(*faculty stamp*)

COURSE DESCRIPTION

1. Course title: HEAT AND MASS TRANSFER	**2. Course code**
3. Validity of course description: 2019/20	
4. Level of studies: BA, **BSc programme** / MA, MSc programme	
5. Mode of studies: intramural studies / extramural studies	
6. Field of study: ENERGY ENGINEERING	(FACULTY SYMBOL)
7. Profile of studies: general academic	
8. Programme:	
9. Semester: 5	
10. Department teaching the course: Institute of Thermal Technology	
11. Course instructor: prof. Ryszard Białecki	
12. Course classification: common directional subject	
13. Course status: compulsory /elective	
14. Language of instruction: English	
15. Pre-requisite qualifications: Thermodynamics	
16. Course objectives: To provide students with basics laws and principles of heat and mass transfer and their practical implementations to . evaluate heat and mass fluxes in basic technical applications.	

17. Description of learning outcomes:

Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	Student knows basic laws of technical and chemical thermodynamics, heat and mass transfer and fluid mechanics	Exam and test	Lecture and problem solving classes	K_W13
2.	Student knows fundamental laws of heat and mass transfer, mechanisms and relationships describing them.	Exam	Lecture	K_W03, K_W12
3.	Student knows fundamental dimensionless criteria for convection and radiation heat transfer.	Exam	Lecture	K_W03, K_W12
4.	Student knows fundamental dimensionless criteria for mass transfer	Exam	Lecture	K_W03, K_W12
5.	Student is capable of formulating basic steady state heat conduction, convection and radiation problems.	Test and exam	Problem solving classes	K_U11
6.	Student is capable of formulating and solving basic heat and mass transfer problems arising in technology	Test and exam	Problem solving classes	K_U11, K_U19
7.	Student is able to carry out basic measurements of heat transfer phenomena and assess their results	Test and exam	Labs	K_W03, K_W12,K_U09, K_U11

18. Teaching modes and hours

30h Lecture / 30h Problem Solving Classes 15h Lab

19. Syllabus description:

Lecture

Basic notions and definitions, Heat conduction, 1D heat conduction with convective boundary conditions, principle of convection. Heat rate enhancement though fins. Forced and natural convection. Convection with phase change (boiling and condensation). Basics of mass transfer. Types of heat exchangers and their design. Design and rating calculations of heat exchangers. Basics of radiative heat transfer.

Problem solving classes

Conductive heat flux through walls with various boundary conditions. Evaluation of convective heat transfer coefficients for forced, natural convection, at condensation and boiling. Heat transfer through finned surfaces. Calculation of mass fluxes, Rating and design calculations of heat exchangers. Evaluation of radiative heat fluxes.

Lab

Determination of heat transfer coefficient at forced convection. Determination of heat transfer coefficients at natural convection. Determination of heat transfer coefficient at natural convection from wire in air. Examination of heat exchangers. Determination of emissivity of surfaces of solids.

20. Examination: Yes

21. Primary sources:

1. Y.A. Çengel, *Heat and Mass Transfer – A Practical Approach*, McGraw-Hill, India, 2007.
2. J.H. Lienhard IV, J.H. Lienhard V, *A Heat Transfer Textbook*, Phlogiston Press, Cambridge, Massachusetts, USA, 2006. http://web.mit.edu/lienhard/www/ahtt.html
3. *VDI Heat Atlas* Second Edition, Springer available in electronic from in the library
4. Presentations for lectures and classes available at websites. Handouts.

22. Secondary sources:

5. Ed. Kostowski, Przepływ ciepła, Wydawnictwo Politechniki Śląskiej, Gliwice, 2006.
6. Ed. Kostowski, Zbiór zadań z przepływu ciepła, Wydawnictwo Politechniki Śląskiej, poz. 2392, Gliwice, 2006.

23. Total workload required to achieve learning outcomes

Lp.	Teaching mode :	Contact hours / Student workload hours
1	Lecture	30/10
2	Classes	30/30
3	Laboratory	15/25
4	Project	/
5	BA/ MA Seminar	/
6	Other	20/20
	Total number of hours	95/85

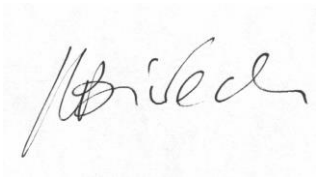
24. Total hours: 180

25. Number of ECTS credits: 6

26. Number of ECTS credits allocated for contact hours: 4

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 2

26. Comments:



…14.05.2019
(date, Instructor's signature)

Approved:

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(*date , the Director of the Faculty Unit signature)*