

NORMANDEALE COMMUNITY COLLEGE

PHYSICS 1103 "Natural Science Physics"

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INSTRUCTOR CONTACT INFORMATION & OUTLINE - Fall, 2004

NOTE: This information sheet is *NOT* the syllabus for this course. The full, interactive syllabus for this course is located at this web site:

faculty.normandale.edu/~physics/

Textbook: Paul G. Hewitt, *Conceptual Physics*, 9th Edition, with *Practicing Physics* workbook.

Note: The learning outcomes and consequently the key concepts, textbook readings, and suggested problems are all subject to change. Preface each learning outcome with the phrase, "Upon successful completion of this course, you should be able to..."

The Art and Science of Measurement

Key Concepts: Mass, length, time, area, volume, density.

Learning Outcomes:

1. Calculate an area.
2. Calculate a volume.
3. Calculate density given mass and volume, or vice versa.
4. Explain the importance of units.
5. Convert from one unit to another within the SI system.
6. Convert between SI and US units.
7. Be able to use simple dimensional analysis to check the consistency of your work.

Textbook: Appendix A, pp. 737-739; Chap. 12, pp. 229-231, 237-241

Suggested Exercises & Problems: Ex. 12:3,7,8,21; Prob. 12:1,2,7

Practicing Physics: p. 51

How things move: Linear Motion

Key Concepts: Distance, velocity, acceleration, freefall

Learning Outcomes:

1. Define the relationship between position, velocity, and acceleration of an object in motion as averages over finite time
2. Solve one-dimensional motion problems when there is constant acceleration or constant velocity.
3. Define free fall and be able to solve simple free fall problems.
4. Use a computer to construct a graph of experimental free fall data.

Textbook: Chap. 3, pp. 39-48

Suggested Exercises & Problems: Ex. 3:1,5,22,25; Prob. 1,2,5,10

Practicing Physics: pp. 5-6

Why things move: Newton's Laws of Motion

Key Concepts: Inertia, Force, mass, weight

Learning Outcomes:

1. List the four fundamental forces of nature.
2. State Newton's First, Second and Third laws
3. State and use Newton's Second Law to calculate forces or accelerations.

4. Explain weight, mass, and inertia.

5. Explain that the normal force is the the reaction force is to a body's weight.

Textbook: Chap. 2, pp.20-28; Chap. 4, pp. 55-56, 58-62, Chap. 5, pp. 69-76

Suggested Exercises & Problems: Chap. 2: Ex. 1,3,6,7,12,13,18,22. Chap. 4: Ex. 3,5,7,15,18,26,31; Prob. 2,4,9. Chap. 5: Ex. 6,7,11,15,25; Prob. 2.

Practicing Physics: pp. 7-8, 10. 11-12

Some things never change: Work, Energy, and the Conservation of Energy

Key Concepts: Work, Energy, Work-Energy Theorem, Conservation of Energy, potential energy, power.

Learning Outcomes:

1. State the definitions of work and energy.
2. State the units of work and energy.
3. Define and explain kinetic energy.
4. Define and explain the work-energy theorem.
5. Define and explain power and the units associated with power.
6. Define and explain potential energy.
7. Calculate the work done by forces, including gravity.
8. Calculate a change in kinetic energy and the resulting change in velocity.

Textbook: Chap. 7, pp. 104-121

Suggested Exercises & Problems: Chap. 7: Ex. 1,6,11,12,14,21,25,29,30,40; Prob. 1,2,10.

Practicing Physics: pp. 25-28

Much ado about gravity: Gravitational Force

Key Concepts: Gravity, gravitational force, gravitational constant, inverse square

Learning Outcomes:

1. State Kepler's three laws of planetary motion.
2. State Newton's Universal Law of Gravitation.
3. Calculate the acceleration due to gravity given a planet's mass and radius.
4. Calculate the gravitation force between two objects.

Textbook: Chap. 9, pp. 154-160

Suggested Exercises & Problems: Chap. 9: Ex. 1,3,9,10,15,37,50; Prob. 5,6.

Practicing Physics: pp. 37

Water, water everywhere: Buoyancy and Pressure in Fluids

Key Concepts: Pressure, buoyant force

Learning Outcomes:

1. Define buoyant force.
2. Define pressure.
3. Calculate the pressure at a depth in a fluid.
4. Convert between pressure units in the SI and US systems of measurement.

Textbook: Chap. 13, pp. 246-254

Suggested Exercises & Problems: Chap. 13: Ex. 1,3,7,8,9,10,18,23,30; Prob. 1,4

Practicing Physics: pp. 53-56

Transferring heat energy from one place to another: Convection, Conduction, and Radiation

Key Concepts: Heat, temperature, thermometer, convection, conduction, radiation, greenhouse effect, solar energy, solar constant.

