Formularz opisu przedmiotu (formularz sylabusa) w języku angielskim – dotyczy studiów I i II stopnia

A. Informacje ogólne

Nazwa pola		Treść
Course title		Neutron methods
Faculty/Institute		Faculty of Physics
Programme for which the course is offered		Second steep of Physics and Medical Physics
Course ID		
Erasmus code		
Course group		
Didactic cycle		Solid State Physics or Nuclear Physics
Type/form of class		Seminar or laboratory
Brief course description		The course is devoted to discovery, detection and production of neutrons as well as to use of neutrons in the researches of nuclear and magnetic structures by means of a number of experimental techniques;
Full course description		The discovery and properties of neutrons (neutrons as a test object and as a probe); Neutron sources, classification and characteristics of the beamline (nuclear reactions, mass defect, binding energy, neutron absorbents, the process of slowing neutrons, neutron detectors); Interaction of neutrons with matter (Coulomb, magnetic, weak, strong, scattering processes of elastic and inelastic scenarios, processes of absorption and fission ones, etc.). How to polarize neutrons? (a typical method of polarization methods of transmission of polarizing filters, polarizers mirror, polarization by reflection Bragg from a ferromagnetic single crystal, the method of spin reversing, so-called flipping methods);); Neutron diffraction (ND) and its application to the studies of solid state physics (basic concepts: total cross section, cross section for the absorption, scattering coherent and incoherent, negative scattering length, the interaction with the nucleus, the amplitude of the magnetic scattering); Inelastic neutron scattering (classical crystal spectrometry - ICNS, TAS - spectrometry triaxial and other neutron spectrometers of MARIA; SANS - low-angle neutron scattering, method time of flight (TOF) - identification of particles TOF SANS; TOF ICNS, or time of flight method in inelastic scattering of neutrons; Pulse technique (elastic scattering and inelastic), Neutron spin echo (NSE), inelastic (INSE), and resonance, or zero field (ZFNSE); Crystal structures and lattice dynamics (phonon dynamics); Magnetic structures and dynamics of spin (the dynamics of magnons, disproportionate (modal) phase transitions, the transition type of order - disorder);
Prerquisites	Formal prerquisites	Courses of solid state physics and magnetism
	other prerquisites	Course of crystallography
Learning outcomes		They will be posted on the university platform in the form of the points
ECTS credits		2
Assessment methods and criteria		Each lecture ends with a bulleted homework. By gathering 51% or more of the total points pool the final mark has usually increased by half
Type of examination		Test and open questions
Type of course		Conventional and e-learning
Mode of delivery		University website and e-learning platform
Language of instruction		English and Polish
Bibliography		G.E. Becon, Neutron Diffraction, Clarendon Press, Oxford (1975), and G.E. Becon, Neutron Diffraction, IL (1957); G. Becon, Neutron Diffraction, 2nd edition, Clarendon Press, Oxford (1962) L. Dobrzyński, K. Blinowski, Handbook on Neutron and Solid State Physics, ed. M. Cooper, Ellis Horwood series in Physics and its applications (1994) Yu.A. Izyumov, R.P. Ozerov, Magnetic Neutron Diffraction, Plenum Press, New York (1970) Enric Canadell, Marie-Liesse Doublet, and Christophe Iung, Orbital Approach to the Electronic Structure of Solids, Clarendon Press,

	Oxford (2012)
Work placement(s)	Faculty of Physics University of Bialystok
Course coordinator	Katarzyna Rećko
Academic teachers	
Remarks	-

B. Informacje szczegółowe

Nazwa pola	Treść
Name of the academic teacher	Katarzyna Rećko
Academic degree	PhD
Form of the class	Seminar or laboratory
Learning outcomes	They will be posted on the university platform in the form of the points
Assessment methods and criteria for this course	Each lecture ends with a bulleted homework. By gathering 51% or more of the total points pool the final mark has usually increased by half
Type of examination	Test and open questions
A list of topics	The discovery and properties of neutrons; Neutron sources, classification and characteristics of the beamline; Interaction of neutrons with matter; How to polarize neutrons? Neutron diffraction (ND); Inelastic neutron scattering (ICNS), TAS - Triple Axes Spectrometry; SANS - low-angle neutron scattering, method time of flight (TOF) and TOF SANS; TOF ICNS, or time of flight method in inelastic scattering of neutrons; Pulse technique, Neutron spin echo (NSE), inelastic (INSE), and resonance, or zero field (ZFNSE); Crystal structures and phonon dynamics; Magnetic structures and dynamics of spin i.e. the dynamics of magnons; Modal phase transitions and finally the transition type of order - disorder;
Learning activities and teaching methods	The work in group, discussion panels, speeches, presentations etc.
Bibliography	G.E. Becon, Neutron Diffraction, Clarendon Press, Oxford (1975), and G.E. Becon, Neutron Diffraction, IL (1957); G. Becon, Neutron Diffraction, 2nd edition, Clarendon Press, Oxford (1962) L. Dobrzyński, K. Blinowski, Handbook on Neutron and Solid State Physics, ed. M. Cooper, Ellis Horwood series in Physics and its applications (1994) Yu.A. Izyumov, R.P. Ozerov, Magnetic Neutron Diffraction, Plenum Press, New York (1970) Enric Canadell, Marie-Liesse Doublet, and Christophe Iung, Orbital Approach to the Electronic Structure of Solids, Oxford University Press (2012)
Limit of places available	This depends on the class, seminar (up to 25 students) and laboratory (up to 12 persons)
Time	15 hours of course and 15 hours of seminar
Place	Faculty of Physics University of Bialystok