The Hebrew University of Jerusalem

Syllabus

SOLID STATE PHYSICS - 77602

Last update 18-08-2016

HU Credits: 4

Degree/Cycle: 1st degree (Bachelor)

Responsible Department: physics

Academic year: 0

Semester: 2nd Semester

Teaching Languages: Hebrew

Campus: E. Safra

Course/Module Coordinator: Dr. Hadar Steinberg

Coordinator Email: hadar@phys.huji.ac.il

Coordinator Office Hours: By appointment

Teaching Staff:

Dr. Hadar Steinberg
Mr. Doron Grossman

Course/Module description:
The course will cover basic and advanced topics in Solid State Physics

Course/Module aims:
The students will be familiar with basic concepts in solid state physics: Conductance in metals, crystal structure, electronic band structure and phonons.

Learning outcomes - On successful completion of this module, students should be able to:
The students will be familiar with basic concepts in solid state physics: Conductance in metals, crystal structure, electronic band structure and phonons.

Attendance requirements(%):
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Teaching arrangement and method of instruction: Frontal lectures, TA hour, weekly exercise.

Course/Module Content:
1. Background
2. Electronic transport in metals: The free electron model. The conductivity tensor. Hall Effect.
3. Crystal structure: Periodic structure, Bravais Lattice, reciprocal lattice.
4. The free electron gas: Density of States.
5. Electronic band structure: Bloch theorem; The nearly free electron approximation, energy bands.
6. Electronic band structure: Tight binding approximation.
7. Probing the Fermi Surface: de-Haas van-Alfven and Shubnikov-de-Haas effects
8. Phonons: Acustic and optical modes. Heat capacity.
9. Low dimensional systems: Quantum Hall Effect, transport in ballistic quantum wires.
10. Graphene.
11. Screening: Thomas Fermi theory.
12. Superconductivity and Magnetism.
13. Semiconductors.

Required Reading:

The course will be based on the following text books:

1. Kittel

2. Ashcroft & Mermin

Additional Reading Material:

Will be given during the course

Course/Module evaluation:

End of year written/oral examination 80 %

Presentation 0 %

Participation in Tutorials 0 %

Project work 0 %

Assignments 10 %

Reports 0 %

Research project 0 %

Quizzes 10 %

Other 0 %

Additional information:

None