COURSE DESCRIPTION CARD - SYLLABUS

Course name
ALTERNATIVE FUELS ON THE DECARBONIZATION ROAD

Course

Proposed by Discipline
Environmental engineering, mining and energy

Year/Semester
II/4, III/6

Type of studies
Doctoral School

Course offered in
English

Form of study
full-time

Requirements
elective

Number of hours

Lecture
4

Tutorials

Projects/seminars

Number of credit points

1

Lecturers

Responsible for the course/lecturer:
dr hab. inż. Rafał Ślefarski,prof. PP
email: rafal.slefarski@put.poznan.pl
phone: +48 61 665 2218
Faculty of Environmental Engineering and Energy
Poznan University of Technology
ul. Berdychowo 4, 61-131 Poznan, Poland

Responsible for the course/lecturer:

Prerequisites

Knowledge: PhD student has basic knowledge in the field of renewable energy resources, chemistry, thermodynamic and fluid mechanic as well as in the field of thermal processes. PhD student knows the structure of basic energy systems and machines and the physical and chemical phenomena occurring during the production of heat and electricity.

Skills: doctorate is able to analyze scientific problems using databases and critically evaluate the quality of input data.

Social competencies: doctoral student is able to consider opinions of other social groups in his/her deliberations and to conduct debates on various aspects related to the conducted research.

Course objective

To acquaint PhD students with the theoretical and practical problems related to production and use of renewable fuels and alternative gaseous fuels.

Course-related learning outcomes

Knowledge

A PhD student who graduated from doctoral school knows and understands:
1) global achievements, covering theoretical foundations as well as general and selected specific issues that are relevant to technologies for production of green fuels, [P8S_WG/SzD_W01]
2) economic, legal, ethical and other vital conditions related to scientific activity in the fiels of energy production basen on renewable fuels such as: hydrogen, biomass, biogas, syngas etc. [P8S_WK/SzD_W06]

Skills

A PhD student who graduated from doctoral school can:
1) critically analyze and assess scientific research results, work of experts and other creative activities in field of new fuels for industrial procesess, [P8S_UW/SzD_U02]
2) communicate on specialized issues concerning decarbonization processes at a level that allows active participation in the international scientific community. [P8S_UK/SzD_U04]

Social competences

A PhD student who graduated from doctoral school is ready to:
1) critically evaluate their own contribution to development of new technologies related to production fuels with low carbon footprint, [P8S_KK/SzD_K02]
2) think and act in an entrepreneurial manner in accordence with acts related to enviromental protection, especially related to decarbonization process. [P8S_KO/SzD_K06]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

PQF code	Methods for verification of learning outcomes	Assessment criteria
W01, W06	written final test covering the verification of theoretical knowledgeinal test, 10 questions from the material presented during the lectures	number of points 10, pass rate 50%
U02, U04	final test and rewarding the knowledge necessary to solve scientific problems in the subject, 2 problems related to presented material	number of points 4, pass rate 50%
K02, K06	written test of social skills in the subject, two open questions	number of points 4, pass rate 50%

Programme content

1. Green hydrogen production in Power to H2 technology.
2. Hydrogen application.
3. Biomass as a fuel.
4. Biogas production.
5. Thermal processes of biomass utilization – production of synthetic fuels (gasification, pyrolysis and methanisation processes).
6. Sustainable aviation fuels.
7. Alternative fuels for transportation.

Teaching methods

Lecture: multimedia presentation including illustrations, examples and a tutorial analysis.

Bibliography

Basic

1. Advances in Power-to-X: Processes, Systems, and Deployment, Valerie Eveloy, Luis M. Romeo, David Parra, Meysam Qadrdan

2. Gasification, Second edition. Christopher Higman, Maarten van der Burgt, Gulf Professional Publishing, 2008

3. Biomass Gasification, Pyrolysis and Torrefaction. Prabir Basu, Elsevier, 2013

4. Biofuels: Greenhouse Gas Mitigation and Global Warming: Next Generation Biofuels and Role of Biotechnology, Ashwani Kumar, Shinjiro Ogita, Yuan-Yeu Yau, 2018

Additional

1. Fossil Fuel Hydrogen: Technical, Economic and Environmental Potential, William J. Nuttall, Adetokunboh T. Bakenne, 2019

2. Synthesis Gas Combustion: Fundamentals and Applications, Tim Lieuwen, Vigor Yang, Richard Yetter, 2009

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1.0
Classes requiring direct contact with the teacher	7	0.3
Student's own work (literature studies, preparation for evaluation) [1]	18	0.7

[1] delete or add other activities as appropriate