COURSE DESCRIPTION CARD - SYLLABUS

Course name
Heat transfer and fluid-flow machines [S1MiBP1>WCiMP]

Course

Field of study
Mechanical and Automotive 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
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of the basics of heat transfer processes in heat-flow machines and equipment Student has a basic knowledge of the basics of thermodynamics, fluid mechanics Student has a basic knowledge on fluid machinery relation to other fields of knowledge. Is aware of the need to expand their competences, readiness to cooperate within a team. Awareness of the need to expand their competences in the field of engineer work.

Course objective

Introduction to basic heat transfer processes and energy conservation equations. Getting to know the methods of describing various heat flow processes implementing the assumed processes of thermal and mechanical energy conversion The goal of the study is to pass on knowledge from fluid-flow machines, definitions, problems of thermal and fluid flow. Students gain insight on designing, building and exploiting flow machinery

Course-related learning outcomes

Knowledge:
Has knowledge in the field of mathematics, including algebra, analysis, theory of differential equations,

probability, analytical geometry necessary to: describe the operation of discrete mechanical systems, understand computer graphics methods, describe the operation of electrical and mechatronic systems. Has knowledge in the field of physics, including the basics of classical mechanics, optics, electricity and magnetism, solid state physics, quantum and nuclear physics, necessary to understand specialist lectures in the field of the theory of construction materials and materials science, theory of machines and mechanisms, theory of electric drives and mechatronic systems.

Skills:
Can obtain information from literature, the Internet, databases and other sources. Can integrate the obtained information, interpret and draw conclusions from it, and create and justify opinions.
Can search in catalogs and on manufacturers" websites ready-made machine components to be used in his own projects.

Social competences:
Is ready to critically assess his knowledge and received content
Is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in case of difficulties in solving the problem on its own.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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- Knowledge acquired as part of the lecture is verified by a final exam consisting of 6 to 9 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.
- Skills acquired as part of the laboratory classes are verified on the basis of short input colloquia and reports from classes. Passing threshold: 50% of points. Issues are first discussed on the blackboard and then implemented in groups - practical exercises.

Programme content

Basics of mass transport of momentum and energy in thermal-fluid machines. Principles of heat transfer and work in machines. Heat exchangers - types, principle of operation, design and selection. Isothermal flow machines. Fluid flow machines - types, principle of operation, design and selection.

Course topics

Heat conduction - differential equation, boundary conditions. Thermal properties of materials. Conduction in the ribs. Conduction in transient conditions. Dimensional analysis and similarity conditions. Introduction to numerical methods. Basics of heat convection processes. Basics of Thermal Radiation. Heat exchanger. Analysis of basic flow phenomena and thermodynamic transformations occurring in turbomachinery. One-dimensional methods for designing turbomachinery, physical interpretation of work indicators and flow indicators. Knowledge and physical interpretation of the definitions of isentropic, polytropic, volumetric, mechanical, electrical and general efficiency in turbomachinery and methods of increasing them. Methods of selection and flow parameters of flow machines operating in series and parallel systems. Methods of protecting fluid-flow machines against destruction as a result of exceeding operating parameters and pumping phenomena. Selection of fluid-flow machines for energy installations. Methods for determining leakage and wading losses in turbomachinery.

Teaching methods

1. Lecture: blackboard with multimedia presentation.
2. Laboratory classes: discussing the theory and assumptions for classes on the board and performing tasks given by the teacher.

Bibliography

Basic
1. S. Perycz – Turbiny parowe i gazowe, Wyd. Pol. Gdańskiej,1982
2. Tuliszka E., Sprężarki, dmuchawy i wentylatory, WNT, Warszawa 1976.

3. Tuliszka E., Turbiny cieplne, WNT, Warszawa 1973
4. Prandtl L., Dynamika gazów, PWN, Warszawa 1956.
5. Jędral W., Pompy wirowe, Wydawnictwo Naukowe PWN, Warszawa 2001
6. Wiśniewski S., Wymiana Ciepła
7. Wymiana i wymienniki ciepła
Additional
T. Chmielniak – Turbiny cieplne, Wyd. Pol. Śląskiej, 2004

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	60	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	2,00