PHYSICS 212

PHY 212 - Introduction to Physics II is the second course in the non-calculus based PHY 211/212 sequence. It provides an introduction to electricity, magnetism, optics and selected topics in Modern Physics. It is designed as a terminal sequence for non-physical science majors. There are three 1-hour lectures, one 1-hour tutorial and one 3-hour lab each week. Prerequisite: MAT 142.

The syllabus below is a general guide and will vary from semester to semester.

Week 1
Electric Charge, Conductors, Insulators, and Induced Charges, Coulomb's Law, Electric Field and Electric Forces, Electric Dipoles

Week 2
Charge and Electric Flux, Gauss's Law, Charges on Conductors, Electric Potential, Electric Potential Energy, Equipotential Surfaces

Week 3
Capacitance, Capacitors in Series and Parallel, Energy Storage, Electric-Field Energy, Dielectrics, Current, Resistivity, Resistance, Electromotive Force, Circuits, Energy and Power in Electric Circuits

Week 4
Resistors in Series and Parallel, Kirchhoff's Rules, R-C Circuits, Power Distribution, Magnetic Field and Magnetic Forces, Magnetic Flux, Motion of Charged Particles in a Magnetic Field, Magnetic Force on a Current, Force and Torque on a Current Loop, The Direct-Current Motor

Week 5
Magnetic Field of a Moving Charge, Current Element and Straight Current-Carrying Conductors, Force Between Parallel Conductors, Magnetic Field of a Circular Current Loop

Week 6
Faraday's Law, Lenz's Law, Motional Electromotive Force, Induced Electric Fields, Self-Inductance, Magnetic-Field Energy, The R-L Circuit, L-C Circuit, and L-R-C Series Circuits

Week 7
Phasors and Alternating Currents, Resistance and Reactance, The L-R-C Series Circuit, Power and Resonance in AC Circuits, Transformers

Week 8
Maxwell's Equations and Electromagnetic Waves, Plane Electromagnetic Waves and the Speed of Light, Sinusoidal Electromagnetic Waves, Energy and Momentum in Electromagnetic Waves, Standing Electromagnetic Waves

Week 9
Reflection and Refraction, Snell's Law, Total Internal Reflection, Polarization, Reflection and Refraction at a Plane Surface

Week 10
Reflection at a Spherical Surface, Refraction at a Spherical Surface, Thin Lenses, Cameras, The Eye, The Magnifier, Microscopes and Telescopes

Week 11
Interference and Coherent Sources, Two-Source Interference of Light, Intensity in Interference Patterns, Interference in Thin Films

Week 12
Fresnel and Fraunhofer Diffraction, Diffraction from a Single Slit, Intensity in the Single-Slit Pattern, Multiple Slits, The Diffraction Grating, Circular Apertures and Resolving Power

Week 13
Invariance of Physical Laws, Relativity of Simultaneity, Relativity of Time Intervals and Length, Lorentz Transformation, The Doppler Effect for Electromagnetic Waves, Relativistic Momentum

Week 14
Emission and Absorption of Light, The Photoelectric Effect, Atomic Line Spectra and Energy Levels, The Nuclear Atom, The Bohr Model, The Laser, X-Ray Production and Scattering, Continuous Spectra, Wave-Particle Duality

Week 15
Selected topics in The Wave Nature of Particles, De Broglie Waves, Electron Diffraction, Probability and Uncertainty, The Electron Microscope, Quantum Mechanics, Particle in a Box, Potential Wells, Potential Barriers and Tunneling, The Hydrogen Atom, The Zeeman Effect, Electron Spin, Many-Electron Atoms and the Exclusion Principle, Properties of Nuclei, Nuclear Binding and Nuclear Structure, Nuclear Stability and Radioactivity, Activities and Half-Lives, Fundamental Particles, Particle Accelerators and Detectors, Particles and Interactions