האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

SOLID STATE IN CHEMISTRY - 69807

Last update 23-09-2019

HU Credits: *3*

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

Responsible Department: *Chemistry*

Academic year: *0*

Semester: *1st Semester*

Teaching Languages: *Hebrew*

Campus: *E. Safra*

Course/Module Coordinator: *Dr. Eli Kraisler*

Coordinator Email: *eli.kraisler@mail.huji.ac.il*

Coordinator Office Hours: *By appointment*

Teaching Staff:

Dr.

Course/Module description:

In this course we focus on crystalline solids, which are infinite periodic systems. Starting with their basic property – spatial periodicity – we will derive mechanical, electric, optical and other properties of solids with quantum-mechanical and semi-classical approaches.

Course/Module aims:

To present the main concepts and methods of solid state theory with possible subsequent application of this knowledge in the student's field of research.

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

1. The students will be able to identify and describe the particular properties of crystalline solids.
2. The students will be able to connect the mechanical, electric, chemical and other properties of materials to their crystal structure.
3. The students will develop intuition for periodic solids.
4. The students will analyse a selected topic in solid state theory according to the literature and the material studied in class, will summarize their work in writing, according to accepted scientific standards.

Attendance requirements(%):

Attendance is not compulsory, but it is expected and recommended.

Teaching arrangement and method of instruction: Lecture, independent accomplishment of assignments, preparation of a written course work.

Course/Module Content:

1. Crystal structure. Periodicity. Bravais lattices, unit cells.
2. Crystal vibrations, phonons, specific heat, melting criterion.
3. X-Ray diffraction from crystals, Bragg's law, reciprocal lattice.
4. Bonding types in solids. Ionic, covalent, metallic, hydrogen and van der Waals bonding.
5. Electronic structure. Bloch theorem, nearly free and tightly bound electrons, bands, the bandgap, Fermi energy. Metals, insulators and semiconductors.
6. Modern methods in electronic structure.

Required Reading:

There are no mandatory reading assignments.

Additional Reading Material:

There are many textbooks on solid state theory. Some selected books are listed below.

1. C. Kittel, Introduction to solid state physics (Wiley)
2. J.W. Ziman, Principles of the theory of solids (Cambridge University Press)
3. A.R. West, Basic solid state chemistry (Wiley)
4. M.P. Marder, Condensed Matter Physics (Wiley)
5. N. W. Ashcroft, N. D. Mermin, Solid state physics (Brooks/Cole)
6. Martin, Electronic structure (Cambridge Univesity Press)

Course/Module evaluation:

End of year written/oral examination 0 %
Presentation 0 %
Participation in Tutorials 0 %
Project work 100 %
Assignments 0 %
Reports 0 %
Research project 0 %
Quizzes 0 %
Other 0 %

Additional information:

By the end of the 9th week of the semester, it is mandatory to meet the lecturer and approve the project work: its subject, scope, main topics covered and the tentative list of references.