

## Detailed course description (SUBJECT CARD)

<b>Course title:</b>	<b>Waste to Energy</b>
<b>Course code:</b>	
<b>Classification of a course group :</b>	<b>specialization course</b>
<b>Course type:</b>	general obligatory
<b>Field of study:</b>	<b>Power Engineering KIC</b>
<b>Level of study:</b>	second-cycle
<b>Profile of study:</b>	general academic
<b>Mode of study:</b>	full-time programme
<b>Specialty (specialisation):</b>	Energy Transition
<b>Year of study:</b>	1
<b>Semester:</b>	<b>winter</b>
<b>Teaching modes and teaching hours:</b>	lectures – 15 laboratories – 15
<b>Language/s of instruction:</b>	<b>English</b>
<b>Number of ECTS credits (according to the study programme):</b>	<b>2</b>

\* – leave the appropriate option

### 1. Course objectives:

The course is aimed at delivering the information about modern technologies and environmental restrictions of recovering energy from waste. The course covers the following general topics: solid waste composition and quantities, classification of fuels, energy potential in waste, waste management and segregation, waste to energy technology, emission and energy balance of waste incineration and Refuse Derived Fuel (RDF or SRF) technology.

### 2. Relation of the field-related learning outcomes to modes of teaching and methods of verification as well as to assessment of student's learning outcomes:

symbol	assumed learning outcomes <i>a student who completed the course:</i>	teaching modes	verification methods and learning outcomes assessment
<b>Knowledge: a student</b>			
K2A_W06	demonstrates deep knowledge of principles of conducting physical measurements and describing their results, types of measurement uncertainties, ways of their determination and expression	Lecture	essay
K2A_W16	is familiar with the principles of using the waste-to-energy process	Lecture	essay
<b>Skills: a student can</b>			
K2A_U07	conduct physical measurements, as well as describe and present their results in a clear way	laboratories	report and presentation
K2A_U17	select fuel types for the needs of energy processes being implemented and/or designed	laboratories	report and presentation

### 3. The content of study programme ensuring learning outcomes (according to the study programme):

### 4. Description of methods of determination of ECTS credits:

Type of activity	Number of hours / ECTS credits
Number of course hours regardless of a teaching mode	30/1
Student's workload 1* writing an essay	7/0,3
Student's workload 2* interpretation of results and preparation a labs report	11/0,4
Student's workload 3* preparation oral and multimedia presentation of the report	7/0,3
The other**	
<b>Total hours:</b>	<b>55</b>
<b>Number of ECTS credits allocated to a course</b>	<b>2</b>

Explanation:

\* – student's workload - fill in the types of activities, e.g. *preparation for a course, interpretation of results, making a course report, preparation for an exam, studying sources, making a project, presentation and report, doing written assignment, etc.*

\*\* – the other e.g. *extra course hours*

5. Summary indexes:

- number of course hours and ECTS credits at the course with a direct participation of academic teachers or other persons running the course and supervising students;
- number of course hours and ECTS credits at the course related to the scientific activity conducted at the Silesian University of Technology in a discipline or in disciplines to which a field of study is assigned - in the case of studies with a general academic profile;
- number of course hours and ECTS credits at the course developing practical skills- in the case of practical studies;
- number of course hours conducted by academic teachers employed by the Silesian University of Technology as their primary workplace.

6. Persons conducting particular modes of courses (name, surname, academic degree or degree in arts, title of professor, business e-mail address):

Lectures: prof. Jan Nadziakiewicz, e-mail: jnadziak@onet.pl

Laboratories: Marcin Landrat, PhD Eng, e-mail: marcin.landrat@polsl.pl

7. Detailed description of teaching modes:

1) Lectures:

- detailed programme's content:
  1. Solid waste composition and quantities,
  2. Classification of fuels,
  3. Energy potential in waste,
  4. Waste management and segregation,
  5. Waste to energy technology,
  6. Emission and energy balance of waste incineration,
  7. Refuse Derived Fuel (RDF or SRF) technology.
- teaching methods, including distance learning:

case teaching, multimedia presentation, discussion
- form and criteria for semester completion, including retake tests, as well as conditions for admission to the examination:

Completion of the lecture is based on a positive essay assessment.
- course organisation and rules of participation in the course, with an indication whether a student's attendance is obligatory  

At the lectures student's attendance is not obligatory

8. Laboratories:

The second part of course is done combining project and laboratory classes. It is based on the research of waste substances to determine their fuel properties:

1. Determination of carbon and hydrogen content
2. Determination of sulfur content
3. Determination of combustible and noncombustible parts content
4. Determination of moisture content
5. Determination of heat of combustion and calorific value
6. Determination of volatiles content
7. Determination of chlorine content

Based on the knowledge acquired from lab research, on the tested waste, students propose and develop a method of managing these waste.

Students would require not only to use the knowledge in the field of waste to energy but also the skills of analysis the legal and economic aspects on this subject. And most importantly, they will gain the ability to work independently in a chemical laboratory, which can be useful in later professional career. Students will be divided into small groups cooperating with each other to achieve a common end result.

- teaching methods, including distance learning:

multimedia presentation, discussion, PBL

- form and criteria for semester completion, including retake tests, as well as conditions for admission to the examination:

Completion of the lecture is based on a positive essay assessment.

- course organisation and rules of participation in the course, with an indication whether a student's attendance is obligatory

At the classes student's attendance is obligatory

9. Description of the method for determining the final grade (rules and criteria for evaluation, as well as the final grade calculation method in the case of a course comprising more than one teaching mode, taking into account all teaching modes and all exam dates and credit tests including retake exams and tests):

The final grade of the subject is the value of the arithmetic mean of the grade of the lecture and the grade of laboratories.

10. Method and procedure for making up for

- student's absence from the course,

Depending on the form of abandoned classes, it is determined by the teacher during consultations in accordance with the forms of conducting classes and the conditions for getting credit set out in point 7 of this card.

- differences in study programmes for students changing their field of study, changing university or resuming studies at the Silesian University of Technology,

Depending on the arrears, it is determined by the teacher during consultations in accordance with the forms of conducting classes and the crediting conditions set out in point 7 of this card.

11. Prerequisites and additional requirements, taking into account the course sequence:

Microsoft Office (Word, Excel, Power Point), English knowledge (B2)

12. Recommended sources and teaching aids:

- Rogoff M.J., Scriver M.: Waste to Energy. Technologies and Project Implementation. Elsevier 2011.
- Hanjalic K., van de Krol R., Lekic A. (editors): Sustainable Energy Technologies. Springer 2008.
- Wandrasz J., Pikoń K., Czekalska Z. (editors): Waste to Energy and Environment. Silesian University of Technology. 2010.
- Wilk R.: Clean combustion technologies. Gliwice. 2002.
- Scientific journals available in university network (Scopus, Science direct etc.)

13. Description of teachers' competences ( e.g. publications, professional experience, certificates, trainings etc. related to the programme contents implemented as a part of the course):

- Case Study Courses (2016, 2019),
- Pedagogical Evolution Toolbox workshop (Grand vision, Elements of design thinking, Grinding-Reverse Brainstorming, The Cornell Notes system and others) (2016),
- 1st degree Coaching Course (2016),
- Prezi soft skills course (creating presentations) (2016),
- Training in the field of "Business presentations and public speaking" (2017),
- Certification course of Tutor School (2018),
- Accreditation course of the Tutor School (2019).

14. Other information: