Winter 2012 **PHY 5015 Non-Classical Physics for Secondary School Educators**

Lecture Hours: M 5 - 8 PM
Location: 219 Physics

Lecturer: Karur R. Padmanabhan
Office: Rm.364 Physics Building
Telephone: 313- 577-3005
E-mail: ad2639@wayne.edu
Office Hours: M 4 -5 PM
T, Th 4 - 6.40 PM

Course Objective: To develop conceptual understanding and problem solving Skills in Modern Physics
All information, , problems, assignments will be posted on Blackboard

Text Book: Most of the topics listed below will follow Chapters 26- 30 in College Physics by Serway and Faughn 5th edition. Some copies are available. Please wait until first day of class before buying this book.

Home work : Weekly home work will be assigned. These need to be submitted at the beginning of class the following week.

TENTATIVE SCHEDULE

Date	**Topic**
1/9	Review of classical Physics, What is Modern Physics, Maxwell's equation, EM waves and properties, Black body radiation, Energy, Plank's hypothesis, particle theory of light, photo effect.
1/23	X-rays, X-ray diffraction, Photons, The Compton Effect, matter waves, wave- particle duality, the wave function, de Broglie waves Uncertainty Principle, Applications and implications of quantum theory.
1/30	Model of the atom, Atomic spectra, Bohr Model, Modifications, Hydrogen atom wave function, quantum mechanics of hydrogen atom, the quantum numbers.
2/06	Multi electron atoms, electron cloud, Pauli's exclusion principle, Excited states and spectra, Characteristic X-rays, atomic transitions. Lasers.
2/13	Hydrogen molecule, Covalent bond, ionic bonding, Molecular vibrations and rotations, molecular spectra.
2/20	Exam-1 (1 hour) Ionic and covalent solids, Energy bands in solids, intrinsic and extrinsic semiconductors,

Semiconductor devices and superconductivity.

2/27 Properties of Nucleus, Nuclear Structure and stability, BE, Radioactivity, Radioactive decay processes,

3/05 Nuclear reactions, radiology and other nuclear medical applications.

3/12 No Class- Spring Break

3/19 Exam-2 (1 hour)
Nuclear Fission, Reactors, Nuclear Fusion, Fundamental forces of nature.

3/26 Elementary particles, anti particles, Families of particles, conservations laws. Quark and standard models.

4/02 Relativity, Introduction to Galilean Relativity, Michelson Morley Expt. and speed of Light, Einstein's special theory of relativity, Length, time and mass Relativistic velocities, momentum and energy.

4/09 Relativity (cont), General Relativity, Pair production and annihilation the cosmic connection.

4/16 Ultimate building blocks of matter, Astrophysics (Neutron Stars, Black holes), the cosmic connection.

4/23 Review

4/30 Final Exam

Grades in this course will be determined by your performance on the exams, assigned homework problems and the project write up

Lab: There is no lab component for the course. However, the course may include participation in some lab/demos such as photoelectric effect, Radioactivity etc. These will be announced in class. Participation is not mandatory. Those who wish to enroll in a lab can register for PHY 3310 (Modern Physics Lab) after discussing it with instructor.

Exams: There will 2 mid term and one final exam.

Homework	25%
First Exam	20 %
Second Exam	20 %
Final Exam	35 %