COURSE DESCRIPTION CARD - SYLLABUS

Course name

Diagnostics of HVAC installations

Course

Field of study

Environmental Engineering

Year/Semester

3 / 6

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

Prerequisites

1.Knowledge:

Student has knowledge of thermodynamics, heat transfer and fluid mechanics, ventilation - in the field of moist air thermodynamics, the heat transfer, conductivity, air flows of indoor air and air flows in air handling units.

2.Skills:

Student has the ability to perform mathematical calculations, formulate mathematical formulas and solving classic linear and ordinary differential equations.

Ability to perform hydraulic, heat losses and cooling loads calculations, and create engineering drawings in AutoCAD.

3.Social competencies:

Student should be aware of decisions consequences. Be aware of the need to constantly update and supplement knowledge and skills. Be aware of the theoretical and practical knowledge strength.

Course objective

The aim of the course is to familiar students with the research and diagnostics methods of heating, ventilation and air conditioning systems as part of commissioning, inspection or verification. The aim of the course is to develop skills to supervise and carry out tests and interpret the results.

Course-related learning outcomes

Knowledge

1. The graduate has an knowledge in the field of fluid mechanics within ducts

2. Student ma wiedzę w zakresie szczelności powietrznej kanałów i budynków

3. The graduate has an knowledge in the field of ducts

4. The graduate has an knowledge in the field of materials and technology used in air and water systems

5. The graduate knows techniques and tools used in solving simple engineering tasks, including selection of structures for heating, ventilation and air conditioning (HVAC) systems for buildings

6. The graduate has a basic knowledge of technical systems, facilities and appliances lifespan

7. The graduate has a basic knowledge of development trends in the field of environmental engineering including technical systems for buildings

Skills

1. The graduate can interpret the results of experiments obtained, draw conclusions and formulate and justify opinions

2. The graduate can perform experiments and prepare report with description of methodology, circumstances and measurement results for technical systems for buildings, including heating and cooling systems

3. The graduate can perform experiment measurements of pressure, temperature, water/air flows, heat flux, heat exhanger capacity

4. The graduate can make a critical analysis of the functioning and evaluate the existing technical solutions in the field of environmental engineering, in particular equipment, facilities, systems, processes, services related to technical systems and installations for buildings, central heating supply, thermal networks, water supply and sewage

Social competences

1. The graduate can cooperate and work in a team

2. The graduate is aware of the need to repeat the measurements and evaluating the uncertainty of measurement results

3. The graduate understands the need of lifelong learning and improvement of competence

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures/Laboratories

A two-part written tests, date stated at the beginning of the semester.

Part 1. Verification of the knowledge, involves answering a few questions. In cases of doubt, extended oral exam is possible.

Part 1. Checking the skills, involves solving tasks and performing basic calculations.

Activity of the students is required at each lecture/laboratory.

Programme content

Air flows measurements (thermoanemometers, Pitot tubes, utilization of VAV and BMS)

Ventilation system adjusting and regulation (balometers, diffusers' pressure sockets)

Heat demand measurements (heat meters)

Flow measurements (water systems, rotameters, balancing valves - differential pressure measurement)

Pressure measurement (elements' pressure drop)

IAQ measurements (CO2, humidity, temperature, laser particle counter)

Meteorological measurements (outdoor)

Microbiological measurements (air and water systems)

Measurements of fan coil units and splits performance

Boilers' efficiency measurements

Duct leakages measurements

Radiators and heat exhangers measurements

Air tightness measurements (n50, Blower Door)

Fire protection system measurements (jet fans, smoke tests)

Filters measurements (bacteriology, dust)

Electrical measurements (fan motors, compressors, refrigeration systems and heat pumps)

Complex parameters measurements (heat recovery efficiency, COP, ESEER)

IR thermographic measurements

Building Management System use for diagnostic

Benchmarking

Communication protocols and automation components

Acoustic measurements

Analysis of measurement data of different accuracy (eg. invoices, periodic heat meters readings, continuous monitoring, BMS)

The users impact (method of assessing the usage level of the building, video surveillance, gate counters, schedule profiles)

The use of diagnostic on reducing operating costs

Teaching methods

1. Lecture: multimedia slideshow, illustrated with examples on the board.

2. Laboratories: multimedia slideshow illustrated with examples given on the board plus practical exercises.

Bibliography

Basic

1. Recknagel H., Sprenger E., Schramek E.R.: Kompendium wiedzy: ogrzewnictwo, klimatyzacja, ciepła woda, chłodnictwo, Wydawnictwo Omni Scala, Wrocław 2008

2. Pełech A.: Wentylacja i klimatyzacja - podstawy. Oficyna Wydawnicza Politechniki Wrocławskiej. Wrocław 2008

3. Jones W.P.: Klimatyzacja. ARKADY. Warszawa 2001

Additional

1. Wymagania techniczne COBRTI INSTAL Zeszyt 5.

2. Wymagania techniczne COBRTI INSTAL Zeszyt 6.

3. Wymagania techniczne COBRTI INSTAL Zeszyt 8.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests, project preparation) [1]	30	1,0

[1] delete or add other activities as appropriate