Learning Outcomes:

1. State the definition of temperature.
2. Explain the three mechanism of heat transfer: Radiation, convection, and conduction.
3. Solve problems related to radiation, and conduction.
4. Describe the nature and causes of the greenhouse effect and suggest remedies to the problem.

Textbook: Chap. 15, pp. 290-294; Chap. 16, pp. 305-321

Suggested Exercises & Problems: Chap. 15: Ex. 1,2,9,10,11. Chap. 16: Ex. 2,5,6,7,13,33,34,41,47,48,49; Prob. 6.

Practicing Physics: pp. 59, 61-62

Get charged: Electric Forces and Energy

Key Concepts: Electric charge, electric force, electrical energy, proton, electron.

Learning Outcomes:

1. Describe the similarities and differences between the gravitational force and the electromagnetic force.
2. State the properties of electric charge.
3. State the characteristics of conductors, insulators.
4. Calculate the force between two charged objects.
5. Define the volt.
6. Define and use the electronvolt unit.
7. Calculate the change in energy and speed as a charged particle moves through a potential difference.
8. State the definition of potential difference (voltage) and its relation to the change in energy when an electric force acts on a charge.

Textbook: Chap. 22, pp. 412-423, 428-431

Suggested Exercises & Problems: Chap. 22: Ex. 1,2,3,6,7,23,26,29; Probs. 5,7.

Practicing Physics: pp. 75-76

Harnessing nature: Simple Electric Circuits

Key Concepts: Current, voltage, resistance. Ohm's Law, series circuit, electrical power.

Learning Outcomes:

1. Define current.
2. Define resistance and resistivity.
3. Use Ohm's Law to calculate current, voltage, or resistance.
4. Calculate the power loss in a resistor.
5. State the convention for direction of current
6. Recognize simple circuit elements in a schematic diagram.
7. Recognize resistors in parallel or series.
8. Calculate or measure the voltage across resistors.
9. Given a circuit and voltage, calculate or measure the current.

Textbook: Chap. 23, pp.438-452

Suggested Exercises & Problems: Chap. 23: Ex. 2,4,6,9,10,11,14,16,21,22; Probs. 1,2,3,5,7,10.

Practicing Physics: pp. 77-81

Harnessing nature: Magnetic Forces

Key Concepts: Magnetic force, magnet, magnetic pole, electric motor, electric generator

Learning Outcomes:

1. Describe the magnetic force on a charge particle, a current carrying wire, and a current loop.
2. Explain the principles involved in building an electric motor.
3. Describe the orientation of magnetic field of the earth.
4. State the sources of magnetic fields.
5. Describe the magnetic field of a solenoid.
6. Describe how an MRI works.
7. Describe how an electric generator works.

Textbook: Chap. 24, pp. 458-474

Suggested Exercises & Problems: Chap. 24: Ex. 3,9,10,15,20,33.

Practicing Physics: pp.85-86

Enlighten me: Light and the Laws of Reflection and Refraction (Optional)**

Key Concepts: Reflection, mirror, refraction, lens, focal length, color, spectrum, transparent, opaque

Learning Outcomes:

1. State the properties of electromagnetic waves.
2. State the regions into which the electromagnetic spectrum is commonly divided and recognize the order of these regions and the range for visible light.
3. Describe how a convex lens forms an image and calculate the position of the object or image.
4. Describe how a concave or convex mirror forms an image and calculate the position of the object or image.
5. Describe how a telescope or microscope forms an image.
6. Describe how the human eye works.

Textbook: Chap. 26,27,28: pp.496-558

Suggested Exercises & Problems: Chap. 26: Ex. 3,4,5,6,10,11,32; Probs. 3, 5. Chap. 27: Ex. 1,5,27,28. Chap. 28: Ex. 4,5,12,17,18,22,25,42,50.

Practicing Physics: pp.89-104

An inexhaustible energy source: Alpha, Beta, and Gamma Decay

Key Concepts: Nucleus, half-life, alpha, beta and gamma decay, exponential growth & decay.

Learning Outcomes:

1. Define radioactivity and define alpha, beta, and gamma decay.
2. Describe how ionizing radiation can be detected.
3. State what maintains nuclear stability and why decay occurs.
4. Define half-life and activity and use the concepts to calculate activity.
5. Describe the biological effects of ionizing radiation and how to protect humans from the effects.

Textbook: Chap. 33, pp.636-658

Suggested Exercises & Problems: Chap 33: Ex. 1,2,7,18,23,24,30,33,34,37,38,39; Prob. 1,2,5.

Practicing Physics: pp. 110, 112

FINAL EXAM