COURSE DESCRIPTION CARD – SPECIMEN

<table>
<tr><td colspan="10">Faculty of Civil Engineering and Environmental Sciences</td></tr>
<tr><td>Field of study</td><td colspan="6"></td><td colspan="2">Degree level and programme type</td><td></td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="6"></td><td colspan="2">Study profile</td><td>Academic profile</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Heat and mass transfer</td><td colspan="2">Course code</td><td>IS-FCEE-00146-1W</td></tr>
<tr><td colspan="2">Course type</td><td>Erasmus</td></tr>
<tr><td rowspan="2">Forms and number of hours of tuition</td><td>L</td><td>C</td><td>LC</td><td>P</td><td>SW</td><td>FW</td><td>S</td><td>Semester</td><td>winter</td></tr>
<tr><td>15</td><td>15</td><td>15</td><td></td><td></td><td></td><td></td><td>No. of ECTS credits</td><td>6</td></tr>
<tr><td>Entry requirements</td><td colspan="9">Mathematics, Physics</td></tr>
<tr><td>Course objectives</td><td colspan="9">Students will acquire skills and competences in the field of:
- constructing model descriptions of heat and mass exchange processes,
- analysis of heat exchange processes in heating networks and devices</td></tr>
<tr><td>Course content</td><td colspan="9">To familiarize students with the basic engineering issues in the field mass and heat exchange and elements of heat transfer theory in technical devices, systems and systems in environmental engineering. Teaching calculation methodology for mass and heat exchange issues, calculations of thermal parameters of processes and thermal issues in devices and systems in engineering environment. To familiarize students with the methods of thermal measurements of physical quantities. Introduction to heat transfer, general differential equation of heat conduction, cartesian and polar coordinates, Fourier’s Law, fundamentals of convection, continuity, N-S and energy equations, one dimensional steady state heat conduction, conduction with internal heat generation , extended surfaces, unsteady heat conduction, numerical methods in conduction, basic radiation theory, Kirchhoff’s Law. Basic notions of the heat and mass transfer, steady conduction in multidimensional configurations, unsteady heat conduction in one or more dimensions, numerical simulation of conduction; forced convection in laminar and turbulent flows; natural convection in internal and external configurations; heat transfer during condensation and boiling; mass transfer at low rates, evaporation; thermal radiation, spectral and solar radiation, heat exanger.</td></tr>
<tr><td>Teaching methods</td><td colspan="9">lecture, classes, laboratory classes</td></tr>
<tr><td>Assessment method</td><td colspan="9">lecture - written exam,
exercises - test;
laboratory - assessment of reports, preparation tests for exercises</td></tr>
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Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study
LO1	student has theoretical knowledge covering mass and heat exchange issues in theoretical foundations, computational techniques and measuring	K_W013
LO2	student has ordered theoretical knowledge covering issues exchange of mass and technical heat in the field of engineering issues	K_W014
LO3	student is able to formulate engineering issues in the field mass and heat exchange and solve calculation problems	K_W015
LO4	student is able to choose measuring tools and carry out measurements basic thermal parameters and devices and systems technical.	K_U11
LO5	student is able to use scientific literature and information technologies in engineering issues and tools for designer work	K_U21
LO6	student understands the need to expand knowledge in the field of science basic to raise professional competences	K_K01
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	exam passing the lecture	LC
LO2	tests passing the exercises	C
LO3	assessment of student activity during classes	C
LO4	preparation tests for laboratory classes, report on a laboratory experiment	C
LO5	tests passing the exercises, laboratory experiment report	C, LC
LO6	exam passing the lecture, test passing the exercises, reports from a laboratory experiment	LC, C, LC
Student workload (in hours)		No. of hours
Calculation	Participation in lectures	15h
	Participation in: classes + laboratory classes	30h
	Preparation for classes + laboratory classes	30h
	Preparation of reports from the laboratory or laboratory and / or performance of tasks homework	30h
	Participation in consultations	15h
	Preparation for the exam and tests and presence on it	30h
	TOTAL:	150
Quantitative indicators		HOURS / No. of ECTS credits
Student workload – activities that require direct teacher participation		75 / 3
Student workload – practical activities		75 / 3

Basic references	1. Frank P. Incropera, David P. DeWitt, Fundamentals of heat and mass transfer, New York : Wiley J., 1996. 2. Yunus A. Çengel , Heat and mass transfer, Singapore : McGraw-Hill, 2006. 3. ed. Nicholas P. Cheremisinoff, Handbook of heat and mass transfer, Houston Gulf, 1986.	
Supplementary references	1. ed. G.F. Hewitt, Heat Exchanger Design Handbook 1998., New York ; Begell House, 1998. 2. ed. by Nikos C. Markatos [et al.], Numerical simulation of fluid flow and heat/mass transfer processes , Berlin : Springer-Verlag, 1986. 3. Pradip Majumdar, Computional methods for heat and mass transfer , New York : Taylor and Francis, 2005.	
Organisational unit conducting the course	**HVAC Department**	**Date of issuing the programme**
Author of the programme	**dr inż.Tomasz Teleszewski**	**30.10.2019**

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work, S – seminar