Course Syllabus

I. General Information

Course name in English	Heat and mass transfer
Course name in Polish	Transfer ciepła i masy
Programme	Bioanalitycal technologies
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	MSc
Form of studies (full-time, part-time)	Full-time
Discipline	Biological sciences
Language of instruction	English

Course coordinator/person responsible	Assoc. Prof. Muhamed Hadziabdic

Type of class *(use only the types mentioned below)*	Number of teaching hours	Semester	ECTS
Lecture	15	III	6
Tutorial	45	III	
Classes			
Laboratory classes			
Workshops			
Seminar			
Introductory seminar			
Foreign language classes			
Practical placement			
Field work			
Diploma laboratory			
Translation classes			
Study visit			

Course pre-requisites	Knowledge in general physics and mathematics.

II. Course Objectives

C1 – Introduce concept of heat transfer and its mechanisms
C2 – Apply heat transfer equations on practical problems
C3 – Introduce numerical methods in heat transfer problems and use it for selected cases
C4 – Introduce basics of mass transfer

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome (Successful completion of the course means that a student is able to)	Reference to programme learning outcome
	KNOWLEDGE	
W_01	Identify the mechanisms of heat transfer that occur simultaneously in nature and practice.	K_W01
W_02	Understand the limitations of analytical solutions of conduction problems, and the need for computation-intensive numerical methods.	K_W04
W_03	Use the non-dimensional numbers to access heat and mass transfer cases.	K_W02
	SKILLS	
U_01	Solve one-dimensional heat conduction problems and obtain the temperature distributions within a medium.	K_U01, K_U14
U_02	Solve steady conduction problems that involve multilayer rectangular, cylindrical, or spherical geometries.	K_U01
U_03	Analyze transient heat transfer problems and solve it when lumped system approach is applicable. The students is able to work in a team	K_U01, K_U07, K_U18
U_04	Calculate various characteristics of internal and external convection heat transfer problems.	K_U01
U_05	Calculate basic problems of mass transfer.	K_U01
U_06	Compute heat transfer problem by using numerical methods.	K_U01, K_U04
	COMPETENCIES	
K_01	The student is open-minded to modern research techniques	K_K06
K_02	is taking care on entrusted laboratory equipment, is able to gauge danger resulting from applied research methods	K_K04

IV. Course Content

The course aims to introduce basic concepts and principles of heat transfer encountered in different engineering practices. It covers analytical, empirical and numerical techniques for the solution of heat transfer equations. At the end of course diffusion mass transfer will be introduced. The following topics are included in the course:
one-dimensional heat conduction equation, steady conduction equation that involve multilayer rectangular, cylindrical, or spherical geometries, transient heat transfer problems, numerical methods, internal and external convection heat transfer problems, basic problems of mass transfer.

V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods *(choose from the list)*	Forms of assessment *(choose from the list)*	Documentation type *(choose from the list)*
KNOWLEDGE			
W_01	Conventional lecture Discussion	Written test	Evaluated written test/test
W_02	Conventional lecture Discussion	Written test	Evaluated written test/test
W_03	Conventional lecture Discussion	Written test, reports	Evaluated written test/test
SKILLS			
U_01	Conventional lecture Discussion	Written test	Evaluated written test/test
U_02	Conventional lecture Discussion	Written test	Evaluated written test/test
U_03	Conventional lecture Discussion	Written test, observation	Evaluated written test/test/observation report
U_04	Conventional lecture Discussion	Written test	Evaluated written test/test
U_05	Conventional lecture Discussion	Written test	Evaluated written test/test
U_06	Conventional lecture Discussion	Written test	Evaluated written test/test
COMPETENCIES			
K_01 K_02	Tutorials	Reports	Report file

VI. Grading criteria, weighting factors

Evaluation Tool	**Quantity**	**Weight (%)**
Final Exam	1	**40**
Semester Evaluation Components		**60**
In-term exam	1	30
Quiz	1	10
Assignments	4	20

Mark	**Evaluation criteria**	
Very good (5)	the student realizes the assumed learning outcomes at a very good level	the student demonstrates knowledge of the education content at the level of 95-100%

overgood (4.5)	the student accomplishes the assumed learning outcomes an over good level	the student demonstrates knowledge of the education content at the level of 85-94 %
Good (4)	the student accomplishes the assumed learning outcomes at a good level	the student demonstrates knowledge of the education content at the level of 75-84%
Quite good (3.5)	the student accomplishes the assumed learning outcomes at a quite good level	the student demonstrates knowledge of the education content at the level of 65-74%
sufficient (3)	the student accomplishes the assumed learning outcomes at a sufficient level	the student demonstrates knowledge of the education content at the level of 55-64%
insufficient (2)	the student accomplishes the assumed learning outcomes at an insufficient level	the student demonstrates knowledge of the education content below the level of 55%

VII. Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	70 (60 + 10 individual consultation)
Number of hours of individual student work	80

VIII. Literature

Basic literature
Heat and Mass Transfer: Fundamentals and Applications, By Yunus Cengel
Ashim K. Datta Heat and Mass Transfer: A Biological Context