COURSE DESCRIPTION CARD - SYLLABUS

Course name
Air Conditioning [N1IŚrod1>Klim]

Course

Field of study
Environmental Engineering

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
20

Laboratory classes
0

Other (e.g. online)
0

Tutorials
10

Projects/seminars
20

Number of credit points

6,00

Coordinators

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Lecturers

Prerequisites

He has knowledge of thermodynamics, heat transfer and fluid mechanics, ventilation - in the field of thermodynamics of moist air, the theory of heat penetration, conduction and heat transfer as well as air flows in rooms and ventilation devices. Ability to perform mathematical transformations, derivations of mathematical formulas. Ability to perform hydraulic calculations, heat loss calculations and drawings in AutoCAD. Awareness of the effects of decisions made and the need to constantly update and supplement knowledge and skills.

Course objective

Acquiring basic knowledge and skills in the field of air conditioning of rooms in buildings, necessary for designing an air-conditioning system, conducting pre-design analyzes of processes and devices used in air-conditioning, and performing installations in this area.

Course-related learning outcomes

Knowledge:
1. The student has knowledge of the parameters of climate comfort, determination of heat and cooling loads for the selection of air-conditioning devices

2. Knows the processes of thermodynamic air preparation in air-conditioning devices and central units and the basic structures of air-conditioning systems for selected rooms
3. Has basic knowledge of the selection of air-conditioning units and the characteristics of all components of air-conditioning units, in particular: air filters, heaters, coolers, air humidifiers, exchangers for heat recovery, fans, for simple systems
4. Has general knowledge of developing the concept of the structure of an air-conditioning system for a room/building and knows the basic structures of control systems for air-conditioning units and air-conditioning systems (obtained during the lecture and the project).
5. Knows the basic programs for calculating air-conditioning systems (obtained during the lecture).

Skills:
1. The student is able to determine the calculation parameters of thermal comfort and air quality in a selected air-conditioned room and calculate the heat and cooling loads as well as the amount of supply air for a specific case
2. Can perform calculations in the field of air distribution in a selected room in order to select diffusers and exhausts in air-conditioning systems
3. Can calculate the efficiency and size of components in the air-conditioning unit, taking into account the efficiency of devices for heat recovery from exhaust air and present the interpretation of the calculations on the h-x diagram for the selected case
4. Can choose an air-conditioning system for a selected room
5. Can use the catalogs of device manufacturers and select devices necessary in the air conditioning system based on charts or selection programs

Social competences:
1. The student is aware of the impact of climatic comfort on
human well-being.
2. Is aware of the need for systematic deepening and
expanding their competences.
3. Is aware of the importance of air conditioning as a technical element of equipment
building that affects human health, safety and productivity.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures:
Written exam with open questions and a calculation task.
Rating scale: 0-50%: 2.0; 51-60%: 3.0; 61-70%: 3.5; 71-80%: 4.0; 81-90%: 4.5; 91-100%: 5.0. "
Tutorials:
Final test with computational tasks.
Rating scale: 0-50%: 2.0; 51-60%: 3.0; 61-70%: 3.5; 71-80%: 4.0; 81-90%: 4.5; 91-100%: 5.0. "
Tutorials:
The final grade is the average of the grades from 3 tasks.
The assessment of the task takes into account: timeliness, work in class and a written test, the execution of drawings is assessed separately.
A minimum of 50% points must be obtained for each task to pass.

Programme content

Lectures:
1. Definitions of air conditioning (differences from ventilation), classification.
2. A reminder of the issues related to the parameters of climate comfort. Adaptive comfort.
3. Air-conditioning loads: sensible heat gains, cooling loads, moisture gains, pollutant emissions.
4. Humid air parameters, diagrams for moist air (Moliera and Carrier).
5. Air changes in the components of air-conditioning units. Components of air-conditioning units - calculations and selection: fans, filters, heaters, coolers, humidifiers and dehumidifiers, recuperators, regenerators, silencers, air intakes, exhausters, dampers, fire dampers.
6. Air conditioning structures and systems - division and characteristics.
7. Local air conditioning, compact air conditioners, SPLIT, VRV, cabinet air conditioners.
8. Regulation and control in air conditioning systems.
Tutorials:

1. Calculation of loads for air conditioning
2. Air changes in air treatment devices: mixing chamber, exchangers for heat recovery, heaters, coolers, humidifiers
3. Air changes in air handling units, full and partial air conditioning
Project:
Individual air conditioning design for an open space room with ventilation designed for hygienic needs. The project includes the selection of air treatment schemes, a full air-conditioning unit and the selection of a system supporting ventilation in the reception of cooling loads (cooling ceiling). The scope of the project includes calculations of air treatment on the h-x diagram for summer and winter, calculations of the power of devices and drawing-diagrams of the installation.

Teaching methods

Lectures:
Informative lecture with elements of a conversational lecture; Multimedia presentation; Discussion
Tutorials:
Problem method; Interactive problem solving
Project:
Individual work on the project; Case study discussion; Consultations; Case study analysis;

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] Pełech A., Szczęśniak S.: Wentylacja i klimatyzacja. Zadania z rozwiązaniami i komentarzami. Oficyna Wydawnicza Politechniki Wrocławskiej. Wrocław 2012.
[4] Lipska B.: Projektowanie wentylacji i klimatyzacji. Podstawy uzdatniania powietrza. Wydawnictwo Politechniki Śląskiej Gliwice 2012.
[5] Malicki M.: Wentylacja i klimatyzacja. PWN Warszawa 1980.
[6] Jones W.P.: Klimatyzacja. ARKADY. Warszawa 2001.

Additional:
[1] Gaziński B.: Technika klimatyzacyjna dla praktyków. Komfort cieplny, zasady obliczeń i urządzenia. Systherm Serwis. Poznań 2005.
[2] Baumgarth, Horner, Reeker: Poradnik Klimatyzacji.Tom 1: Podstawy. Wydanie 1 polskie na podstawie 5. zmienionego i rozszerzonego wydania niemieckiego. Systherm, Poznań 2011.

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,00
Classes requiring direct contact with the teacher	50	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	100	4,00