COURSE DESCRIPTION CARD - SYLLABUS

Course name
Heat and mass transfer [S1Lot2-SLiPL>WCPiM]

Course

Field of study
Aviation

Year/Semester
3/5

Area of study (specialization)
Aircraft Engines and Airframes

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
15

Laboratory classes
15

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of selected heat flow processes in machines and devices heat flow. Ability to describe and calculate complex heat flow processes. The ability to effectively self-educate in a field related to the chosen field of study.

Course objective

Familiarization with complex heat flow processes and energy conservation equations taking into account convection processes that carry out momentum exchange. Learning different methods of describing heat flow processes occurring in the assumed thermal and mechanical energy conversion processes for the purpose of modernization or reconstruction of technological systems in energy-related areas heat, heating and refrigeration. Practical mastery of the ability to describe the implementation effective thermal processes in which heat, momentum and mass transfer occur.

Course-related learning outcomes

Knowledge:
1. has structured, theoretically based general knowledge covering key issues in the field of technical thermodynamics, fluid mechanics, in particular aerodynamics

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2. the student knows basic probability distributions. the student knows the basic concepts of mathematical statistics. the student knows various methods of statistical inference. has structured, theoretically based knowledge in the field of mathematics used to analyze results, create mathematical models and adapt them to numerical code
3. has basic knowledge of the mechanisms and laws governing human behavior and psyche

Skills:
1. is able to obtain information from various sources, including literature and databases, both in Polish and English, integrate it properly, interpret and critically evaluate it, draw conclusions, and comprehensively justify the opinions he/she formulates
2. is able to properly plan and perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions from them
3. is able to solve tasks using basic knowledge of aerodynamics, flight mechanics and flow around bodies

Social competences:
1. understands that in technology, knowledge and skills become outdated very quickly
2. is aware of the importance of knowledge in solving engineering problems and knows examples and understands the causes of malfunctioning engineering projects that led to serious financial and social losses or to serious loss of health or even life
3. is aware of the social role of a graduate of a technical university, in particular understands the need to formulate and convey to society, in an appropriate form, information and opinions concerning engineering activities, technical achievements, as well as the achievements and traditions of the engineering profession

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture
continuous assessment in each class, rewarding activity and the quality of perception.
written final exam
Blackboard exercises:
test and rewarding knowledge necessary to implement the given problems in a given area computational tasks,
continuous assessment in each class - rewarding the increase in use skills known principles and methods,
assessment of knowledge and skills related to the implementation of the exercise task,
Laboratory exercises:
test and rewarding knowledge necessary to implement the given problems in a given area laboratory tasks,
assessment of knowledge and skills related to the implementation of the laboratory exercise, assessment of the report
exercise performed.

Programme content

Introduction to methods for describing heat flow processes. Conduction in typical configurations geometric. Dimensional analysis and similarity conditions. Introduction to numerical methods. Heat convection - differential equation, turbulence models. Convection in closed channels. Convection flowing around the surface. Convection in gaps. Thermal radiation. Exchange heat when boiling and condensing. Heat exchangers. Basics of mass diffusion and convection
PART - 66 (THEORY - 22.5 hours, PRACTICE - 11.25 hours)
MODULE 2. PHYSICS
2.3 Thermodynamics
b) Isothermal and adiabatic expansion and compression, engine thermodynamic circulation, constant volume and
constant pressure, refrigeration container and heat pump;
Latent heat of fusion and evaporation, thermal energy, heat of combustion. [2]

Course topics

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Teaching methods

lecture, description, discussion, blackboard exercises, independent practical exercises, laboratories

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. Staniszewski B. Red.: Wymiana ciepła ? zadania i przykłady, PWN 1965
6. Staniszewski B.: Wymiana ciepła, PWN 1979
7. Wiśniewski St., Wiśniewski T.: Wymiana ciepła, WNT 1997
8. Holman J.P., Heat transfer, London McGraw-Hill 1992
9. Incropera F.P., De Witt D.P.: Fundamentals of Heat and Mass Transfer, John Wiley & Sons, New York 2002

Additional:
1. Madejski J.: Teoria wymiany ciepła, Szczecin, WUPSz 1998
2. Bejan A.: Heat Transfer, John Wiley & Sons, Inc., New York 1993
3. Cengel Y.A.: Heat and Mass Transfer, Mc Graw Hill, New York 2006

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	55	2,00