



The Hebrew University of Jerusalem

Syllabus

INTRODUCTION TO MODERN PHYSICS - 71627

Last update 25-09-2016

HU Credits: 3.5

Degree/Cycle: 1st degree (Bachelor)

Responsible Department: soil and water sciences

Academic year: 0

Semester: 1st Semester

Teaching Languages: Hebrew

Campus: Rehovot

Course/Module Coordinator: Jeremy I. Pfeffer

Coordinator Email: pfeffer.jeremy@mail.huji.ac.il

Coordinator Office Hours: By appointment

Teaching Staff:

Mr. Pfeffer Jeremy

Course/Module description:

Physics at the End of the 19th Century
The Theories of Relativity
Quantum Theory
The Nuclear Atom
Nuclear Physics

The presentation of the material emphasises the physical aspects of the phenomena.

Mathematics is entailed but only to the extent required for descriptive or illustrative purposes.

Course/Module aims:

The course sets out to present 20th century physics in a form accessible and useful to undergraduate and graduate students of the life, agricultural, earth and environmental sciences.

Learning outcomes - On successful completion of this module, students should be able to:

The student will be familiar with:

1. The concepts and principles that underlie modern physics and the experiments and physical phenomena from which these were derived.
2. The physical constants and variables, the laws and functions, specific to modern physics and will be able to do simple mathematical exercises and solve elementary problems using them.
3. The impact of the discoveries of modern physics on various aspects of human endeavor: on technology, industry, our way of thinking and on society at large.

Overall, the student will be "Modern Physics Literate."

Attendance requirements(%):

85

Teaching arrangement and method of instruction: Lectures and Student Assignments

The assigned Exercises give students the opportunity to use the material learnt and

to develop computational capability. The assigned Problems focus on more serious examples, developing formulae and abstract reasoning.

Course/Module Content:

The Beginnings of a New Physics:

The electron, electromagnetic waves, special relativity, principles of general relativity.

Quantum Theory:

Quantum hypothesis, photoelectric effect, photons, the mechanics of minute particles.

The Nuclear Atom:

Atomic structure and spectra, Bohr's atomic model, the atom according to quantum mechanics, electron spin.

Nuclear Physics:

Nuclear structure, nuclear radiation - radioactivity, passage of nuclear radiation through matter, biological effects of radiation, nuclear reactions and nuclear energy utilization.

Required Reading:

Modern Physics - An Introductory Text: 2nd Edition

Jeremy I. Pfeffer and Shlomo Nir

Imperial College Press, 2013,

Additional Reading Material:

"A Brief History of Time" by Stephen Hawking

Course/Module evaluation:

End of year written/oral examination 0 %

Presentation 0 %

Participation in Tutorials 0 %

Project work 85 %

Assignments 15 %

Reports 0 %

Research project 0 %

Quizzes 0 %
Other 0 %

Additional information:

The students participating in the course are required to submit a term-paper (5000 to 10000 words) on any topic of their choice, providing it falls within the scope of modern physics or describes and elucidates one or other of the industrial, technical or research applications derived from it. For example: MRI, CT, PET; advanced uses of X-rays in medicine, research and industry; semiconductor devices; astrophysics; design and dismantling of nuclear power plants; design and dismantling of nuclear weapons; particle accelerators and high-energy physics; the nano world; research techniques in the life sciences; or any other subject approved by the teacher.