COURSE DESCRIPTION CARD - SYLLABUS

Course name
Audyting and Energy Management [N2IŚrod2-ZwCKiOP>AiG]

Course

Field of study
Environmental Engineering

Year/Semester
2/3

Area of study (specialization)
Heating, Air Conditioning and Air Protection

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
18

Laboratory classes
0

Other (e.g. online)
0

Tutorials
10

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

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.
Energy and exergy principles of energy audit
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.
Energy and exergy balancing of buildings.
Static and Dynamic Methods of Economic Evaluation of Energy Projects.
Energy certificates for buildings (GREENBUILDING, LEED, breeam, DGNB).

Course topics

Energy balance of building's energy systems - case studies; Exergy balance of building' energy systems - case studies; LCA analysis of buildings - case studies; Ecomic analysis i building's evaluation - case studies; Ceertification of buildings - case studies

Teaching methods

Lecture with multimedia presentation.
Exercises - exercise method.

Bibliography

Basic:

1. Kurtz K., Gawin D.: Certyfikacja eneregtyczna budynków mieszlanych 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.

Mróz T.M.: Energy Management in Built Environment. Toolas and Evaluation Procedures, Wydawnictwo Politechniki Poznańskiej, 2022

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:

1. Kreith, F., West, R.E.: CRC Handbook of Energy Efficiency. CRC Press Inc. 1997

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	28	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	47	2,00