



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Heat and mass transfer

Course

Field of study

Aviation

Area of study (specialization)

Aircraft engines and airframes

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/5

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

15

Projects/seminars

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

dr inż. Robert Kłosowiak

Responsible for the course/lecturer:

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Prerequisites

Basic knowledge of selected heat flow processes in heat-flow machines and equipment. The 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.

Course objective

Acquaintance with complex heat flow processes and energy conservation equations including convection processes realizing momentum exchange. Getting to know the methods of describing various heat flow processes occurring in the assumed processes of thermal and mechanical energy conversion in order to modernize or rebuild technological systems in areas related to thermal energy, heating and



cooling. Practical mastery of the ability to describe the implementation of effective thermal processes in which heat, momentum and mass exchange processes occur

Course-related learning outcomes

Knowledge

1. has ordered, theoretically founded general knowledge covering key issues in the field of technical thermodynamics, fluid mechanics, in particular aerodynamics
2. the student knows the basic probability distributions. The student knows the basic concepts of mathematical statistics. The student knows various methods of statistical inference. Has an ordered, theoretically founded knowledge of mathematics used to analyze the results, create mathematical models and their adaptation to the numerical code
3. has a 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 in English, integrate them properly, interpret them and make a critical evaluation, draw conclusions and exhaustively justify the opinions they formulate
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. can solve tasks using basic knowledge of aerodynamics, flight mechanics and body flow

Social competences

1. understands that in technology, knowledge and skills very quickly become obsolete
2. is aware of the importance of knowledge in solving engineering problems and knows examples and understands the causes of faulty engineering projects that have led to serious financial and social losses, or to a serious loss of health and even life
3. is aware of the social role of a technical university graduate, in particular understands the need to formulate and provide the society, in an appropriate form, with information and opinions on engineering activities, technological achievements, as well as the achievements and traditions of the engineer profession

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture

continuous assessment in every class, rewarding activity and quality of perception.

written final exam

Blackboard exercises:



test and rewarding knowledge necessary to implement the problems posed in a given area of computational tasks,

continuous assessment, during each class - rewarding the increase in the ability to use 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 problems posed in a given area of laboratory tasks,

assessment of knowledge and skills related to the implementation of the laboratory exercise,
assessment of the report of the exercise.

Programme content

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 by flowing around the surface. Convection in gaps. Thermal radiation. Heat transfer at boiling and condensation. Heat exchangers. Fundamentals 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 cycle, constant volume and constant pressure, refrigerated container and heat pump;

Latent heat of melting and evaporation, thermal energy, heat of combustion. [2]

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	4,0
Classes requiring direct contact with the teacher	45	1,8
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests) ¹	55	2,2

¹ delete or add other activities as appropriate