

## Course Syllabus SCPY 169: Elementary Physics

### Course Information

**Course Title:** Elementary Physics

**Course Number:** SCPY169

**Credits:** 3 credits

**Semester:** First

**Academic Year:** 2022

**Lecture Hours:** Wednesday 09:00--12:00 (3 hours/week)

**Lecture Room:** SC1-156 and Online (Google classroom, the Zoom link) only if needed

**Lecturer:** Dr. Areeya Chantasri; areeya.chn@mahidol.ac.th; 02-201-5777

**Office Hours:** Time is flexible. Please send emails to make appointments (Online)

### Reference Texts:

1. D. Halladay, R. Resnick, J. Walk, Fundamentals of Physics, 5<sup>th</sup> Ed. John Wiley and Sons, 1997.
2. P. P Urone, Physics with Health Science Applications, Wiley, 1985.
3. R. A. Serway, J. W. Jewett, Physics for Scientists and Engineers, 8<sup>th</sup> Ed. Brooks Cole, 2009.
4. H. D. Young, R. Freeman, University Physics with Modern Physics, 9<sup>th</sup> Ed. Pearson, 2004.

**Lecture Notes:** Lecture notes will be distributed to students on the course's Dropbox or by emails.

### Course Objectives

After completing the course, students are expected to

1. use basic mechanics to understand functions body parts and the effects of various kinds of movements on these body parts;
2. understand basic properties of matter and their applications for medical purposes;
3. understand characteristics and properties of waves and wave-like motions;
4. understand properties of sound wave and its applications for medical purposes;
5. understand properties of light wave and its applications for medical purposes;
6. understand properties of fluids and body functions involving fluids;
7. understand the physical meaning of heat and temperature and various heat transfer processes;
8. understand the meaning of quantities related to electricity and magnetism, simple phenomena in electromagnetism and their applications for medical purposes;
9. understand atomic structure, generation of X-rays and applications for medical purposes;
10. understand nuclear structure, radioactive phenomena and understand the risks, methods of prevention and applications of radioactive materials.

### Course Evaluation and Grades

Grading and evaluation follow the regulations as announced by the Faculty of Science, Mahidol University. Students' grades are assigned in 8 letter grades as follow: A, B+, B, C+, C, D+, D and F. The total course grade distributions are

Midterm Examination	30 %
Final Examination	30 %
In-class Tests	20 %
Homework	10 %
Attendance and Class Participation	10%

Letter Grades Assignment (subject to adjustment at the instructor's discretion)

Scores	Grades
80--100	A
75--79	B+
70--74	B
65--69	C+
60--64	C
55--59	D+
50--54	D
0--49	F

## Lecture Schedule (tentative)

Lecture	Date	Topics
1	Wed. 10 Aug. 2022	Introduction and Mechanics 1 <ul style="list-style-type: none"><li>- General discussion about the class syllabus</li><li>- Introduction: Why do we need Physics?</li><li>- Different concepts in Physics (discussion)</li><li>- Units, scalars, vectors and dimensions</li><li>- Position, distance, velocity, acceleration</li><li>- Motion and projectile</li></ul>
2	Wed. 17 Aug. 2022	Introduction and Mechanics 2 <ul style="list-style-type: none"><li>- Mass and Force</li><li>- Center of Mass</li><li>- Common Types of Forces (discussion)</li><li>- Newton's laws of motion</li><li>- Rotational motion about a fixed axis</li></ul>
3	Wed. 24 Aug. 2022	Momentum, Work and Energy <ul style="list-style-type: none"><li>- Momentum and angular momentum</li><li>- Kinetic energy</li><li>- Potential energy</li><li>- Conservation of energy in different systems</li></ul>
4	Wed. 31 Aug. 2022	Properties of Materials <ul style="list-style-type: none"><li>- Mechanical properties</li><li>- Compressive strength</li><li>- Elasticity</li><li>- Flexibility</li><li>- Friction coefficient</li><li>- Viscosity</li></ul>
5	Wed. 7 Sep. 2022	Waves <ul style="list-style-type: none"><li>- Types of waves, Transverse waves</li><li>- Oscillation motion, Sin/Cos functions</li><li>- Speed and wavelength</li><li>- Standing waves and resonance</li><li>- Reflection, refraction, diffraction</li><li>- Interference</li></ul>
6	Wed. 14 Sep. 2022	Sound and Hearing <ul style="list-style-type: none"><li>- Sound waves and frequency</li><li>- Intensity sound levels</li><li>- Dropper effect and shock wave</li><li>- Ear and hearing mechanism</li><li>- Sound pollution</li></ul>
7	Wed. 21 Sep. 2022	Light and Seeing <ul style="list-style-type: none"><li>- Nature of lights</li><li>- Brightness</li><li>- Reflection, refraction, diffraction</li><li>- Total Internal Reflection</li><li>- Mirrors and lens</li><li>- Interference from thin films</li><li>- X-ray diffraction</li></ul>

8 Wed. 28 Sep. 2022 Review for Midterm Examination  
**Topics from Week 1—7**

**3-7 October 2022 Midterm Examination**

- 9 Wed. 12 Oct. 2022 Fluid Mechanics 1
- Types of Fluid
  - Fluid, density, and pressure
  - Fluid at rest
  - Floating, buoyancy, and density
- 10 Wed. 19 Oct. 2022 Fluid Mechanics 2
- Fluid in motion
  - The equation of continuity
  - Bernoulli's Equation
  - Flow of Viscous Fluid
  - Applications in medicine and industry
- 11 Wed. 26 Oct. 2022 Heat
- Temperature (Celsius and Fahrenheit scales)
  - Thermal expansion
  - Absorption of heat (heat capacity, specific heat)
  - Heat transfer mechanism (conduction and convection)
  - Ideal gases and properties
- 12 Wed. 2 Nov. 2022 Electricity and Magnetism 1
- Charges and Electric forces
  - Electric field due to a charge particle
  - A point charge in electric field
  - Electric potential
  - Currents and magnetic force
  - Magnetic field due to currents
  - Charge movement in magnetic fields
  - Magnetization of Matter / Magnetic Induction
- 13 Wed. 9 Nov. 2022 Electricity and Magnetism 2
- Electromagnetic wave
  - Spectrum of EM waves in Nature
  - Energy of EM waves
  - Electrical circuits (resistance, capacitance, inductance)
  - AC/DC currents
  - Ammeter and voltmeter
  - Storage of Electrical Energy
  - Applications in Medicine and Industry
- 14 Wed. 16 Nov. 2022 Atomic Physics and Nuclear Physics 1
- Properties of atoms
  - Ionic, Covalent and Metallic Bonds
  - Insulators and Semiconductors
  - Lasers and how lasers work
- 15 Wed. 23 Nov. 2022 Atomic Physics and Nuclear Physics 2

- Discovering the nucleus
- Nuclear Magnetic Resonance
- Interaction of Radiation with Matter
- Radioactivity, X-rays
- Radioactive material and safety

16      Wed. 30 Nov. 2022    Review for Examination

**Topics from Week 9—15**

**6-16 December 2022 Final Examination**