Course Name: PHY-133 Engineering Physics II

Date Updated: 2/2022

Credit Hours/week: 4 hrs./wk. – 4 cr.

BEGINNING: SPRING 2022

Catalog Description: This is the second course of a three-semester, calculus-based physics sequence. Topics include simple harmonic motion, waves, electromagnetic theory and applications, Maxwell's equations in integral form

Prerequisite: PHY-130, MAT-132, MAT-230, PHY-134

Text: Sears & Zemansky's University Physics, Volume I & II Young & Freedman Addison Wesley
Sears & Zemansky's University Physics, Study Guide, Volume I, II & III Young & Freedman Addison Wesley
Young & Freedman Addison Wesley Sears & Zemansky's University Physics, Student Solutions Manual, Volume I, II & III
Supplementary Material: Scientific **Calculator** Materials:
Specialized equipment, supplies, facilities, for classes limited by enrollment or restricted by accreditation and/or equipment limitations:

Syllabus:

Topics:
Ch. 14 Oscillations; Simple harmonic motion; Force law
Energy; Angular SHM
Pendulums; SHM & UCM: Damping (lightly)
Ch. 17 Waves & particles; Stretched string; Wavelength & frequency
Speed; Traveling waves; Speed in a string
Power; Superposition; I**nterference**
Standing waves; Reflections; Resonance
Ch. 18 Sound waves; Doppler effect; Ch. 23 Electrom**agnetism**
Charge; Coulomb's law; Charge is quantized
Charge conservation; Ch. 24 Field concepts
Lines of force; Point charge; Dipole; Ring of charge
Ring and disk; Charge in a field
Deflection plates; Dipole in a field; Ch. 25 Gauss' law; Flux
More on flux; Electric field flux; Gauss' law; Coulomb's law

Isolated conductor; Testing; Linear, planar **& spherical symmetry**
More on spherical symmetry; Ch. 26 Energy; Potential
Equipotentials; Potential from field; Charge; Dipole
More on dipole; Superposition; Disk; Field from potential
Energy; Isolated conductor; Accelerator; Ch. *27* Us**es of capacitance**
Capacitance; Calculating capacitance; Concepts of charging
Series & parallel; Storing energy
Dielectric; Experiments; Atomic view
Gauss' law; Ch. 28 Electric current
More on current; Current density; Resistance
More on resistance; Resistivity, Ohm's Law, Power
Optional topics (lightly); Ch. 29 EMF; Loop rule
Single-loop circuit; Potential differences; Multiloop circuits; Junction rule
Instruments; RC circuits (charging)
Discharging; Ch. 30 Magnetic field; Definition

Force on charge; Field lines; The electron
Hall effect; Circulating charge; Cyclotron
Force on current; Torque on loop
Magnetic dipole (lightly); Ch. 31 Biot-Savart law; Long wire
More on long wire; Parallel wires; Ampere's law
Ampere's law; Long wire; Cable; Solenoid & toroid
Field of current loop; Ch. 32 Experiments; Faraday's law

More on Faraday's law; Lenz' law; Quantitative study
Induced electric fields; Maxwell's equations (lightly); Ch. 33 Inductance
Self-inductance; Solenoid & Toroid; LR circuit
More on LR circuit; Energy; Mutual inductance
Ch. 36 Introduction; Pure R or C or L devices; Phasors
More on pure L; Series LCR circuit; Impedance; Phase
Power in an AC circuit; Transformer

Format for Offering this Course: Traditional

Students are expected to adhere to the policies of the County College of Morris. These can be accessed at: (insert link here)

Statement of Expected Course LEARNING OUTCOMES

- Apply expressions that describe simple harmonic oscillation in terms of amplitude, time, angular **frequen**cy, and phase angle to the task of determining any unknown parameters.
- **Sketch standing wave modes for a described system and use the patterns to determine** corresponding wavelength, frequency, and velocity values from given information.
- Compute the electric field as function of position by direct integration over a specified continuous charge distribution.
- Apply Gauss's Law to a described system using an appropriately-chosen closed surface to determine the electric field and potential as functions of position.
- Apply Kirchhoff's Laws and Ohm's Law to a diagrammed dc circuit to find any unspecified current, potential difference, and power dissipation (or supply) values for each element.
- Apply the Lorentz Force expression to determine the magnetic force acting on a moving charged particle and/or on a current-carrying wire.
- Use Maxwell's 4th equation (Faraday-Lenz law) to compute induced electric potential by identifying the sign and rate of magnetic flux changes for a described system.
- State Maxwell's equations of electromagnetism in integral form.
- Use the scientific method to analyze and derive conclusions from collected data and information (Gen Ed)
- Explain the difference between a hypothesis, a theory and a law as they are used in science (Gen Ed)

Learning Activities to Support General Education Outcomes: Lectures, demonstrations and in-class activities
Assessment Methods related to General Education Outcomes: Exam questions that test a student's understanding of the presented material.

Statement of Relation to Curriculum(s):

Required for Engineering Science major; elective for Mathematics, Chemistry and Biology majors.