1. **PHYS 24100 – Electricity and Optics**

2. **Credits and contact hours:**
   3 credits
   Lecture – 2 days per week at 50 minutes for 15 weeks.
   Recitation - 1 day per week at 50 minutes for 15 weeks.

3. **Instructor's or course coordinator's name:** Daniel S. Elliott, Laura J. Pyrak-Nolte, Jonah A. Quirk, Brian M. Fields, Zachary K. Davis …

4. **Textbook(s):** *Physics for Scientists and Engineers,* P. Tipler & G. Mosca, Bedford/Freeman/Worth, 6th Volume 2, Notes: Textbooks are available and can be ordered through University Bookstore (765-743-9618) or Follett's Bookstore (765-743-9642) ISBN 1429284587
   a. **Other supplemental materials:** i>Clicker, Macmillan MPS, Notes: Choose one of three options; Textbooks are available and can be ordered through University Bookstore (765-743-9618) or Follett's Bookstore (765-743-9642)
5. **Specific course information**
   a. **Catalog description:** Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Fall Spring Summer.
   b. **Prerequisites or co-requisites:** (PHYS 15200 Minimum Grade of D- or PHYS 17200 Minimum Grade of D- or (PHYS 16200 Minimum Grade of D- and PHYS 16300 Minimum Grade of D-)) and (MA 16200 Minimum Grade of D- [may be taken concurrently] or MA 17100 Minimum Grade of D- [may be taken concurrently] or MA 17300 Minimum Grade of D- [may be taken concurrently] or MA 16900 Minimum Grade of D- [may be taken concurrently] or MA 16600 Minimum Grade of D- [may be taken concurrently] or MATH 16400 Minimum Grade of D- [may be taken concurrently] or MATH M2160 Minimum Grade of D- [may be taken concurrently] or MA 18100 Minimum Grade of D- [may be taken concurrently] or MA 16400 Minimum Grade of D- [may be taken concurrently] or MATH 16600 Minimum Grade of D- [may be taken concurrently])
   c. **Course status:**

6. **Specific goals for the course**
   a. **Student Learning Outcomes:**
      1. Learn that a relatively small number of fundamental physics concepts form the basis of a wide variety of complex physical phenomena.
      2. Learn that conceptual understanding can invariably be raised to the level of analytic and quantitative understanding by use of suitable mathematics.
      3. Learn that the quantitative formulations so achieved can be used for problem solving and predicting outcomes of experiments.

4. Learn to apply this process to problem solving involving various natural phenomena, such as those encountered in electrostatics, dc and ac currents and circuits, magnetostatics, magnetic induction, electromagnetic waves, light and optics including both geometric and physical optics.
5. Learn to relate the basic understanding and problem solving skills to concrete and practical examples.
6. Develop an elementary understanding of Maxwell's Equations.

b. Relationship of course to program outcomes:

7. Topics

Weeks	
1	Electricity & Optics
2	Coulomb's Law for continuous charge distributions, Electric Flux, Gauss' Law
3	Discontinuity of E at surface charge; Charge & Field at Conductor Surfaces
4	Electric Potential, Electric Potential for Continuous Charge Distributions; Equipotential Surfaces
5	Electrostatic Energy; Capacitors; Energy stored by a capacitor, Capacitors in Circuits; Dielectric Materials
6	Current; Resistnce & Ohm's Law; Energy, Resistor Combinations; Kirchoff's Laws
7	RC circuits; Magnetic Force, Magnetic Force and Torque; Hall effect
8	Biot-Savart Law, Parallel Wires; Gauss' Law for Magnetism; Ampere's Law; Magnetization
9	Magnetic Flux, Faraday's Law, Lenz's Law
10	Motional EMF, Eddy Currents; Self Inductance, RL circuits; Magnetic Energy; Magnetic Properties of Superconductors
11	Alternating Current in a Resistor; a.c. Circuits; Phasors, LC & RLC circuits; Driven RLC circuits; Transformers
12	Maxwell's Eqn's; EM wave propagation, Properties of Light
13	Refraction, Reflection, Total Internal Reflection, Polarization; Geometrical Optics; Spherical Mirrors
14	Refraction at a Single Surface; Thin Lenses; Combinations of Lenses, Interference of Light
15	Diffraction of Light, Resolution