

(faculty stamp)

Syllabus

1. Name of the subject: Combustion of Fossil And Alternative Fuels			2. Course code:	
3. Valid in academic year: 2016/2017				
4. Course: MSc (second degree programme)				
5. Type of studies: full time stationery course				
6 Field of study: POWER ENGINEERING				
7. Profile of studies: General academic				
8. Programme: CLEAN FOSSIL AND ALTERNATIVE FUELS ENERGY (KIC INNOENERGY)				
9. Semester: 2				
10. Responsible unit: Institute of Thermal Technology (RIE-6)				
11. Lecturer: dr inż. Sebastian Werle				
12. Group of subjects: Selective subject				
13. Status: Obligatory				
14. Language of instruction: English				
15. Prerequisites: mathematics, thermodynamics				
16. Course objectives: The course is aimed at delivering the most recent information on the co-combustion of biomass or waste together with a base fuel (coal) in a boiler. The module makes students to show ability to use knowledge, ideas and technology to create or significantly improve products, services, processes or business model.				
17. Learning outcomes:¹				
Nr	Description of learning outcome	Method of assessments	Type of classes	Reference to learning outcomes
1	Student is able to define waste, biomass and waste types in terms of the law	Written test, oral answer	Lectures, Sminar	K2A_W10, K2A_U10, K2A_U17
2	Student is able to explain and compare the properties of waste and biomass to fossil fuels	Written test, oral answer	Lectures	K2A_W10, K2A_U17
3	Student is able to discuss the process of co-firing based on the real installation	Written test	Lectures, Project, Seminar, Seminar	K2A_W10, K2A_W11,
4	Student is able to characterize the perspective of the use of biomass and waste in Poland and Europe in comparison to other energy sources	Elaborated project	Project, Seminar	K2A_W10, K2A_W17, K2A_U10, K2A_U13, K2A_U26
5	Student is able to prepare energy balance for co-combustion systems based on biomass and waste	Written test, elaborated project, oral answer	Lectures, Project	K2A_W10, K2A_W14, K2A_W17, K2A_U11, K2A_U13, K2A_U15, K2A_U22, K2A_U26

¹ 5-8 learning outcomes should be given

6	Student is able to explain the basic quantities characterizing complex power systems based on the use of biomass and waste	Presentation	Seminar	K2A_W10, K2A_U10,
18. Type of classes and their duration Lecture: 15h Project: 15h Seminar 15h				
19. Content of the course: Lectures: Theory of combustion (and co-combustion), principle of different methods of co-combustion, principles of biomass and fuel properties, advantages and disadvantages of co-combustion, environmental and technological impact of co-combustion. Lectures are conducted in an interactive way with use of audio-visual tools. During the lecture problem questions/topics are raised, students take part in the discussion and brainstorm, trying to find solution/answers, assess existing solutions as well as develop critical thinking. Students are encouraged to participate in discussions which are moderated by the tutor. Students will be able to explain the dynamic nature of complex systems and change over time. Seminar: Multimedia presentations prepared and given by students connected with different aspects of co-combustion in boilers. Project: Research on co-combustion of waste agricultural biomass and sewage sludge in the power engineering boiler. New innovative solutions should be proposed by students. Proposal will be assessed by tutor who will conduct discussion about obtain results with the rest of the group. Students will be required to make assessments and values judgments of solutions proposed by their colleagues according to their knowledge and competence as well as their personal experiences. Solutions should contain technological, economic and environmental part. This makes students to think in a multidimensional way taking into consideration different aspects both technological as well as economic and environmental. This finally should lead to creation to new product or service which does not exist on the market.				
20. Examination: no				
21. Basic literature: 1. Grammelis P. (ed.), Solid biofuels for energy, Springer 2011 2. McGowan T.F. (ed.), Biomass and Alternate Fuel Systems. An engineering and economic guide. Wiley 2009				
22. Other reading: 1. Niessen W.R., Combustion and incineration processes, CRC Press, 2010 2. Scientific journals available in university network (Scopus, Science direct etc.)				
23. Work load of the student necessary to achieve the learning outcomes				
Lp.	Type of classes	Number of contact hours / student work		
1	Lectures	15/7		
2	Recitations	/		
3	Lab	/		
4	Project	15/20		
5	Seminar	15/15		
6	Other (participation in consultations associated with project execution)	3/		
	number of hours (subtotal)	48/42		
24. Total number of hours: 90				
25. Number of ECTS credits: ² 3				
26. Number of ECTS credit points gained during classes (contact hours): 2				
27. Number of ECTS credits gained during practice oriented classes (labs, projects): 1				

² 1 ECTS point – 30 hours workload

26. Remarks:

Teaching tools: **learning by doing**

The overall assessment consist of two steps:

1. Check of fulfilling of module LO consequently OLOs criteria.
2. Assessment and grading of the quality of students work and reached LO.

EIT OLOs assessed in the subject :

- Value judgments and sustainability competencies (EIT OLO 1)
- Entrepreneurship skills and competencies (EIT OLO 2)
- Innovation skills and competencies (EIT OLO 4)
- Research skills and competencies (EIT OLO 5)
- Intellectual transforming skills and competencies (EIT OLO 6)

The Method of assessments indicated in point 17 includes assessment of learning outcomes and OLOs

Grading:

Grading formula: $FG = PMWF_{lec} * PMG_{lec} + PMWF_{proj} * PMG_{proj} + PMWF_{sem} * PMG_{sem}$

Where:

- FG-final grade
- $PMWF_{lec}$ – Lecture part weighting factor – 0,4
- PMG_{lec} – Grade of achieved LOs relevant to lecture
- $PMWF_{proj}$ – Project part weighting factor – 0,3
- PMG_{proj} – Grade of achieved LOs relevant to project
- $PMWF_{sem}$ – Seminar part weighting factor – 0,3
- PMG_{sem} – Grade of achieved LOs relevant to Seminar

All LO weighting factors associated with part of the module (PM) equal 1.

Accepted:

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(Date and signature of the responsible instructor)

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(date and signature of teh director of the institute, chair, Director of Foreign Language College/head or director of inter-faculty unit)