Thermonuclear power generation

Faculty of	**Mechanical and Power Engineering**
Name in English	**Thermonuclear power generation**
Name in Polish	**Energetyka termojądrowa**
Main field of study	**Power Engineering**
Specialization	**-**
Level of studies	**II level**
Form of studies	**full-time**
Kind of subject	**optional-specialization**
Subject code	**W09ENG-SM2357**
Group of courses	**NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15				
Number of hours of total student workload (CNPS)	25				
Form of crediting	Zaliczenie				
For group of courses mark final course with (X)					
Number of ECTS points	1				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BU) classes	0,68				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1.	Fundamentals of thermodynamics

SUBJECT OBJECTIVES

C1	Acquiring knowledge of the basics of nuclear physics, nuclear fusion and plasma physics
C2	Getting to know the various methods of controlled nuclear fusion
C3	Getting to know the results of the most important nuclear fusion experiments and applied engineering solutions

SUBJECT LEARNING OUTCOMES

relating to knowledge:	
PEU_W01	Knowledge and understanding of the basics of nuclear fusion
PEU_W02	Familiarization with modern technologies of controlled nuclear fusion and the challenges associated with it
relating to skills:	
PEU_U01	
relating to social competences:	
PEU_K01	

PROGRAMME CONTENT

Form of classes - lecture		Number of hours
Wy1	Introduction to nuclear physics: binding energy, basic fusion reactions.	2
Wy2	Basics of nuclear fusion, cross-section of the atom, Coulomb potential, tunnel effect on the example of the Schrödinger equation, Lawson's criterion.	2
Wy3-4	Methods of controlling plasma. Fusion reactors using a magnetic trap (Tokamak, Stellarator); Inertial reaktors. Usage of a laser to perform controlled fusion.	4
Wy5	Discussion of selected experiments: ASDEX, JET, WEST, Wendelstein 7-X, NIF. Plasma heating technologies, plasma dynamics and related phenomena.	4
Wy6	ITER reactor: main engineering challenges, superconducting magnets, cryogenic cooling. Prospects for building a power plant based on a thermonuclear reactor.	2
Wy7	Final test	1
Suma godzin		15

TEACHING TOOLS USED	
N1	Traditional lecture using multimedia tools
N2	Consultations

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F– forming (during semester), C– concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEU_W01, PEU_W02	Final test

PRIMARY AND SECONDARY LITERATURE

Primary literature	
1	Kenro Miyamoto, Fundamentals of Plasma Physics and Controlled Fusion, NIFS-PROC-48 by National Institute of Fusion Science (NIFS) in Tokio.
2	B.K.Hodge, Alternative Energy Systems and Applications, John Wiley and Sons, 2009
3	G. Neilson, Magnetic Fusion Energy: From Experiments to Power Plants, Woodhead Publishing
Secondary literaturę	
1	Steven Van Sciver, Hellium Cryogenics, Springer
2	R.P.Feynman, R.B.Leighton, M.Sands, „ The Feynmann Lecture of Physics”

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

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