COURSE SYLLABUS

Syllabus for: PHYS 2020 Non-Calculus Based Physics II

Former Quarter Course(s):

Catalog Description: This course is an applied physics study of temperature, heat transfer, heat gas laws, and thermodynamic applications, basic laws and principles of electrostatics, direct current, magnetism, alternating current, sound, light, and nuclear physics.

Credit Hours: 4 Contact Hours 5 Lab Hours 2

Prerequisite(s): Documented eligibility for collegiate level English; PHYS 2010 (Non-Calculus BasedPhysics I)

Required Textbook:

College Physics Young 9th / 2012 Addison-Wesley
(with Mastering Physics Access Card)

Title Author(s) Edition/Date Publisher

Required Supplies/Material(s)

Recommended Supplementary Material(s):

Student Group for Whom Course is Required/Intended: Engineering Technology students, apprenticeship students, pre-dental, pre-medical, pre-optometry, pre-pharmacy, pre-physical therapy, pre-veterinary and aerospace university parallel students.
PHYS 2020 NON-CALCULUS BASED PHYSICS II

Goals

GOALS: These should be broadly stated, measurable learner outcomes expected with the completion of the course: use additional sheet(s) if necessary.

The goals of this course are to provide an understanding of the basic laws and principles of temperature, heat, heat transfer, gas laws and electrostatics, direct current, magnetism, sound, light, and nuclear physics.

OBJECTIVES: These should be specifically stated, measurable learner outcomes to be met throughout the course; use additional sheet(s) if necessary.

Subject Areas

1. Temperature and expansion of materials
2. Quantity of heat
3. Heat transfer
4. Thermal properties of matter
5. The first law of thermodynamics
6. The second law of thermodynamics
7. Wave motion
8. Sound
9. Light
10. Electric fields
11. Electric potential
12. Capacitance
13. Current and resistance
14. DC circuits
15. Magnetism and Magnetic fields
16. Electromagnetic Induction
17. Nuclear physics
PHYS 2020 NON-CALCULUS BASED PHYSICS II

SPECIFIC OBJECTIVES:
1. a. Demonstrate an understanding of the Celsius, Fahrenheit, kelvin, and Rankine temperature scales by converting from specific temperatures on one scale to corresponding temperatures on another scale.
   b. Distinguish between specific temperatures and temperature intervals and convert an interval on one scale to the equivalent interval on another scale.
   c. Write formulas for linear expansion, area expansion, and volume expansion and be able to apply them to the solution of problems similar to those given in the chapter.

2. a. Define quantity of heat in terms of the calorie, the kilocalorie, the joule, and the British thermal unit (Btu).
   b. Write a formula for the specific heat capacity of a material and apply it to the solution of problems involving the loss or gain of heat.
   c. Write formulas for calculating the latent heats of fusion and vaporization and apply them to the solution of problems in which heat produces a change in the phase of a substance.

3. a. Demonstrate by example and definition an understanding of heat transfer by conduction, convection, and radiation.

4. a. Define and describe transverse and longitudinal wave motion, indicating the measure of a wavelength for each type of wave.
   b. Solve problems involving the mass, length, tension, and wave speed for transverse waves in a string.
   c. Describe and apply the relationship between wave speed, wavelength, and frequency for periodic wave motion.

5. a. Define sound and discuss its nature and the factors which affect its propagation.
   b. Solve problems involving the speed of sound as a function of air temperature.
   c. Discuss the physical meaning of loudness, pitch, quality, resonance, and beats as the terms apply to sound waves.
   d. Discuss the meaning of the intensity level for sound, and demonstrate your understanding of the decibel as a measure of the relative intensities of sound.

6. a. Discuss the nature of light and work problems involving its energy, frequency, velocity, and wavelength.
   b. Illustrate with drawings an understanding of the formation of shadows, labeling the umbra and penumbra.
   c. Demonstrate an understanding of the concepts of luminous flux, luminous intensity, and illumination, and solve problems similar to those in the text.
   d. Demonstrate by example and definition an understanding of the concepts of reflection and refraction.
7. a. Demonstrate the existence of two kinds of electric charge, verify, and explain the first law of electrostatics using appropriate lab materials.
b. Demonstrate or explain with diagrams the processes of charging by contact or by induction.
c. State or write Coulomb’s law for electrostatic forces and apply it to the solution of problems.
d. Define and illustrate an understanding of the concepts of electric field, electric field intensity, and electric field lines.
e. Write and apply a relationship for calculating the electric field intensity as a function of the force on a given charge.

8. a. Distinguish by definition and example between electric potential energy and electric potential difference.
b. Write and apply a relationship between potential difference, electric field intensity, and plate separation for two parallel conductors.
c. Use potential difference to calculate the work required to move a known charge from one point to another in an electric field.

9. a. Define capacitance and apply a relationship between capacitance, applied voltage, and total charge.
b. Discuss how the capacitance is affected by plate area, plate separation, and the insertion of a dielectric.

10 a. Demonstrate by definition and examples an understanding of the concepts of electric current and electromotive force, including their units.
b. Write Ohm’s law and apply it to the solution of electrical problems involving resistance.
c. Discuss the effects of material, length, area, and temperature on electrical resistance.
d. Compute the power losses in an electric circuit when any two of the following quantities are known: (a) the voltage, (b) the current and (c) the resistance.

11. a. Illustrate and write a statement concerning the voltage, current, and effective resistance for a group of resistors connected in series and in parallel.
b. Calculate the effective resistance for a group of resistors connected in series or in parallel.
c. Determine the current and voltage for each resistor in a circuit containing known resistors connected in series and in parallel with a given source of emf.
d. Understand and apply the relationship between the terminal voltage, the emf, the internal resistance, and the load resistance for a given dc circuit.

