COURSE DESCRIPTION

- Course name: Renewable energy sources in domestic and power sector

Form of course	***Lecture***	***Tutorial***	***Laboratory***	***Project***	***Seminar***
Total number of hours	*0*	*0*	*46*	*-*	*14*
Form of completion	*-*	*-*	*credit*	*-*	*credit*

- Initial requirements: basic of thermodynamics, basic of combustion
- Name, surname, title of teacher: Bartosz Gil, dr inż., Magdalena Nemś, dr inż, Michał Ostrycharczyk, dr inż., Krzysztof Mościcki, dr inż., Łukasz Niedźwiecki, mgr inż.
- Aims of course and educational outcomes:

  Aims: familiarization with solar systems, knowledge of basic definitions and parameters related to solar energy, description of the renewable fuels like biomass, hydrogen, biogas, optimization of the use of these fuels in power sector from small scale boilers 20kW to power plant unit 200MW

  Educational outcomes: ability to design heating systems with the use of solar collectors, ability to choose the appropriate working parameters of the installation, ability to analyze measuring data and validation of the model results, ability to determine how to increase the efficiency and how to decrease the pollution from combustion of renewable fuels, knowledge of the various types of energy conversion.
- Form of teaching (traditional / e-learning): Traditional
- Short description of the course content:

  Issues related to renewable energy, solar energy, biomass energy, hydrogen energy, will be presented. A course starts from the renewable source of energy - solar energy. The knowledge of solar collectors types, computational models of solar collectors and applied construction materials will be discussed. Further the biomass and hydrogen, as a representative renewable fuels will be discussed. In this part of the course the use of solid renewable fuels will be presented for various cases, with the capacity varying from small scale boilers 20kW to power plant unit 200MW. Theoretical and experimental laboratory covers performing measurements on the combustion installation, calculation, experimental studies, analysis and comparison of obtained results. The students gain knowledge about the calculation and modeling of solar installations, biomass combustion, hydrogen production. At the end of the course, a report will be presented by the students.

- Laboratory – content:

Form of classes - laboratory		**Number of hours**
Lab1	Sun and solar radiation. Solar collectors - construction, classification, efficiency of energy conversion.	4
Lab2/3	Experimental study of the operating parameters of solar collectors	8
Lab4	Introduction to TRNSYS. Annual analysis of the solar system's operation.	4

Lab5	Comparison of experimental and numerical results.	4
Lab6	Experimental research various types of renewable fuels (biomass, gas) during combustion processes.	10
Lab7	Hydrogen production from renewable sources and usage as an fuel.	8
Lab8	Analysis and comparison of experimental data.	8
	Total hours	**46**

- Basic literature:

  Duffie J.A., Beckman W.A. Solar engineering of thermal processes. John Wiley & Sons Inc., Hoboken New Jersey 2006.

  Articles related to different kinds of fuels and combustion processes

- Additional literature:

  Kalogirou S. Solar Energy Engineering, 2nd Edition: Processes and Systems. Academic Press 2014.

- Completion rules: presentation summarizing the work carried out or final report.