Physics of condensed matter - opis przedmiotu

Informacje ogólne

Nazwa przedmiotu	Physics of condensed matter
Kod przedmiotu	13.2-WF-FizD-SS- 19
Wydział	Wydział Fizyki i Astronomii
Kierunek	Fizyka
Profil	ogólnoakademicki
Rodzaj studiów	drugiego stopnia z tyt. magistra
Semestr rozpoczęcia	semestr zimowy 2019/2020

Informacje o przedmiocie

Semestr	3
Liczba punktów ECTS do zdobycia	7
Typ przedmiotu	obowiązkowy
Język nauczania	polski
Sylabus opracował	• prof. dr hab. Mirosław Dudek

Formy zajęć

Forma zajęć	Liczba godzin w semestrze (stacjonarne)	Liczba godzin w tygodniu (stacjonarne)	Liczba godzin w semestrze (niestacjonarne)	Liczba godzin w tygodniu (niestacjonarne)	Forma zaliczenia
Wykład	30	2	-	-	Egzamin
Ćwiczenia	30	2	-	-	Zaliczenie na ocenę

Cel przedmiotu

The aim of the course is to provide students with basic knowledge of condensed matter physics and the corresponding research methods with the learning outcomes in the area of science. Students should know the basics of crystallography, the concept of reciprocal lattice, diffraction methods for determining the crystal structure, they should be familiar with the issue of an electron in a periodic potential, the question of the formation of the band structure in solids, examples of band structures of selected metals, the harmonic crystal approximation, they should know in detail the selected problems of condensed phase in the quantum description, including superconductivity.

Wymagania wstępne

It is assumed that students know subjects of general physics and they have got basic course of mathematical analysis (knowledge and skills that meet the criteria K2A_W01).

Zakres tematyczny

- Crystal lattices, the classification of Bravais lattices and crystal structures.

- Reciprocal lattice, diffraction methods to determine the crystal structure (Laue condition, Bragg equation, Brillouin zones, geometric structural factor).

- An electron in a periodic potential, the Bloch theorem, Kronig-Penney Model.

- Band theory of solids: metals, semiconductors and dielectrics, examples of band structures.

- Crystal in the harmonic approximation (classical and quantum theory), dispersion relations, normal modes in 1D monatomic Bravais lattices, one-dimensional chain with basis, acoustic and optical branches at Brillouin zone boundary.

- Selected issues: continuum linear elastic theory, wave propagation, specific heat, Debye model.

- Superconductivity.

Metody kształcenia

Teaching methods have two forms: lecture and exercises.
During the lecture both theory and selected examples are presented. Next, the examples are recommended to be extended at exercises. Students increase their computational skills by solving these examples in detail. In addition, they discuss selected problems.

Efekty uczenia się i metody weryfikacji osiągania efektów uczenia się

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
Students can explain and describe particular phenomena.	• K2_W01 • K2_W04	• dyskusja • egzamin - ustny, opisowy, testowy i inne • sprawdzian	• Wykład • Ćwiczenia

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
Students have a basic knowledge of the methods of condensed matter physics. General knowledge is supported by a detailed skills in computing for selected models such as one-dimensional model Kröning-Penney'go one-dimensional chain of atoms - unions dispersion, specific heat, which allow broader understanding of the more general theoretical frameworks.	• K2_W01	• dyskusja • egzamin - ustny, opisowy, testowy i inne • sprawdzian	• Wykład • Ćwiczenia

Warunki zaliczenia

The course ends with an exam grade. Examination is a written test of theoretical knowledge and practical skills in accounting. The effects of exercise training are reviewed by partial reviews on completed tasks, evaluation of written tests and assessment of accounting skills and understanding of selected topics of condensed matter physics.

Overall rating: arithmetic mean score of the exam and exercises.

Literatura podstawowa

[1] Neil W. Ashcroft, N. David Mermin, *Solid State Physics*, Harcourt College Publishers 1976

[2] C. Kittel, *Introduction to solid state physics*, John Wiley& Sons Inc, 1996.

[3] L. E. Reichl, *A Modern Course in Statistical Physics*, E. Arnold (Publishers) LTD, University of Texas Press 1980.

Literatura uzupełniająca

[1] Donald A. MCQuarrie, *The Kroning-Penney Model: A Single Lecture Illustrating the Band Structure of Solids*, in The Chemical Educator VOL. 1. 1996 Springer-Vellag New York, inc.

[2] F. Reif, *Fundamentals of Statistical and Thermal Physics*, Mc Graw-Hill, Singapore 1985

Uwagi

Zmodyfikowane przez dr hab. Maria Przybylska, prof. UZ (ostatnia modyfikacja: 30-04-2020 22:02)