



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Auditing and Energy Management

### Course

Field of study

Environmental Engineering Second-cycle Studies

Area of study (specialization)

Heating, Air Conditioning and Air Protection

Level of study

Second-cycle studies

Form of study

part-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

### Number of hours

Lecture

18

Laboratory classes

Other (e.g. online)

Tutorials

10

Projects/seminars

### Number of credit points

3

### Lecturers

Responsible for the course/lecturer:

prof.dr hab.inż Tomasz Mróz

Responsible for the course/lecturer:

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Faculty of Environmental Engineering and Energy

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### Prerequisites

1.Knowledge:

Classification of renewable and non-renewable primary energy sources, evaluation of energy capacity of demand and supply side of energy market; ,

Principles of energy balancing, economic and ecological evaluation of energy systems in built environment.

2.Skills :

Application of energy balance equation in evaluation of energy systems in built environment;



### Course objective

Widening and deepening of knowledge, skills assessment of energy efficiency, economic and ecological energy systems in buildings.

### Course-related learning outcomes

#### Knowledge

1. The student has a theoretical and practical knowledge on the energy balancing of complex energy systems of complex systems in environmental engineering (obtained at the lecture)
2. The student knows the methods of static and dynamic evaluation of economic efficiency (obtained at the lecture and exercises)
3. The student knows the principles of energy auditing of buildings and technical equipment of buildings (obtained at the lecture and exercises)
4. The student is able to perform an energy performance certificate (obtained at exercises)

#### Skills

1. The student can construct evaluation model and energy balance equations for simple and complex energy systems in built environment (obtained at the lecture)
2. The student can calculate simple payback time (SPBT), net present value (NPV) and internal rate of return (IRR) for elements and energy systems used in built environment (obtained at the lecture and exercises)
3. The student is able to compare the energy assessment methods of buildings (energy performance certificate, LEED, BREEAM and other) (obtained at the lecture and exercises)

#### Social competences

1. The student understands the need for teamwork in solving theoretical and practical problems (obtained at the lecture and exercises)
2. The student is aware of the need for change in energy management in buildings arising from the implementation of the European Directive on the energy performance of buildings (obtained at the lecture and exercises) -]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures:

Written test of competences checking knowledge (4 open questions)

Exercises:

Written test of competences checking skills (2 exercises)



Evaluation criteria depending on the percentage obtained

Obtained percentage - mark

0% - 40% - insufficient (2.0)

41% - 60% - sufficient (3.0)

61% - 70% - sufficient plus (3.5)

71% - 80% - good (4.0)

81% - 90% - good plus (4,5)

91% - 100% - very good (5.0)

### Programme content

Course description:

Energy policy in Poland, basic financing mechanisms and effects of thermo-modernization projects, energy audit of the building - basics.

Detailed methodology for developing an energy audit for a building.

Energy-ecological assessment of buildings in full life cycle (LCA), application of standards PN-EN 15978 and PN-EN 15804.

Heat energy costs.

Heat protection requirements for WT buildings.

Energy balancing of buildings.

Static and Dynamic Methods of Economic Evaluation of Energy Projects.

Energy certificates for buildings (GREENBUILDING, LEED, breeam, DGNB).

### Teaching methods

Lecture with multimedia presentation.

Exercises - exercise method.

### Bibliography

Basic

1. Kurtz K., Gawin D.: Certyfikacja energetyczna budynków mieszanych z przykładami. Wrocławskie Wydawnictwo Naukowe Atla 2, Wrocław 2009



2. KOCZYK H. [i in.]: Ogrzewnictwo praktyczne. Projektowanie. Montaż. Eksploatacja. Certyfikacja energetyczna budynków. pod red. Haliny KOCZYK. Aut.: KOCZYK H., ANTONIEWICZ B., BASIŃSKA M., GÓRKA A., Makowska Hess R.. Poznań: SYSTHERM SERWIS S.C. 2009. 524 s., ISBN 978-83-61265-12-2.
3. USTAWA z dnia 29 sierpnia 2014 r. (Dz. U. z 2014 r. poz. 1200) o charakterystyce energetycznej budynków
4. Dz.U. poz. 376: Rozporządzenie Ministra Infrastruktury i rozwoju z dnia 27 lutego 2015 r. w sprawie metodologii wyznaczania charakterystyki energetycznej budynku lub części budynku oraz świadectw charakterystyki energetycznej
5. Dz.U. 2009 Nr 43 poz. 346 z dnia 17 marca 2009 r. w sprawie szczegółowego zakresu i form audytu energetycznego oraz części audytu remontowego, wzorów kart audytu, a także algorytmu oceny opłacalności przedsięwzięcia termomodernizacyjnego
6. Dz. U. z 2008 r. Nr 223, poz. 1459 z dnia 21 listopada 2008 r. o wspieraniu termomodernizacji i remontów
7. PN-EN-15459-2008 Charakterystyka energetyczna budynków. Ekonomiczna ocena instalacji energetycznych w budynkach

Additional

### Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	28	1,0
Student's own work (literature studies, preparation for tutorials, preparation for tests, project preparation) <sup>1</sup>	47	2,0

<sup>1</sup> delete or add other activities as appropriate