COURSE DESCRIPTION CARD - SYLLABUS

Course name
Aspects of Heat Transfer [S2EPiO1>WZWC]

Course

Field of study
Industrial and Renewable Energy Systems

Year/Semester
1/2

Area of study (specialization)
Gas Technology and Renewable Energy

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
15

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge on selected heat flow processes and thermodynamics in fluid-flow machines and equipment. Ability to describe and calculate complex heat flow processes. The ability to effectively self-study in a field related to the chosen field of study. Is aware of the need to expand their competences, readiness to cooperate within the team.

Course objective

Introduction to the description of the phenomena of heat transfer and computational methods for heat exchangers.

Course-related learning outcomes

Knowledge:
student has extended knowledge of the latest scientific discoveries and technical solutions in the field of heat exchange.
student has knowledge of the basic processes occurring in heat exchangers.
student has in-depth knowledge of methods of temperature, pressure and fluid streams measurements.

Skills:
student is able to use his knowledge and skills to adapt existing or create new technical solutions related to heat flow processes.
student is able to solve research and engineering tasks requiring the use of engineering standards and norms and the use of technologies appropriate for industrial and renewable energy.
student is able to design and conduct experiments and simulations as well as analyze and interpret their results.

Social competences:
student is ready to critically assess knowledge and received content in the field of heat exchange.
student is ready to recognize the importance of knowledge in solving cognitive and practical problems and to seek expert opinions in the event of difficulties in solving the problem independently.
student is ready to perform responsible professional roles, taking into account changing social needs, including:
− developing the profession"s achievements,
− maintaining the ethos of the profession,
− compliance with and development of the principles of professional ethics and actions to comply with these principles.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Knowledge acquired as part of the lecture is verified by a final exam consisting of 5 to 6 questions with various points depending on their level of difficulty. Passing threshold: 50% of points. Final issues on the basis of which questions are prepared will be sent to students by e-mail using the university e-mail system.
Classes will be conducted at the blackboard (chalk or white), the student is required to have a calculator.
Skills acquired as part of the project classes are verified on the basis of short presentations during the semester, questions from the teacher and on the basis of the final project developed. Passing threshold: 50% of points.

Programme content

Phenomena of heat transfer processes and their description.
Dimensional analysis and similarity conditions.
Heat transfer processes in exchangers.
Heat exchangers geometries.
Calculation methods of heat exchangers.

Course topics

Introduction to methods for describing heat transfer processes. Conduction in typical geometric configurations. Dimensional analysis and similarity conditions. Introduction to numerical methods. Heat convection - differential equation, turbulence models. Convection in closed channels. Convection with surface flow. Convection in gaps. Heat radiation. Heat transfer at condensation. Heat exchangers.

Teaching methods

Blackboard lecture with multimedia presentation.
The lecture will be conducted using a multimedia presentation. Classes will be conducted at the blackboard (chalk or white), the student is required to have a calculator.
Project classes: discussing theory and assumptions for classes on the board and performing tasks given by the teacher, independent work on the design task.

Bibliography

Basic
1. Brodowicz K.: Teoria wymienników ciepła i masy, PWN 1982
2. Hobler T.: Ruch ciepła i wymienniki, WNT 1979
3. Kostowski E.: Przepływ ciepła, Wyd. P. Śl. 1991

4. Kostowski E.: Zbiór zadań z przepływu ciepła, Wyd. P. Śl. 1988
5. Wiśniewski St., Wiśniewski T.: Wymiana ciepła, WNT 1997
Additional
Staniszewski B. Red.: Wymiana ciepła - zadania i przykłady, PWN 1965
Staniszewski B.: Wymiana ciepła, PWN 1979
Holman J.P., Heat transfer, London McGraw-Hill 1992
Incropera F.P., De Witt D.P.: Fundamentals of Heat and Mass Transfer, John Wiley & Sons, New York 2002
Madejski J.: Teoria wymiany ciepła, Szczecin, WUPSz 1998
Bejan A.: Heat Transfer, John Wiley & Sons, Inc., New York 1993
Cengel Y.A.: Heat and Mass Transfer, Mc Graw Hill, New York 2006

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,00
Classes requiring direct contact with the teacher	47	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	0,00