

Phys 204 Course Description-T261

PHYS 204 Nuclear Instrumentation (3-0-3)

Inductance; magnetic properties of matter, electromagnetic oscillations and waves; geometrical and physical optics. Relativity, introduction to quantum physics, atomic physics, solids, nuclear physics, particle physics and cosmology.

(Prerequisites: PHYS 102, MATH 102)

Course Objectives:

1. Teach the students Maxwell's equations, how they relate to Gauss's, Faraday's, Ampere's laws.
2. Teach the students the major laws in geometrical and wave optics.
3. Introduce Einstein's two postulates of special relativity and their major consequences.
4. Motivate the need of quantum physics.
5. Introduce Schrodinger's equation in one dimension and Heisenberg uncertainty principle.
6. Introduce the hydrogen atom and its quantized energy levels.

Textbooks:

Fundamentals of Physics, by Halliday, Resnick and Walker, Eleventh Edition, John Wiley & Sons, Inc (2018).

List Recommended Textbooks and Reference Material (Journals, Reports, etc)

Physics for Scientists and Engineers by Serway (Latest Edition), The Physics Teacher, Physics Today, Scientific American

. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

- <http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html> ;
- [YouTube](#)

Schedule of Assessment Tasks for Students During the Semester

	Assessment Task*	Week Due	Proportion
1	Class work (assignments)	Weekly	10%
2	Quizzes	Weekly	20%
3	First Major Exam	6	20%
4	Second Major Exam	12	20%
5	Final Exam	16	30%

Lecture Schedule

Week	Chapter	Topics	Omitted Sections
1	30	Induction and Inductance: Faradays Law of Induction, Inductance, RL Circuits, Energy stored in B, Mutual inductance.	
2	31	Electromagnetic Oscillations and Alternating Current: LC Oscillations, RLC Circuits, Series RLC Circuits.	Forced oscillation, transformers
3	32	Maxwell's Equations: Magnetism of Matter: Gauss' Law for magnetic field, Maxwell's equations, Magnetic Materials.	
4	33	Electromagnetic Waves: EM Waves (Qualitative and Quantitative Analysis), Energy Transport, energy transport and the Poynting vectors, Polarization, Total Internal Refraction.	radiation pressure
5	34	Images: Plane and spherical Mirrors, Spherical Refracting Surfaces and thin lenses.	spherical lenses, three proofs
6	35	Interference: Light as a wave and diffraction, Young's Interference experiment, Intensity in Double Slit Interference.	
7	36	Diffraction: Diffraction & Wave Theory of Light, Diffraction by Double Slit, Diffraction Gratings.	
8	37	Relativity: The postulates, Measuring and event, Relativity of Time and Length, Lorentz Transformation, Doppler Effect for Light	
9	38	Photons and Matter Waves: Photon, The Quantum of Light, Photons Have Momentum (Schrodinger's equation)	
10	39	More About Matter Waves: Energy of Trapped Electron, Two- and Three-Dimensional Trap, The Hydrogen Atom.	two and three D electron trap,
11	40	All About Atoms: Properties of Atoms, Pauli Exclusion Principle, Lasers	
12	41	Conduction of Electricity in Solids: Electronic Properties, Metals, Semiconductors	
13	42	Nuclear Physics: Some Nuclear Properties, Radioactive Decay, β Decay	Measuring radiation dosage, nuclear models
14	43	Energy from the Nucleus: Energy from the Nucleus	
15	44	Quark, Leptons and the Big Bang	

Attendance Policy:

PHYS 204 course is offered in person. Class attendance and participation are required.

- A DN grade shall be given to the student who has more than **12 unexcused absences** in lectures.