

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Audytng and Energy Management		Code 1010135231010100351
Field of study Enviromental Engineering Extramural Second-	Profile of study (general academic, practical) general academic	Year /Semester 2 / 3
Elective path/specialty Heating, Air Conditioning and And	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) part-time	
No. of hours Lecture: 20 Classes: 10 Laboratory: - Project/seminars: -		No. of credits 2
Status of the course in the study program (Basic, major, other) other		(university-wide, from another field) university-wide
Education areas and fields of science and art technical sciences		ECTS distribution (number and %) 2 100%
Responsible for subject / lecturer: dr inż. Małgorzata Basińska email: malgorzata.basinska@put.poznan.pl tel. (61) 647 5824 Faculty of Civil and Environmental Engineering ul. Piotrowo 5 60-965 Poznań		Responsible for subject / lecturer: dr inż. Andrzej Górka email: andrzej.gorka@put.poznan.pl tel. (61) 647 5826 Faculty of Civil and Environmental Engineering ul. Piotrowo 5 60-965 Poznań
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Knowledge of selected aspects of building physics, heat and mass transfer, thermodynamic cycles. Basic knowledge of building construction. The basic economic knowledge.
2	Skills	Ability to effectively use knowledge of mathematical analysis, physics and economic. Application of energy balance equation in evaluation of energy systems in built environment. Calculation of coefficients of energy, economic and ecologic efficiency of energy systems in built environment.
3	Social competencies	Awareness of the need to constantly update and supplement knowledge and skills.
Assumptions and objectives of the course: Widening and deepening of knowledge, skills assessment of energy efficiency, economic and ecological energy systems in buildings.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. The student has a theoretical and practical knowledge on the energy balancing of complex energy systems of complex systems in environmental engineering - [K2_W04, K2_W05]		
2. The student knows the methods of static and dynamic evaluation of economic efficiency - [K2_W06, K2_W08]		
3. The student knows the principles of energy auditing of buildings and technical equipment of buildings - [K2_W04, K2_W06, K2_W08]		
4. The student is able to perform an energy performance certificate - [K2_W02, K2_W04, K2_W06, K2_W07]		
Skills:		
1. The student can construct evaluation model and energy balance equations for simple and complex energy systems in built environment - [K2_U10, K2_U11]		
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 - [K2_U10, K2_U14]		
3. The student is able to compare the energy assessment methods of buildings (energy performance certificate, LEED, BREEAM and other) - [K2_U11, K2_U12, K2_U15, K2_U16]		
Social competencies:		

1. The student understands the need for teamwork in solving theoretical and practical problems - [K2_K03]
 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 - [K2_K07]

Assessment methods of study outcomes		
Lectures: Written test of competences checking knowledge (5 questions)		
Tutorials: Written test of competences checking skills (3 exercises)		
Course description		
Basic knowledge on auditing and energy management: definition of energy management, definition of energy performance of buildings, non-renewable primary energy sources, renewable primary energy sources, coefficient of non-renewable primary energy consumption, coefficient of carbon dioxide emission. Principles of energy balancing in built environment, calculation of energy efficiency of complex energy systems in built environment. Static and dynamic methods of economical evaluation of energy systems in built environment: simple payback time (SPBT), dynamic payback time (DPBT), total operation cost (TOC), net present value (NPV), internal rate of return (IRR). Principles of energy auditing: evaluation of energy use in buildings and technical systems of buildings; identification of technically acceptable scenarios of buildings retrofitting process, evaluation of chosen scenarios using energy, economy and ecological criteria.		
Basic bibliography:		
Additional bibliography:		
Result of average student's workload		
Activity	Time (working hours)	
1. Participation in lectures:	20	
2. Participation in tutorials	10	
3. Participation in consultations related to the tutorials (we assume that the student uses a 3 consultation)	3	
4. Preparation for the final test of lectures and tutorial	30	
Student's workload		
Source of workload	hours	ECTS
Total workload	63	2
Contact hours	33	1
Practical activities	30	1