

**DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND
TECHNOLOGY**

SUPERVISOR/TEAM/ DECLARING/CONDUCTING COURSE: Leszek Bryja
DEPARTMENT: Faculty of Basic Technical Problems W11
SCIENTIFIC DISCIPLINE: Physical Sciences

COURSE CARD

Course name in Polish: Wybrane Zagadnienia Fizyki Ciała Stałego

Course name in English: Selected Aspects of Solid State Physics

Course language Polish / English*

The course is intended for all PhD students: YES / NO

1) BASIC COURSE

2) SPECIALIST COURSE

3) SEMINAR

4) HUMANISTIC COURSE

5) LANGUAGE

Subject code: NFQ100051W

* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)	30			
Grading	Exam	Exam	Oral presentation	Exam, inspection, evaluation classes
Number of ECTS points	0			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge in quantum mechanics and solid state physics
2. Linear algebra and mathematic analysis skills
3. Competences in self work

COURSE OBJECTIVES

- C1 Acquisition of advanced knowledge on calculations of band structure of solid states
- C2 Acquisition of advanced knowledge on electric transport in solid states
- C3 Acquisition of advanced knowledge on interactions of electric and magnetic fields on solid states
- C4 Acquisition of advanced knowledge on low dimensional semiconductor structures

PROGRAM CONTENTS

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Form of classes – lecture (Lec)		Number of hours
L1, 2	Band structure calculations: kp and tight binding model	4
L3	Concentrations of electrons and holes on solid states	2
L4	Boltzmann equation of electron transport in solid states	2
L5	Microscopic Ohm low	2
L6	Classical and Quantum Hall Effect	2
L7	Complex conductivity and reflective index	2
L8	Electrons in external magnetic field. Landau levels	2
L9	Stark effect	2
L10,11	Low dimensional semiconductor structures	4
L12,13	Optical studies of low dimensional semiconductor structures. Excitons	4
L 14, 15	Graphen and 2D semiconducting transition metal dichalcogenides	4
	Total hours	30

TEACHING TOOLS USED
N1 Traditional lecture with use of slides N2. Self-work. Examination N3. Consultation

ACHIEVED SUBJECT LEARNING OUTCOMES		
Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	P8S_WG	- student has a sound knowledge of basic subjects such as mathematics, physics, chemistry or others - has an advanced knowledge fundamental to a field relevant to his/her research, including the most advanced methods of research and verification of results achieved - has an advanced knowledge fundamental to other subjects relevant to his/her research -has an advanced knowledge relevant to the field of her/his study, comprising the most recent results achieved by other authors

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PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] H. Ibach, H. Luth, Physics of Solid State, Springer 1998
- [2] N.W. Ashcroft, N.D. Mermin, Physics of Solid State, Springer 1994
- [3] G. Bastard, Wave Mechanics Applied to Semiconductor Heterostructures. J. Willey, NY 1988
- [4] Artykuły oryginalne

SECONDARY LITERATURE:

- [1] P. Yu, M. Cardona, Fundamentals of Semiconductors, Springer, Berlin 1996
- [2] Yehuda B. Band, Light and Matter, Willey, West Sussex, 2006
- [3] John J. Quinn, Kyung Soo Yi, Solid State Physics: Principles And Modern Applications”, Springer (2009)

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

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