



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Heating, ventilation and air-conditioning elements testing

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### Course

Field of study

Environmental Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

4 / 7

Profile of study

general academic

Course offered in

Polish

Requirements

elective

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### Number of hours

Lecture

Laboratory classes

Other (e.g. online)

30

Tutorials

Projects/seminars

### Number of credit points

3

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### Lecturers

Responsible for the course/lecturer:

dr inż. Katarzyna Ratajczak

email: [katarzyna.m.ratajczak@put.poznan.pl](mailto:katarzyna.m.ratajczak@put.poznan.pl)

tel. 616475824

Faculty of Environmental Engineering and  
Energy

ul. Berdychowo 4, 61-131 Poznań

Responsible for the course/lecturer:



### Prerequisites

1. Knowledge:

ventilation, air conditioning with refrigeration, heating within the scope discussed at the first degree of studies

2. Skills:

acquired in the following subjects: ventilation, air conditioning with refrigeration, heating

3. Social competencies:

awareness of constant updating and supplementing knowledge and skills, willingness to work in a group

### Course objective

The aim of the course is to broaden the knowledge and skills acquired on subjects from ventilation, air conditioning with refrigeration and heating, and to use in practice the knowledge and skills in laboratory exercises. The performance of laboratory exercises along with the preparation of the presentation and report is also intended to help in the preparation of engineering work by paying attention to the elements of scientific research and their components, including literature review, description of variants, presentation of results and drawing conclusions.

### Course-related learning outcomes

#### Knowledge

1. Has knowledge of changing trends in HVAC systems - [KIS\_W05]
2. . Has knowledge of modern elements of HVAC systems and their - [KIS\_W06]
3. Has knowledge in the field of HVAC technology development and tools used to conduct experiments - [KIS\_W07]
4. Has knowledge of research conducted at the Institute of Environmental Engineering, PUT - [KIS\_W05]

#### Skills

1. Is able to plan experience based on a literature review taking into account economic, ecological and energy aspects - [KIS\_U06]
2. . Is able to plan variants, thanks to which it will be possible to evaluate a given solution - [KIS\_U09]
3. Can carry out an experiment on a test bench mapping an element of the HVAC system using the right - [KIS\_U09]
4. Is able to prepare a report on exercises including a number of elements: test stand description, variants, methodology - [KIS\_U07, KIS\_U09]
5. Can draw conclusions - [KIS\_U07, KIS\_U09]



### Social competences

1. Is able to work in a group and sees individual responsibility in teamwork - [KIS\_K03]
2. Sees the need to be up to date on matters related to the development of HVAC technology - [KIS\_K03]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

In order to pass the course, students are required to perform a minimum of 2 laboratory exercises out of the proposed 4-5, pass the entrance tests, perform oral presentations for all participants of the course and prepare a report of the conducted exercises covering the location of results in the literature.

Before completing each exercise, students should get a minimum of 50% of the points from the entrance test. The entrance test will cover basic issues, the detailed scope of which will be presented at the first organizational classes.

The oral presentation will evaluate based on: the form of presentation, the vocabulary used, discussion of the literature review in the subject, presentation of the research stand, presentation of results, clarity and completeness of the conclusions. The presentation will be prepared by a given laboratory group.

The exercise report will be one report for everyone performing a given topic. It should include a list and description of all variants analyzed by students. It should have a compact form. And take into account a number of observations and conclusions obtained for many variants made.

The final grade consists of:

20% - grade from entrance tests - individual

40% - final oral presentation with results and scope of the exercise - for a laboratory group

40% - report on the results carried out - one for all groups performing a given exercise

Credit thresholds for individual grades:

up to 50% - insufficient

51-60% - sufficient

61-70% - a sufficient plus



71-80% - good

81-90% - a good plus

91-100% - very good

### **Programme content**

As part of the course, students perform a minimum of two laboratory exercises. The choice of exercise will take place during the first class from the set of 4-5 proposals.

Laboratory exercises will cover issues discussed in the subjects ventilation, air conditioning with refrigeration, heating.

Sample topics:

1. Equation of disappearance of pollutants in practice
2. Impact of ventilation on evaporation in swimming pools
3. Cooperation of the radiator with valves
4. Examination of the air conditioner system

Topics will be given before the start of the semester.

Class schedule:

1. Organizational classes covering division into groups and presentation of issues (2 hours)
2. Discussion of laboratory positions - after a literature review. Determining the scope of exercise and parameters tested
2. Performing laboratory exercises in groups (2x5 hours)
3. Performing laboratory exercises in groups (2x5 hours)
4. Discussion of the results with the teacher (2 hours)
5. Presentation of the exercise and results (4 hours)

### **Teaching methods**

Method of experiments - independent performance of laboratory exercises.

Oral report and seminar method - in the scope of presentation of research results.

### **Bibliography**



Basic

1. Ratajczak K. ;Układy wentylacyjne krytych basenów kąpielowych w aspekcie energooszczędności; Wyd. Politechniki Poznańskiej, Poznań 2016
2. Amanowicz Ł., Ratajczak K., Szczechowiak E. ;Badania jednorurowych systemów wentylacyjnych pod kątem oceny mieszania się strumieni powietrza w czepni i wyrzutni ;; Ciepłownictwo Ogrzewnictwo Wentylacja 50/6, 2019.
3. Detailed literature will be given before the beginning of the semester and adapted to the current state of knowledge.

Additional

1. Detailed literature will be given before the beginning of the semester and adapted to the current state of knowledge.

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes, preparation for entrance tests, preparation of presentations) <sup>1</sup>	45	2,0

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