



Course title: HEATING, VENTILLATION AND AIR CONDITIONING IN ENERGY-EFFICIENT BUILDINGS

ECTS credit allocation (and other scores): 3.5

Semester: autumn

Level of study: ISCED-7 - second-cycle programmes (EQF-7)

Branch of science: Engineering and technology

Language: English

Number of hours per semester: 45

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Type of classes: classes and lectures

Substantive content

CLASSES: Exercises in the subject will be devoted to presenting the principles of designing enabling element significant energy savings during the operation of the building. In particular, a project will be made a ground heat exchanger in a mechanical ventilation system or a ground source heat pump horizontal heat exchanger or drilled probes as an addition to the surface system central heating allowing the use of renewable energy to heat the cottages detached. In addition, other calculation methods and outlines will be outlined in the course design elements of energy-efficient building installations such as solar collectors, heat pumps, etc., in addition, current standards for heating and ventilation of buildings will be outlined. Analysis the economic aspect of the proposed solutions will be subjected - comparison of investment outlays to payback time in the conditions of the actual functioning of the facility.

LECTURES: Overview of heating and ventilation issues in energy-saving buildings. They will be discussed elements of energy-saving construction design: housing energy consumption, location the building, its shape, the use of solar radiation energy in construction (passive and active methods of obtaining solar energy), wind influence, methods of energy recovery in ventilation, accumulation method solar and electricity in the building, air conditioning and cooling of the building. Also discussed there will be methods for using the energy contained in the soil for HVAC purposes and also for this purpose heat pumps. The problem of economic and environmental expenditures in construction will be discussed sustainable.

Learning purpose: To familiarize students with the basic information on the use of renewable energies for purposes heating and ventilation of the building to reduce the primary energy consumption as effectively as possible reduce the burden on the environment of fossil fuel combustion products. In addition, the student will get information what criteria should be met in order for a building to be considered as energy-saving and even obtained a passive building certificate. The issue of the economics of the proposed solutions will be discussed energy-saving in terms of capital expenditure on installations and the operating costs of the facility.

On completion of the study programme the graduate will gain:

Knowledge: Has knowledge of design studies and technical documentation for various complex buildings and knows what impact individual building and installation elements have on energy consumption. Knows the principles and methods of building renovation and modernization, knows advanced building physics methods for heat and moisture migration in buildings. Has knowledge about the impact of the implementation of construction projects on the environment.

Skills: Is able to classify simple and complex building objects. Uses advanced specialist tools to search for useful information, communication and acquisition software supporting the work of a designer and organizer of



construction processes. Is able to prepare and analyze the energy balance of a building. He can choose tools (analytical or numerical) to solve engineering problems.

Social Competencies: He is responsible for the reliability of the results of his work and for assessing the work of his team. Independently supplements and expands the knowledge in the field of modern processes and technologies in construction. Is aware of the need for sustainable development in construction. Is aware of the need to raise professional and personal competences. He understands the need to provide the public with knowledge about construction.

Basic literature: 1) Feist W., Podstawy budownictwa pasywnego, wyd. PIBP, 2006; 2) Wnuk R, Instalacje w budynkach pasywnych i energooszczędnym, wyd. Przewodnik Budowlany, 2007; 3) Mikoś J., Budownictwo ekologiczne, wyd. Wydawnictwo Politechniki Śląskiej, 2000; 4) Chwieduk D., Energetyka słoneczna budynku, wyd. Arkady, 2011; 5) Piotrowski R., Dominiak P., Budowa domu pasywnego krok po kroku, wyd. Przewodnik Budowlany, 2008

Supplementary literature:

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 47 hours

Student's independent work: 40,5 hours