PHYS 2005 CLASSICAL PHYSICS AND ADVANCED TECHNOLOGIES

Credit Points 10

Legacy Code 301393

Coordinator Timothy Stait-Gardner (https://directory.westernsydney.edu.au/search/name/Timothy Stait-Gardner/)

Description This subject explains in depth aspects of classical mechanics related to forced and damped oscillations. Physical waves are introduced and formalized by describing applications of the wave equation to mechanical systems and electromagnetic radiation. Interference and diffraction are detailed using electromagnetic fields (physical optics). Main technological applications of mechanical oscillations and electromagnetic waves are also explained, such as the atomic force microscope, laser, optical tweezers and the zeta-sizer.

School Science

Discipline Physics

Student Contribution Band HECS Band 2 10cp

Check your HECS Band contribution amount via the Fees (https://www.westernsydney.edu.au/currentstudents/current_students/fees/) page.

Level Undergraduate Level 2 subject

Pre-requisite(s) PHYS 1006

Equivalent Subjects LGYA 6024 - Applied Instrumentation in Nanotechnology

Assumed Knowledge

Introductory mechanics: Newton's laws, work, conservation of energy and momentum. Introductory Electrostatics: Electric forces and Coulomb's law; DC electricity, voltage, current, resistance, Ohm's law, electric power, circuit laws. Introduction to Magnetic fields: production by magnets & currents, magnetic forces on currents & charges; Induced EMF, Faraday's law and electrical generators; AC current & voltage, peak & rms values, capacitance and inductance.

Learning Outcomes

On successful completion of this subject, students should be able to:

1. Explain physical principles underlying oscillatory phenomena and major instrument operation.
2. Conduct basic experiments implementing the scientific method.
3. Apply the theoretical principles governing the phenomena under study in a laboratory set-up and the error propagation rules.
4. Analyse the results of study and investigations in written form.
5. Apply safety principles during laboratory experiments.
6. Problem solve and apply critical skills towards scientific hypotheses.
7. phenomena and major instrument operation.

Subject Content

1. The harmonic oscillator
2. The Atomic Force Microscope (AFM)
3. Electric and magnetic fields
4. Optical tweezers
5. Electron beam lithography
6. Electromagnetic oscillations: waves
7. The wave equation
8. Light interference
9. Light interference applied to nano-scale patterns

Prescribed Texts

- R. Shankar, Fundamentals of physics i : mechanics, relativity, and thermodynamics, Expanded edition. ed., Yale University Press, New Haven, CT, 2019

Teaching Periods