האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

INTRODUCTION TO QUANTUM MECHANICS FOR ENGINEERS - 83326

Last update 13-03-2025

HU Credits: 6

Degree/Cycle: 1st degree (Bachelor)

Responsible Department: Applied Physics

Academic year: 0

Semester: 2nd Semester

Teaching Languages: Hebrew

Campus: E. Safra

Course/Module Coordinator: Prof. Gilad Marcus

Coordinator Email: Gilad.Marcus@mail.huji.ac.il

Coordinator Office Hours: in coordination with the lecturer

Teaching Staff:
Prof. Gilad Marcus,
Mr. Pavel Penshin

Course/Module description:
*This course is an introduction course to quantum mechanics. We start by {***this part will not be given this year*** introducing the students to the Lagrangian and Hamiltonian formalism of the classical mechanics.***}*
Next we will overview the physical evidences which stimulated physicist at the beginning of the 20th century to formulate the quantum mechanics. The students will be introduced to the black body radiation, the photo-electric effect, Compton scattering, diffraction of light and electron beams and the radiation spectrum of the hydrogen atom. We will recall the concept of dispersion and use it to derive the Schrodinger equation. We'll learn the meaning of the wave function and measurement in quantum mechanics. We'll understand the connection between wave mechanics and matrix mechanics. WE will solve the Schrodinger equation for various cases (square well, tunneling through barrier, harmonic oscillator and central force potential). At the end we will introduce the technique of perturbation theory (time dependent and time independent)

Course/Module aims:
the aim of this course is to give the student the historical and scientific background for quantum mechanics and to supply him with the basic toolbox to understand the quantum world.

Learning outcomes - On successful completion of this module, students should be able to:
Describe the first evidence of quantum mechanics and be able to explain them

Could explain the meaning of the wave function in quantum mechanics

Could explain the difference between measuring Conte Classical Guitar

Knowledge to solve the Schrödinger equation for the potential bases

Knowledge activate the perturbation theory for the potential non-basic

Attendance requirements(%):
100

Teaching arrangement and method of instruction: Frontal lecture + tutorial

Course/Module Content:

*•{this part will not be given this year*** Basic concepts of classical mechanics, Lagrangian, Hamiltonian, constant of motion, generalized coordinates and canonical transformation }*

** Early leads to a new quantum theory*
• Particle-wave duality
• Formalism: wave functions, operators, eigenfunctions, eigenvalues.
• The Schroedinger equation
• Potential wells
• Tunneling
• The harmonic oscillator
• The Stern Gerlach experiment and the concept of measurement in quantum mechanics
• The hydrogen atom
• Perturbations and methods of approximation.

Required Reading:

NA

Additional Reading Material:

Herbert Goldstein - Classical mechanics

J. J Sakurai - Modern Quantum Mechanics

Cohen Tannouji - Quantum Mechanics

Landau-Lifschitz - Quantum Mechanics

Grading Scheme:

Written / Oral / Practical Exam 80 %

Submission assignments during the semester: Exercises / Essays / Audits / Reports / Forum / Simulation / others 20 %

Additional information:

Completion of 80% home work is obligatory.