Nazwa w jęz. angielskim: Municipal and distributed energy systems

Dane dotyczące zajęć:
Information on course:

Jednostka oferująca: Wydział Inżynierii Środowiska i Energetyki // dr hab. inż. Jacek Kalina, prof. PŚ
Course offered by: Faculty of Energy and Environmental Engineering // dr hab. inż. Jacek Kalina, prof. PŚ

Język wykładowy:

angielski

Language:

English

Strona WWW:
Course homepage:

Skrócony opis:

Short description:

Course objectives: The purpose of the course is to provide students with a basic knowledge and the fundamental principles of energy systems engineering in the field of municipal energy systems and distributed energy systems, contemporary technological solutions and investment project development procedure.
Pre-requisite qualifications: mathematics, thermodynamics, heat transfer, energy conversion machinery.

Opis:

Description:

Lecture:
energy demand analysis, description of energy conversion technologies, characteristics of main components of thermal plants, plant design problems; energy demand analysis in DE systems, mass and energy balances of thermal processes and systems; process flowsheeting, design and off-design modes of operation, introduction to optimization, introduction to the computer packages used in handson training, thermodynamic and financial evaluation of investment projects.

Recitations:
Classes will be based on case studies of different projects. Students will be given classes of different type: diagnostic cases, find solution cases. They will work in small groups and exchange findings and results in open class discussion. Sample cases include: small-scale cogeneration plant in building application, conversion of municipal coal fired heating plant into dual fuel cogeneration facility, sizing of an industrial combined cycle heat and power plant, sizing heat storage unit for a heating network, design of an integrated biomass gasifiation heat and power plant, cogeneration plant with an ORC module, mass and energy balancing within trigeneration plant.

Project:
Within hands-on training the students build and solve problems in the field of energy plant design using the following software: Ebsilon Professional from STAEG, Cycle Tempo from University of Delft. They are instructed how to build and run the models. The examples of problems are as follows: modelling of coal fired cogeneration plant, modelling of gas turbine plant, gas engine plant, fuel cell plant, cogeneration, trigeneration etc. Models will be build using assumptions elaborated during classes.

Number of hours of classes with direct participation of academic teachers or other persons teaching courses and students
Lecture: 15h
Exercises: 30h
Project: 15h
Number of ECTS credits: 5

Literatura:

Bibliography:

1. Cengel Y., Boles M.A.: Thermodynamics - An Engineering Approach. ISBN 978-007-131111-3,
2. Cengel Y.A., Ghajar A.J. Heat and Mass Transfer - Fundamentals and Applications. ISBN 978-007-131112-0;
3. Bejan A., Tsatsaronis G., Moran M.: Thermal design and optimisation. A Wiley- Interscience Publication, John Wiley and Sons, INC. New York 1996.;
4. Jogesh Jaluria: Design and Optimization of Thermal Systems, Second Edition, December 13, 2007 by CRC Press ISBN 9780849337536 - CAT# DK6038, Series: Mechanical Engineering;
5. Ziębik A., Hoinka K.: Energy Systems of Complex Buildings, Springer, 2013,
6. B.K. Hodge, Robert Taylor: Analysis and Design of Energy Systems 3rd Edition. ISBN-13: 978-0135259733
7. Lund H.: Renewable Energy Systems: A Smart Energy Systems Approach to the Choice and Modeling of 100% Renewable Energy Solutions. ISBN 978-0-12-410423-5
8. Andrea Lazzaretto, Andrea Toffolo: Optimum Choice of Energy System Configuration and Storages for a Proper Match between Energy Conversion and Demands. ISBN 978-3-03928-036-0, ISBN 978-3-03928-037-7 (PDF)
9. Favorsky, R.A. Chaplin and Christos Frangopoulos: Mechanical engineering, energy systems and sustainable development. ISBN 1848262965, 9781848262966
10. Ebsilon Professional Package Documentation;
11. CycleTempo Package Documentation.

Efekty uczenia się:

Learning outcomes:

K_W12, K_W15, K_W16, K_W17, K_W18, K_W19, K_W20, K_W24, K_U20, K_U22, K_U24
Student is able to characterise fuels, energy carriers and energy processes (used in distributed energy sector) from ecology and energy point of view
Student can build mathematical model of a given energy installation and carry out technical analysis of energy processes based on combustion of fuels
Student can perform an initial feasibility study of an investment project in distributed energy sector
Student is able to use commercial software for design and analysis of energy processes

Metody i kryteria oceniania:

Assessment methods and assessment criteria:

Written test, oral answer
Reports on solved exercises
Elaborated project

Przynależność do grup przedmiotów w cyklach:
Element of course groups in various terms:

Opis grupy przedmiotów Course group description	Cykl pocz. First term	Cykl kon. Last term
przedmioty obieralne studia stacjonarne i niestacjonarne stopień studiów – dowolny kierunek studiów – dowolny, semestr dowolny elective courses full-time and part-time studies degree - any field of study - any semester - any	2023/2024	