

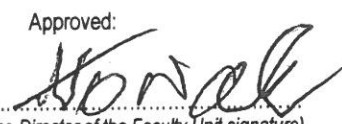
1. Course title: ENERGY FROM BIOMASS	2. Course code
3. Validity of course description: 2014/2015	
4. Level of studies: BA, BSc programme / MA, MSc programme lub 1st cycle / 2nd cycle of higher education	
5. Mode of studies: intramural studies / extramural studies	
6. Field of study: Environmental Engineering	(FACULTY SYMBOL) IŚIE
7. Profile of studies:	
8. Programme: Environmental Engineering and Clean Technologies in Power Industry and Motorization	
9. Semester: 3	
10. Faculty teaching the course: Institute of Thermal Technology	
11. Course instructor: Michał Chabiński, PhD	
12. Course classification: Specialization courses	
3. Course status: Compulsory	
14. Language of instruction: English	
15. Pre-requisite qualifications: Chemistry, Thermodynamics	
16. Course objectives: Knowledge of biomass as energy source	

17. Description of learning outcomes:

Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	Definition of biomass according to Polish and European law.	Written test	Lecture	K_W05 K_W07 K_W10
2.	Detailed characterization of biomass as a renewable energy source, comparison of biomass fuels properties and other renewable and non-renewable fuels properties	Written test	Lecture	K_W05 K_W07 K_W10 K_U25
3.	Characterization of biomass (solid, liquid and gaseous) thermal conversion processes and construction of biomass thermal conversion installations	Written test/	Lecture	K_W05 K_W07 K_W10 K_W18 K_U25 K_U27
4.	Energy from biomass in Poland and Europe. Current and future usage possibilities.	Written test/	Lecture	K_W05 K_W07 K_W10 K_U21 K_U25
5.	Basic solid and liquid biomass properties in comparison with non-renewable fuels properties	Written test/ lab. report	Lab. exercises	K_W12 K_W22 K_U18 K_U25
6.	Combustion of liquid biofuels and characteristic parameters of the process	Written test/ lab. report	Lab. exercises	K_W10 K_W22 K_U18 K_U25

7.	Analysis of data received during the laboratory exercises with conclusions	Written test/ lab. report	Lab. exercises	K_W21 K_U10
18. Teaching modes and hours				
Lecture / BA /MA Seminar / Class / Project / Laboratory				
Lecture 30h, Laboratory 15h				
19. Syllabus description:				
Lecture:				
Definition of biomass, law in Poland and Europe, characterization of different biomass fuels properties, characterization of different biomass combustion processes, examples of biomass combustion technologies and constructions (co-firing, combustion, pyrolysis), examples of energy from biomass devices in Poland and Europe, development and future possibilities of biomass use as a fuel				
Laboratory exercises:				
Chemical and physical properties of solid and liquid biofuels and comparison with non-renewable fuels				
Combustion of liquid fuel drop,				
Density and viscosity of liquid biofuels				
Temperature of ignition and combustion of biofuels				
20. Examination: semester 1				
21. Primary sources:				
1. W. Rybak, Spalanie i współspalanie biopaliwa stałych, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2006				
2. M. Ściążko, J. Zuwała, M. Pronobis, Współspalanie biomasy i paliw alternatywnych w energetyce, Wydawnictwo IChPW, Zabrze 2007				
3. W.M. Lewandowski, Proekologiczne odnawialne źródła energii, WNT Warszawa 2010				
22. Secondary sources:				
1. J.B. Bień, K. Wystalska, Przekształcanie osadów ściekowych w procesach termicznych, Wydawnictwo „Seidel-Przywecki Sp. Z o.o.”, Warszawa 2009				
2. P. Gradzik (red.), Biopaliwa, Akademia Rolnicza w Lublinie, Lublin 2003				
23. Total workload required to achieve learning outcomes				
Lp.	Teaching mode :	Contact hours / Student workload hours		
1	Lecture	30 / 5		
2	Classes	/		
3	Laboratory	15 / 10		
4	Project	/		
5	BA/ MA Seminar	/		
6	Other	/		
	Total number of hours	30 / 30		
24. Total hours: 60				
25. Number of ECTS credits: 2				
26. Number of ECTS credits allocated for contact hours: 1				
27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 1				
26. Comments:				


(date, Instructor's signature)

Approved:

(date, the Director of the Faculty Unit signature)