

Course code:

Plan position:

A. INFORMATION ABOUT THE COURSE

B. Basic information

Name of course	Heat transfer
Field of studies	Chemical Technology
Level of studies	First degree
Profile of studies	General academic
Form of studies	Stationary
Specialty	1. Chemical process technology 2. Bioengineering 3. Chemistry and technology of cosmetics
Unit responsible for the field of studies	Faculty of Chemical Technology and Engineering / Division of Chemical and Biochemical Engineering
Name and academic degree of teacher(s)	Sylvia Kwiatkowska-Marks, BEng PhD, Justyna Miłek, BEng, PhD, Ilona Trawczyńska, BEng, PhD Sławomir Żak, BEng, PhD
Introductory courses	Physical Chemistry, Chemical engineering
Introductory requirements	No prerequisites

C. Semester/week schedule of classes

Semester	Lectures (W)	Auditorium classes (Ć)	Laboratory classes (L)	Project classes (P)	Seminar (S)	Field classes (T)	Number of ECTS points
winter / summer	30	15					6

2. LEARNING OUTCOME

No.	Learning outcomes description	The reference to the learning outcomes of specific field of study	The reference to the learning outcomes for the area
KNOWLEDGE			
W1	The student has knowledge of heat transfer.	K_W13	P6S_WG
W2	The student knows the basic methods, techniques, tools and materials used in solving simple engineering problems related to heat transfer.	K_W15	P6S_WG
SKILLS			
U1	Student uses knowledge to design and implement simple chemical processes and unit operations and explains basic phenomena related to important processes in heat transfer.	K_U07	P6S_UW
U2	The student is supposed to solve basic engineering problems in heat transfer.	K_U18	P6S_WG

SOCIAL COMPETENCES			
K1	The student understands the need for learning and motivation to develop their competences.	K_K01	P6S_KK
K2	The student is aware of the responsibility for jointly performed problems to cooperate with other chemists.	K_K04	P6S_KK P6S_KO

3. TEACHING METHODS

A. Traditional methods used ***

Standard lecture with presentation. Calculations (classes) performed by students under supervision of teacher. Outdoor classes - visits of production companies.

B. Distance learning methods used ***

Synchronous method (classes conducted in a way that ensures direct interaction between the student and the teacher in real time, enabling immediate flow of information, the method can be used only if it is provided for in the study plan for a given cycle of education):
e.g. remote lecture in the form of videoconference, remote discussion, etc.

Asynchronous method used as an auxiliary (a method that does not ensure direct interaction between the student and the teacher in real time, used only as an auxiliary / complementary method):

e.g. online educational videos, online multimedia presentations, etc.

4. METHODS OF EXAMINATION

Written exam from lectures during winter/summer examination session, written test from classes.

5. SCOPE

Lectures	Introduction to Heat Transfer. One dimensional steady state conduction heat transfer. Conduction heat transfer: Fourier's law. Heat transfer by natural and forced convection. Condensation and boiling. Radiation heat transfer. Thermal resistance. Heat exchanger.
Laboratories	Solving of engineering problems in unit operations.

6. METHODS OF VERIFICATION OF LEARNING OUTCOMES

LEARNING OUTCOME	Form of assessment					
	Oral examination	Written exam	Colloquium	Project	Presentation
W1	x	x				
W2	x	x				
U1			x		x	
U2			x		x	
K1					x	
K2					x	

7. LITERATURE

Basic literature	<ol style="list-style-type: none"> 1. Cengel Y. and Ghajar A. Heat and Mass Transfer: Fundamentals and Applications, McGraw-Hill, 2010. 2. McCabe W.L., Smith J.L. Unit operations of chemical engineering. McGrawHill's, New York, 1985. 3. Chpey N. P. Handbook of Chemical Engineering Calculations. McGraw – Hill's, New York, 2004.
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Supplementary literature	1. Perry R.H., Green D.W. Perry's Chemical Engineers' Handbook. Mc Graw – Hill, New York, 1997.
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8. TOTAL STUDENT WORKLOAD REQUIRED TO ACHIEVE EXPECTED LEARNING OUTCOMES EXPRESSED IN TIME AND ECTS CREDITS

Student's activity		Student workload– number of hours
Classes conducted under a direct supervision of an academic teacher or other persons responsible for classes	Participation in classes indicated in point 1B	45
	Supervision hours	3
Student's own work	Preparation for classes	34
	Reading assignments	34
	Other (preparation for exams, tests, carrying out a project etc)	34
Total student workload		150
Number of ECTS points		6