Lecture II-P - opis przedmiotu

Informacje ogólne

Nazwa przedmiotu	Lecture II-P
Kod przedmiotu	13.2-WF-FiAP-W-II-P- 18
Wydział	Wydział Fizyki i Astronomii
Kierunek	Fizyka i Astronomia
Profil	ogólnoakademicki
Rodzaj studiów	trzeciego stopnia z tyt. doktora
Semestr rozpoczęcia	semestr zimowy 2018/2019

Informacje o przedmiocie

Semestr	2
Liczba punktów ECTS do zdobycia	3
Typ przedmiotu	obowiązkowy
Język nauczania	angielski
Sylabus opracował	• dr hab. Bohdan Padlyak, prof. UZ

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

Cel przedmiotu

Understanding the theoretical foundations and modern experimental techniques of radiospectroscopy (nuclear magnetic resonance (NMR), electron paramagnetic / spin resonance (EPR / ESR), ferromagnetic resonance (FMR)) and optical spectroscopy (optical absorption and luminescence) and their applications for investigations of solids in the form of single crystals, glasses, polycrystalline powders and nanocomposites.

Wymagania wstępne

Knowledge of the basics of contemporary experimental and theoretical physics, including electrodynamics, quantum mechanics, atomic and nuclear physics, and solid state physics within university courses.

Zakres tematyczny

Classification and short characteristics of modern spectroscopic methods.

Nuclear magnetic resonance (NMR).

Experimental techniques and applications of NMR spectroscopy.

Nature of paramagnetism and paramagnets.

Ferromagnets and other magnetically ordered systems, their structure and properties.

Experimental methods and techniques of spectroscopy EPR / ESR and FMR.

Theoretical background and elementary theory of magnetic resonances.

The shape of resonance lines. Spin-lattice and spin-spin relaxation. EPR / ESR relaxometers.

FMR spectra, their description and interpretation.

Non-resonant absorption in ideal diamagnets (superconductors).

Description of EPR / ESR spectra in the framework of spin Hamiltonian formalism.

Zeeman effect and anisotropy of the g-factor.

Influence of the crystalline field and fine structure of the EPR spectrum.

Interaction with nuclear spins: hyperfine structure and superhyperfine structure of the EPR / ESR spectrum.

Electron-nuclear double resonance (ENDOR).

Optically detected electron paramagnetic resonance (ODEPR).

Theoretical foundations, experimental techniques and equipment of modern optical spectroscopy (absorption spectroscopy and luminescence).

Studies of optical absorption and luminescence spectra as well as luminescence kinetics in borate glasses, doped with rare earth elements and their interpretation.

Metody kształcenia

Conventional lecture. Work with scientific literature, including specialised monographs and original articles in scientific journals about investigation of solids by magnetic resonance and optical spectroscopy methods.

Efekty uczenia się i metody weryfikacji osiągania efektów uczenia się

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
Shows knowledge of the latest theories, research methods, principles and concepts from physics and /or astronomy and detailed specialised knowledge enabling the creation of new theories, research methodologies and concepts by independent research in the specialisation in which the doctoral thesis is performed or at the interface between various related specialisations	• SD_W02	• Exam	• Wykład
Is able to independently formulate a research problem, propose and carry out research aimed at solving it	• SD_U01	• Exam	• Wykład
Understands the need for continuous training and needs as a necessary condition for creative participation in the development of the field	• SD_K01	• Exam	• Wykład

Warunki zaliczenia

Oral exam from the whole range of the material. Getting a positive exam grade.

Literatura podstawowa

[1] C. Kittel, *Wstęp do fizyki ciała stałego*, PWN, Warszawa 1999.

[2] J. Stankowski, W. Hilczer, *Wstęp do spektroskopii rezonansów magnetycznych*, PWN, Wydawnictwo Naukowe, Warszawa 2005.

[3] S. A. Altszuler, B. M. Kozyriew, *Elektronowy rezonans paramagnetyczny*, PWN, Warszawa 1965.

[4] J. A. Weil, J. A. Bolton. J. E. Wertz, *Electron Spin Resonance. Elementary Theory and Practical Applications*, John Wiley & Sons, New York1994 (in English).

[5] A. S. Marfunin, *Physics of Minerals and Inorganic Materials. An introduction*, Springer-Verlag, Berlin Heidelberg New York, 1979 (in English).

Literatura uzupełniająca

[1] Hyperfine Interaction, *Selected review articles*, Edited by A. J. Freeman, R.B. Frankel, Academic Press, New York – London, 1967 (in English).

[2] J. R. Pilbrow, *Transition Ions Electron Paramagnetic Resonance*, Clarendon Press, Oxford 1990 (in English).

[3] B. V. Padlyak, *Foundations of the electron paramagnetic resonance spectroscopy of ions of the transitional groups*, Lviv University: Lviv 1996 (in Ukrainian).

[4] Monographs and original articles on magnetic resonances and optical spectroscopy of solids, published in specialised scientific journals.

Uwagi

Zmodyfikowane przez dr Joanna Kalaga (ostatnia modyfikacja: 08-08-2018 16:11)