12. a. Demonstrate by definitions, examples, and drawings an understanding of magnetic forces, magnetic field lines, and the modern day theory of magnetism.
OBJECTIVES (continued) PHYS 2020

b. Apply the right-hand rules to determine the direction of magnetic forces and magnetic fields of current-carrying conductors.
c. Explain the operation of a dc ammeter and calculate the shunt resistance necessary to increase the range of the ammeter.
d. Explain the operation of dc voltmeter and calculate the multiplier resistance necessary to increase its range.

13. a. Disassemble a laboratory dc motor and explain the function of each of its parts, with particular emphasis on the split-ring commutator; if a motor is not available, explain with drawings.
b. Explain with drawings how an electric current is induced by a conductor moving through a magnetic field, discussing factors which affect its magnitude and direction.
c. Describe the function of each of the parts of an ac or dc generator in the laboratory; if the generators are not available, explain with drawings.
d. Discuss and apply the relationship between applied voltage, back emf, and net voltage or power.
e. Explain the operation of a transformer and solve problems involving changes in voltage or power.

14. a. Describe the structure of an atom and its nucleus, stating what is currently known about the mass, charge, and size of the fundamental nuclear particles.
b. Define the mass number \( A \) and the atomic number \( Z \), write, and apply a relationship between them.
c. Demonstrate an understanding of the equivalence of mass and energy by interchanging units in kilograms, atomic mass units, joules, and electron volts.
d. Define and calculate the mass defect and the binding energy for a given atomic nucleus.
e. Write a brief description of alpha particles, beta particles, and gamma rays, listing their properties.
f. Demonstrate an understanding of radioactive decay and nuclear reactions by writing nuclear equations for these events.
g. Calculate the activity and the quantity of a radioactive material remaining after periods if the half-life and the initial quantity are known.
h. Draw a rough diagram of a nuclear reactor, describing the various components and their function in the production of nuclear power.
**PHYS 2020 NON-CALCULUS BASED PHYSICS II**

**SUGGESTED EVALUATION PLAN**

<table>
<thead>
<tr>
<th>TASK</th>
<th>WEIGHT</th>
<th>OBJECTIVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labs</td>
<td>25%</td>
<td></td>
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<tr>
<td>Quizzes</td>
<td>25%</td>
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<tr>
<td>Midterm Exam</td>
<td>25%</td>
<td></td>
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<tr>
<td>Final Exam</td>
<td>25%</td>
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</tbody>
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**FINAL GRADING PLAN**

*Based upon Percentages*

- A= 90-100
- B= 80-89
- C= 70-79
- D= 60-69
- F= BELOW 60

Additional Comments:
## INSTRUCTIONAL SCHEDULE

for

**PHYS 2020 NON-CALCULUS BASED PHYSICS II**

<table>
<thead>
<tr>
<th>Objective Week Numbers</th>
<th>Content to be Covered</th>
<th>Student Assignments/Supplementary Material(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. 1, 2, 3</td>
<td>Chapter 16 Temperature and Expansion Lab as assigned by Instructor</td>
<td>Selected problems from textbook</td>
</tr>
<tr>
<td>II. 4, 5, 6</td>
<td>Chapter 17 Quantity of Heat Lab as assigned by Instructor Chapter 18 Transfer of Heat Lab as assigned by Instructor</td>
<td>Selected problems from textbook</td>
</tr>
<tr>
<td>III. 7</td>
<td>Chapter 21 Wave Motion Lab as assigned by Instructor</td>
<td>Selected problems from textbook</td>
</tr>
<tr>
<td>IV. 8</td>
<td>Chapter 22 Sound Lab as assigned by Instructor</td>
<td>Selected problems in textbook</td>
</tr>
<tr>
<td>V. 9</td>
<td>Chapter 23 Light Lab as assigned by Instructor</td>
<td>Selected problems in textbook</td>
</tr>
<tr>
<td>VI.</td>
<td>Review; Mid-Term Exam Lab as assigned by Instructor</td>
<td>Selected problems in textbook</td>
</tr>
<tr>
<td>VII. 10</td>
<td>Chapter 24 Electric Fields Lab as assigned by Instructor</td>
<td>Selected problems in textbooks</td>
</tr>
<tr>
<td>VIII. 11</td>
<td>Chapter 25 Electric Potential Lab as assigned by Instructor</td>
<td>Selected problems from textbook</td>
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for

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<tbody>
<tr>
<td>IX.</td>
<td>Chapter 26 Capacitance LAB AS ASSIGNED BY INSTRUCTOR</td>
<td>Selected problems from textbook</td>
</tr>
<tr>
<td>X.</td>
<td>Chapter 27 Current and Resistance LAB AS ASSIGNED BY INSTRUCTOR</td>
<td>Selected problems from textbook</td>
</tr>
<tr>
<td>XI.</td>
<td>Chapter 28 DC Circuits LAB AS ASSIGNED BY INSTRUCTOR</td>
<td>Selected problems from textbook</td>
</tr>
<tr>
<td>XII.</td>
<td>Chapter 29 Magnetism and the Magnetic Field LAB AS ASSIGNED BY INSTRUCTOR</td>
<td>Selected problems from textbook</td>
</tr>
<tr>
<td>XIII.</td>
<td>Chapter 31 Electromagnetic Induction LAB AS ASSIGNED BY INSTRUCTOR</td>
<td>Selected problems from textbook</td>
</tr>
<tr>
<td>XIV.</td>
<td>Chapter 39 Nuclear Physics Review for Final Exam LAB AS ASSIGNED BY INSTRUCTOR</td>
<td></td>
</tr>
<tr>
<td>XV.</td>
<td>FINAL EXAM</td>
<td></td>
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