STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Energy Protction Building**		Code **1010102221010132021**
Field of study **Environmental Engineering Second-cycle**	Profile of study (general academic, practical) **(brak)**	Year /Semester **1 / 2**
Elective path/specialty **Heating, Air Conditioning and Air Protection**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **30** Classes: **15** Laboratory: **-** Project/seminars: **-**		No. of credits **3**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences**		ECTS distribution (number and %) **3 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Knowledge of thermodynamics, heat transfer and fluid mechanics, heating, ventilation, air conditioning and refrigeration, and general construction.
2	**Skills**	The ability to perform mathematical transformations, derivation of mathematical formulas and solving classic linear equations and differential equations in the field of heat transfer. The ability to perform hydraulic calculations in the field od ventilation, air conditioning and refrigeration and perform engineering drawings in AutoCAD in the range discussed in the first cycle of study.
3	**Social competencies**	The student should be aware of the consequences of decisions. The student understands of the need to constantly update and supplement knowledge and skills.

Assumptions and objectives of the course:

-Acquiring the knowledge and skills of the new generation of buildings, environmentally friendly and energy-efficient technical solutions saving energy during operation.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Knowledge in the field of construction development from the energy point of view - [[K2_W02, K2_W04]]
2. Knows the energy standards of buildings and their evolution - [[K2_W02, K2_W04]]
3. Knows expertise in the environmental assessment of buildings: LEED, BREEAM - [[K2_W02, K2_W04]]
4. Knows expertise in the analysis of energy and environmental building life cycle - [[K2_W02, K2_W04]]
5. Knows the requirements for energy efficient buildings in the field of construction and technical equipment - [[K2_W02, K2_W04, K2_W07]]
6. Knows the requirements for passive buildings and nearly zero-energy buildings - [[K2_W02, K2_W04, K2_W07]]
7. Knows the principles of design and implementation of the partitions in the energy-efficient buildings - [[K2_W02, K2_W07]]
8. Knows heating, ventilation and cooling systems for energy efficient buildings - [[K2_W02, K2_W04, K2_W05, K2_W07]]
9. Knows basic calculation programs for the evaluation and design of energy efficient buildings - [[K2_W02, K2_W04, K2_W07]]
10. Knows the rules of the modernization of existing buildings for energy-saving standards - [[K2_W02, K2_W04]]
11. Knows examples of solutions of energy efficient buildings of various types - [[K2_W02, K2_W04]]

Skills:

1. Can define the parameters for the calculation of the energy efficient buildings - [[K2_U01, K2_U09, K2_U10]]
2. Is able to perform calculations in the energy performance of the energy efficient building - [[K2_U01, K2_U09, K2_U10]]
3. Is able to perform the detaild calculation of components for the construction and installation of energy-efficient building - [[K2_U01, K2_U09]]
4. Is able to perform economic viability calculations of energy-efficient building with different - [[K2_U01, K2_U07, K2_U09]
5. Is able to choose the components for building passive - [[K2_U01, K2_U07]]
6. Can use component manufacturers for parts and equipment and assemble them for the planned energy-efficient building of given parameters - [[K2_U01, K2_U07]
7. Is able to do the drawings for the project in AutoCad technology - [[K2_U01, K_U07]]

Social competencies:

1. Is aware of the impact of the quality of the building on the health and well-being of - [[K2_K02, K2_K05, K_K07]]
2. Is aware of the need to systematically deepening and broadening of its powers - [[K2_K01]]
3. Is aware of the importance of modern buildings for the future and safety of man - [[K2_K02, K2_K05, K2_K07]]

Assessment methods of study outcomes

-Lecture:

written test - duration 60 minutes - knowledge test (10 questions)

oral exam

Classes:

two tests of knowledge during the semester.

Course description

-Historical development of the construction industry. Sustainable development in the construction industry. Methods of assessing the impact of building on the environment. The principles of environmental assessment of buildings. Methods: LEAD, BREEAM. Directive on energy performance and standards support. Changes in energy standards of buildings. Requirements for energy efficient buildings: construction and installation. The definition of passive house standard or nearly zero-energy standard. Way to achieve the standard of those buildings and methods of design calculations. Principles of design partitions and building components for energy-efficient standards. Systems of technical equipment and energy sources for energy efficient buildings. Sources of energy based on renewable energy. Examples of solutions of energy efficient buildings. Principles of the modernization of existing buildings for energy-effici standards. Principles of operation of energy efficient buildings.

Basic bibliography:

1. Feist W.: Podstawy budownictwa pasywnego. PIBP Gdańsk 2007.
2. Wnuk R.: Instalacje w domu pasywnym i energooszczędnym. Przewodnik Budowlany 2007.
3. Górzyński J.: Podstawy analizy środowiskowej wyrobów i obiektów. WNT Warszawa 2007.
4. Recknagel H., Sprenger E., Schramek E.R.: Kompendium wiedzy: ogrzewnictwo, klimatyzacja, ciepła woda, chłodnictwo, Wydawnictwo Omni Scala, Wrocław 2008.
5. Haas K-H.: Der Weg zum Null-Energiehaus. VDE GmbH Berlin 2013.

Additional bibliography:

1. Harvey Danny L.D.: A Handbook on Low-Energy Buildings and District-Energy Systems. Earthscan London 2007.
2. Tymkow P. i inni: Building Services Design for Energy Efficient Buildings. Earthscan London and New York 2013

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	30
2. Participation in classes	15
3. Implementation of classes (work at home incl. e.g. software installation and software learning)	15
4. Preparing to the final test and presence on it	5

Student's workload

Source of workload	hours	ECTS
Total workload	65	3
Contact hours	45	2
Practical activities	20	1