu/physics/lon_capa/**. Your username is everything to the left of the @ in your NDSU email address (use all lowercase letters). For example, if your email address is Sheldon.Cooper.2@ndsu.edu, then your LON-CAPA username is sheldon.cooper.2. Initially you create your own password by following the link "Forgot Password". For help using LON-CAPA contact your instructor or laboratory technician Paul Omernik (SE110, Paul.Omernik@ndsu.edu, 231-7047). Technology concerns other than Lon-Capa can be addressed to IT Help Desk; Email: ndsu.helpdesk@ndsu.edu, Call: 701-231-8685 (option 1)

Homework: 6 homework problem sets, each containing a number of problems as specified in the table below, will be assigned via the LON-CAPA online system. The total number of available problems is 150.

set #	coverage	assigned	due	recommended # of problems to be solved	# of problems available
1	chapters 1-2	Jan 12	Feb 03	20	25
2	chapters 3-5	Jan 12	Feb 24	15	25
3	chapters 6-7	Jan 12	March 12	20	23
4	chapters 8-9	Jan 12	April 09	15	27
5	chapters 10-11	Jan 12	April 28	15	27
6	chapters 12-13	Jan 12	May 10	15	23

Each correctly solved problem earns 1 point. For problems with multiple parts each part earns 1 point. To get full credit, 100 points must be earned. The solved problems can come from any of the chapters and can be solved as long as the problems are available (until the due date). You may work together on homework sets, but simply copying another's answers is neither recommended nor beneficial. No late homework will be accepted.

Exams: 6 exams (including the final) will be administered. For each exam (including the final), 10 questions need to be solved within 30 minutes. Each exam covers the material as specified on the preceding page. Each correctly solved problem earns 2 points. The lowest-scoring exam will be dropped. The other 5 exams will count towards the final score. The maximal number of available points from the exams is thus 100.

All exams are "open notes". Notes include the textbook and all course material in Lon-Capa. Using computers to access notes is permitted during an exam. Communicating with others and making use of external help (especially tutoring services) is not permitted. Exams can be taken from any location, including the classroom. Students bring a device (computer, laptop, even a cell phone may work) that allows them to access and answer the exam questions through Lon-Capa during exam time. Scantrons will not be used. No makeup exams will be scheduled.

Grading: Grading will be based on LON-CAPA homework score (max. 100 points) and 5 exams (max. 100 points). From the actual number of points and the maximal number ($100 + 100 = 200$ points) the percentage will be calculated and used to grade according to: 88.0% -100% A, 77.0% - 88.0% B, 66.0% - 77.0% C, 55.0% - 66.0% D, 0% - 55.0% F. Expressed in points, this corresponds to: 176 - 200 A, 154 - 175 B, 132 - 153 C, 110 - 131 D, 0 - 109 F. The instructor reserves the right to lower the grade cutoffs in response to class performance, but they will not be raised.

Student illness: Do not come to class if you are sick or if you have been exposed to individuals who tested positive for COVID-19 and/or you have been notified to self-quarantine due to exposure. Please protect your health and the health of others by staying home and participate in class remotely. For information on COVID-19, symptoms, testing, and steps to stay healthy see https://www.ndsu.edu/studenthealthservice/covid_19/. If you are unable to attend class at the regularly scheduled time due to illness, contact the instructor for alternate arrangements, especially for exams and extensions of homework due dates.

Face coverings and physical distancing: NDSU requires students and faculty to wear face coverings in classrooms. Wearing face coverings helps reduce the risk to others in case you are infected but do not have symptoms. You must properly wear a face covering (covering both mouth and nose) for the entirety of the class. If you fail to properly wear a face covering, you will not be admitted to the classroom. However, you may choose to participate in the class remotely. Referral to Dean of Students Office or administrative removal from class will be used if necessary.

Students should observe social distancing guidelines whenever possible. Students should avoid congregating around instructional space entrances before or after class. Students should exit the instructional space immediately after the end of class to ensure social distancing and allow for the persons attending the next scheduled class to enter the classroom.

food and drinks are not allowed in the class unless a student has a documented accommodation through Disability Services.

In accordance with NDSU Policy 601, failure to comply with instructions, including this syllabus, may be handled according to the Code of Student Conduct resolution process and may result in disciplinary sanctions.

Resources for Students on campus and remotely:

- Counseling Services: 701-231-7671; https://www.ndsu.edu/counseling/
- Disability Services: 701-231-8463; https://www.ndsu.edu/disabilityservices/
- Student Health Service: 701-231-7331; https://www.ndsu.edu/studenthealthservice/
- Dean of Students Office: 701-231-7701; https://www.ndsu.edu/deanofstudents/

Additional Information:

- 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.
- 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.