

Physics 120

3 credits

FALL 2021

## Fundamentals of Physics

**Instructor:** Alexander Wagner  
South Engineering 210  
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**Bulletin description:** Application of Physics concepts and principles to the real world.  
Topics selected from mechanics, heat, optics, electricity, and magnetism.

**General Education Approved Course for the Science & Technology (S) category:**

This course has been approved by the NDSU Faculty Senate to meet the requirements for the Natural and Physical Science Learning Outcome. Students will (i) analyze components and dynamics of natural and physical worlds, (ii) develop models to explain phenomena within the natural and physical worlds, and (iii) apply methods of scientific inquiry to enhance their understanding of the natural and physical world.

**Goals:** This course provides students with a basic overview of physical theories developed to predict the behavior of our environment. It will guide them in their everyday lives and careers as informed members of our society.

**Meetings:** 15:30 - 16:45 Tuesday, Thursday in A. Glenn Hill Center, room 122

**Attendance:** According to NDSU policy 333 attendance in classes is expected. Absences for NDSU sponsored extracurricular activities will be excused when appropriate documentation is provided. Online homework should be completed by the stated deadline. For medical reasons or family emergencies homework extensions will be granted on request. It is expected that extensions are requested before the expiration of the deadline whenever possible.

**Office hours:** 11:00 - 12:00 Wednesday, or by arrangement  
Office hours are held via Skype at <https://join.skype.com/rDcgGkX5wX7b>.

**Text:** Physics, Concepts & Connections, Art Hobson (recommended)  
Optional: Shawn Otto, *The War on Science*  
Optional: David C. Lindberg, *The Beginnings of Western Science*

**Schedule:** What is science?, Astronomy  
Atoms, how things move, why things move,  
Newton's universe, conservation of energy,  
Second law of thermodynamics, electromagnetism,  
Waves & light & climate change, special theory of relativity,

Einstein's universe and the new cosmology, the quantum idea,  
The quantum universe, the nucleus and radioactivity,  
Fusion and fission, the energy challenge, quantum fields  
We will cover about one chapter each 1.5 weeks.

**Blackboard:** This classes uses LON-CAPA instead of blackboard as its content management system. LON-CAPA can be accessed by selecting the appropriate server at [http://www.ndsu.edu/physics/lon\\_capa/](http://www.ndsu.edu/physics/lon_capa/). Your username is everything before the @in your ndsu email address. Follow the "forgot password" link to set your password. Please contact Paul.Omernik@ndsu.edu with any technical issues.

**Grading:**

Problems in LON-CAPA:	100pts
Test 1, Sept. 9:	50pts*
Test 2, Sept. 23:	50pts*
Test 3, Oct. 7:	50pts*
Test 4, Oct 21	50pts
Test 5, Nov. 4:	50pts*
Test 6, Nov. 18:	50pts*
Test 7, Dec. 2:	50pts*
Final, Dec 14, 10:30am-12:30pm:	50pts
Participation, extra essay homework:	bonus points (up to 50 points)

Only the 6 best test scores count. (Grading scale: A: 400-360, B: 359-320, C: 319-270, D:269-200, F: 200-0)

### General Education Outcomes and Student Learning Assessment:

Both exam questions and homework problems will assess the degree of having reached our General Education Approved learning outcomes. Each exam and homework question is designed to assess one of the following abilities:

1. Extract and analyze relationships that reflect underlying physical laws.
2. Analyze the components that determine the behavior of a physical system.
3. Predict the behavior of a physical system in a quantitative manner.
4. Learn how to build models of physical systems and use them to make predictions. Applications include developing astronomical models for problems not available on google, as well as unconventional mechanical and quantum mechanical problems.
5. Apply the method of scientific inquiry as a tool to understand our physical world. This involves an iterative approach of observing, making hypotheses, and testing the predictions entailed by the hypothesis.
6. Apply general physical laws to new, previously not encountered situations.

Abilities 1-3 relate most closely to Learning Outcome 1: *Students will analyze components and dynamics of natural and physical worlds.*

Ability 4 relates most closely to Learning Outcome 2: *Students will develop models to explain phenomena within the natural and physical worlds.* Abilities 5 and 6 relate most closely to Learning Outcome 3: *Students will apply methods of scientific inquiry to enhance their understanding of the natural and physical world.*

**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 if 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. 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.

**\* No makeup exams will be scheduled. Only the 6 best grades of the tests count towards the final grade.**

**Resources for Students on campus and remotely (telehealth):**

- 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 who need accommodation in this course are encouraged to speak with the instructor as soon as possible to make appropriate arrangements.*
- *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*
- *All work done in this course must be completed in a manner consistent with NDSU University Senate Policy, section 355: Code of Academic Responsibility and Conduct (<http://www.ndsu.nodak.edu/policy/355.htm>)*