האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

QUANTUM THEORY IN APPLIED PHYSICS - 83880

Last update 28-10-2015

HU Credits: *5*

Degree/Cycle: *2nd degree (Master)*

Responsible Department: *applied physics*

Academic year: *0*

Semester: *2nd Semester*

Teaching Languages: *Hebrew*

Campus: *E. Safra*

Course/Module Coordinator: *Prof. Ronen Rapaport*

Coordinator Email: *paltiel@mail.huji.ac.il*

Coordinator Office Hours: *Prof. Ronen Rapaport*

Teaching Staff:

Prof Ronen Rapaport
Mr. Cohen Eyal

Course/Module description:
Basic concepts.
Non-locality and Bell inequalities. Pure and mixed quantum states. The density matrix. The dipole approximation, Optical Bloch equations, and the interaction of a 2-level atom with a clasicall EM field. Idensical particles, symmetries of the many-particle wavefunction. Variational method and the Helium atom. Exchange density and energy. Hrtree and Hartree-Fock approximations, interacting electrons in a metal. Second quantization. light-matter interaction and the quantization of the electromagnetic field and the photon.
Spontaneous and stimulated emission.
Particle under external electric and magnetic field. The Aharonov-Bohm effect and the Quantum Hall effect.

For each subjects possible applications will be discussed.

Course/Module aims:
See learning outcomes

Learning outcomes - On successful completion of this module, students should be able to:
Advanced knowledge quantum physics, identical many particle physics, Second quantization
And applications

Attendance requirements(%):
0

Teaching arrangement and method of instruction: Frontal lecture + Exercise

Course/Module Content:
Basic concepts.
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metal. Second quantization. light-matter interaction and the quantization of the electromagnetic field and the photon.
Spontaneous and stimulated emission.
Particle under external electric and magnetic field. The Aharonov-Bohm effect and the Quantum Hall effect.

For each subjects possible applications will be discussed.

Required Reading:
NA

Additional Reading Material:
Formalistic books:
- *J. J. Sakurai, Modern Quantum Mechanics*
- *Albert Messiah, Quantum Mechanics*

General
- *Leonard Schiff, Quantum Mechanics*
- *Gordon Baym, Lectures on Quantum Mechanics*

Quantum Optics
- *A Yariv, Quantum Electronics*
- *C Cohen-Tanoudji et. al., Atom-Photon Interactions*
- *L Mandel & E Wolf, Optical Coherence and Quatum Optics*
- *MO Scully & MS Zubairy, Quantum Optics*

Applied Quantum Mechanics
Herbert Kroemer, Quantum Mechanic for Engineering: Materials Science and Applied Physics

Web
http://aphquantum.weebly.com

Course/Module evaluation:
End of year written/oral examination 0 %
Presentation 80 %
Participation in Tutorials 0 %
Project work 0 %
Assignments 20 %
Reports 0 %

Research project 0 %
Quizzes 0 %
Other 0 %

Additional information:
NA