WROCŁAW UNIVERSITY OF TECHNOLOGY – PHD STUDIES

FACULTY OF Fundamental Problems of Technology

SUBJECT CARD

Course name in Polish	**Teoria ciała stałego**
Course name in English	**Solid State Theory**
Course language	**Polish**
Departmental course developing professional skills: 1) specialized course	
Type of course**: optional**	
Educational effects according to ZW 26/2017: P8S_WG	
Subject code **FZP9075**	

*delete as applicable

	Lecture
Number of hours of organized classes in University (ZZU)	30
Number of hours of total student workload (CNPS)	90
Form of crediting	Exam
Number of ECTS points	3
including number of ECTS points for practical (P) classes	0
including number of ECTS points for direct teacher-student contact (BK) classes	1,4

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Student is able to analyze problems and find solutions using methods of mathematical analysis and linear algebra.
2. Student knows quantum mechanics and statistical physics and is able to apply their formalism
3. Student is able to work with literature, including papers in English

SUBJECT OBJECTIVES

C1 A student will learn the essential concepts and methods of solid state theory.
C2 A student will get acquainted with the current research topics in the field of solid state theory .

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 has knowledge of the foundations of solid state theory
PEK_W02 has knowledge of the use of theoretical methods of solid state theory in semiconductor systems
PEK_W03 can use knowledge from quantum mechanics, statistical physics and other fields of physics to analyze problems of solid state theory

relating to skills:

PEK_U01 has skills related to the research methodology of solid state theory

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PROGRAMME CONTENT		
Form of classes - lecture		Number of hours
Lec1	Theory of interacting electron gas; screening, plasmons; dielectric function of the electron gas	4
Lec2	Excitons in semiconductors	2
Lec3	Lattice vibrations: phonons; vibration modes in the long wave length limit; Lyddane–Sachs–Tellera relation; phonon polaritons	4
Lec4	Elelctron-phonon coupling; deformation and piezoelectric potentials; coupling to optical phonons; polaron theory; independent boson model	4
Lec5	Theory of the optical response of semiconductors; inter- and intra-band transitions; selection rules; phonon effects	4
Lec6	Spin waves: magnons	4
Lec7	Selected current topics in the solid state theory (overview): strongly correalted systems; quantum hall effect; topological insulators	8
	Total hours	**30**

TEACHING TOOLS USED
N1 lecture with multimedia presentation N2 homework – solving problems

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01, PEK_W02, PEK_W03, PEK_U01	Homework
F2	PEK_W01, PEK_W02, PEK_W03, PEK_U01	Final test
P=0.4*F1+0.6*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

1. O. Madelung, *Introduction to Solid State Theory*
2. J. Spałek, *Wstęp do fizyki materii skondensowanej*

SECONDARY LITERATURE:

1. Current review papers

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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