POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

COURSE DESCRIPTION CARD - SYLLABUS

Course name

Exergy analysis

Course

Field of study	Year/Semester
Green energy	2/3
Area of study (specialization)	Profile of study
-	general academic
Level of study	Course offered in
Second-cycle studies	English
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	0	0
Tutorials	Projects/seminars	
0	0	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

Tomasz Mróz, Professor

Institute of Environmental Engineering and Building Installations

Faculty of Environmental and Energy Engineering

tomasz.mroz@put.poznan.pl

Tel. 61 665 2900

Responsible for the course/lecturer:

Prerequisites

Energy forms, principles of energy analysis, I and II law of thermodynamics, principles of heat exchange and fluid mechanics

Course objective

Introduction to methods of exergy analysis of energy systems.

Course-related learning outcomes

Knowledge

1.   Student knows the causes of irreversibilty of real thermodynamic processes.

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2.   Student knows the basics of exergy balancing.

3.   Student knows the principles of evaluation of internal exergy losses.

4.   Student knows the principles of evaluation of external exergy losses.

Skills

1.   Student is able to identify causes of irreversibility of energy processes.

2.   Student is able to create exergy model of simple and complex energy systems.

3.   Student is able to calculate internal and external exergy losses.

4.   Student is able to derive exergy efficiency.

Social competences

1.   Student is able to communicatively formulate conclusions and define problems within the exergy analysis.

2.   Student is able to solve tasks in a teamwork.

3.   Student is aware of the need of minimaizing of energy and exergy losses being the basis of sustainable development.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture

Credit in the form of oral examination. Closed questions of different kind. 50% of accesable points are required.

Programme content

Lecture:

1.   Irreversibility of thermodynamic processes – prawo Gouy'a-Stodoli law

2.   Definition of exergy.

3.   Principles of exergy balancing.

4.   Exergy balance equation - integral and differential form.

5.   Definition of exergy efficiency.

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6. Examples of exergy balance equation for simple and complex energy systems

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples, discussion.

Bibliography

Basic

1. Mróz T.M. (2013). Energy Management in Built Environment. Tools and Evaluation Procedures. Wydawnictwo Politechniki Poznańskiej.

2. IEA Annex 49 Report (2006). Low Exergy Buildings. iea.org

3. Wall G., Gong W.: On exergy and sustainable development – Part 1: Con-ditions and concepts. Exergy an International Journal 1 (2001), pp. 128-145.

4. Wang S.P. et all, A phenomenological equation of exergy transfer and its application, Energy, (30) 2005, pp. 8.

5. Vats K. Tiwari G.N.: Energy and exergy analysis of a building integrated semitransparent photovoltaic thermal (BISPVT) system. Applied Energy. 2012.

6. Yucer C.T., Hepbasli A.: Thermodynamic analysis of building using exergy analysis method. Energy and Buildings, 43 (2011) pp. 536-542.

Additional

Articles posted next to each topic and scholarly articles in the topic (Scoups database)

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam) [1]	20	1,0

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[1] delete or add other activities as appropriate