MASTER COURSE OUTLINE
Prepared By: Jim Hamm Date: September 2017

COURSE TITLE
Engineering Physics II with Lab

GENERAL COURSE INFORMATION

Dept.: PHYS&	Course Num: 222	(Formerly:)
CIP Code: 40.0801	Intent Code: 11	Program Code:
Credits: 5		
Total Contact Hrs Per Qtr.: 66		
Lecture Hrs: 44	Lab Hrs: 22	Other Hrs: 0
Distribution Designation: Lab Science LS		

COURSE DESCRIPTION (as it will appear in the catalog)
The second in a three-quarter calculus-based sequence in introductory physics intended for students majoring in science or engineering. Course content includes waves, optics, thermodynamics, and may include a unit on gravitation.

PREREQUISITES
Successful completion of Engineering Physics I (PHYS& 221)

TEXTBOOK GUIDELINES
A calculus-based Engineering Physics textbook, such as *University Physics* by Young and Freedman.

COURSE LEARNING OUTCOMES
Upon successful completion of the course, students should be able to demonstrate the following knowledge or skills:

1. Apply problem-solving techniques learned in Engineering Physics I (PHYS& 221) to gravitation, simple harmonic motion, pendulum motion, waves, geometric optics, physical optics, and elementary thermodynamics.
2. Apply conservation of energy principles to simple harmonic motion and pendulum motion.
3. Apply the mathematical equations of periodic waves to sound waves and waves on strings.
4. Apply the mathematical equations of geometric optics to simple situations involving mirrors, thin lenses, and refracting surfaces.
5. Apply the mathematical equations of physical optics to multiple-source interference, thin-film interference, and diffraction.
6. Analyze situations involving thermal expansion, calorimetry, and heat transfer.
7. Use the ideal gas law to solve simple problems and analyze systems.
8. Perform simple calculations employing the kinetic-molecular model of an ideal gas.
9. Apply the first law of thermodynamics to elementary situations.
10. (If time permits) Apply the second law of thermodynamics to elementary situations.
11. Present clearly explained problem solutions.
12. Present experimental results in clearly written laboratory reports.

INSTITUTIONAL OUTCOMES

IO2 Quantitative Reasoning: Students will be able to reason mathematically.

COURSE CONTENT OUTLINE

Gravitation
- Newton's law of gravitation
- Weight
- Gravitational potential energy
- The motion of satellites
- Kepler's laws
- Spherical mass distributions
- Apparent weight and Earth's rotation

Oscillations and Waves
- Simple harmonic motion
- Displacement, velocity and acceleration in simple harmonic motion
- Energy in simple harmonic motion
- Pendulum motion
- (Optional) Damped and forced oscillations
- Periodic waves
- Sinusoidal waves
- Wave speeds and energies
- Superposition and interference
- Standing waves and normal modes of oscillation
- Sound waves
- (Optional) Sound intensity
- Standing sound waves and normal modes
- Beats
- The Doppler effect

Optics
- The nature of light
- Reflection and refraction
- Dispersion
- Total internal reflection
- Polarization
- Huygen's principle
- Reflection and refraction at plane and spherical surfaces
- Thin lenses
- (Optional) Cameras, telescopes, microscopes, magnifiers, the eye
- Constructive and destructive interference
- Two-source interference and intensity in interference patterns
- Thin-film interference
- (Optional) The Michelson interferometer
- Single-slit diffraction
- Multiple-slit diffraction and the diffraction grating
- (Optional) X-Ray diffraction
- Circular aperture diffraction and resolving power

Thermodynamics
- Temperature

Thermal expansion
Heat and calorimetry
Heat transfer
The ideal gas law
Kinetic-molecular theory of gases
First law of thermodynamics
Second law of thermodynamics

DEPARTMENTAL GUIDELINES *(optional)*

Exams and Quizzes 50-60% Homework 20-30% Laboratory Reports 20%

PO5 should be assessed: Students will be able to solve problems by gathering, interpreting, combining and/or applying information from multiple sources.

_____ _____

DIVISION CHAIR APPROVAL **DATE**