No. 33

Course syllabus for Second cycle studies						
1.	**Course title**	Transport Phenomena				
2.	**Code**	MDE4M3				
3.	**Study Program**	Metallurgical Digital Engineering				
4.	**Study program organizer (unit, institute, department, division)**	Faculty of Technology and Metallurgy Department of Chemical and Control Engineering				
5.	**Degree (first, second, third cycle)**	First degree				
6.	**Academic year / semester**	2/4	7.	**Number of ECTS**	6	
8.	**Instructors**	Kiril Lisichkov, PhD, Full Professor				
9.	**Prerequisites for course enrollment**					
10.	**Objectives of the course syllabus (competences):** Introducing students to the principles of momentum, heat, and mass transfer and their practical applications. **Acquired skills (competences):** Understanding and application of the physical and mathematical principles of momentum, heat, and mass transfer. Competence in identifying and applying heat transfer mechanisms (conduction, convection, radiation). Knowledge of mass transfer mechanisms, including Fick's laws and diffusivity. Ability to model the diffusion processes in liquids, gases, and porous media. Understanding steady-state and transient heat and mass transfer phenomena.					
11.	**Content of the course:** Introduction to transport phenomena. Physical and mathematical principles of momentum, heat, and mass transfer. Viscosity, mechanisms of momentum transfer, and rheological properties of fluids. Thermal conductivity coefficient of metals, polymers, ceramics, and composites. Heat transfer mechanisms (conduction, convection, radiation, and combinations). Steady-state and transient heat transfer. Heat transfer in materials processing. Mass transfer mechanisms. Fick's laws and diffusivity of materials. Diffusion in liquids. Diffusion in gases. Diffusion in porous media. Steady-state and unsteady-state mass transfer. Interfacial and simultaneous heat and mass transfer.					
12.	**Study methods:** Lectures, exercises, homework assignments, and independent study at home					
13.	**Total available time**	180 hours				
14.	**Allocation of available time**					
15.	**Teaching activities**	15.1.	Lectures	30 hours		
		15.2.	Exercises (auditory, laboratory)	30 hours		
16.	**Other types of activities**	16.1.	Project tasks	20 hours		
		16.2.	Independent tasks	30 hours		
		16.3.	Work at home	70 hours		
17.	**Grading system**					
	17.1.	Tests		80 points		

	17.2.	Seminar project, written and oral presentation	10 points
	17.3.	Engagement and Participation	10 points
18.	**Grading criteria (points/grade)**	Up to 50 points	5 (five) (F)
		From 51 to 60 points	6 (six) (E)
		From 61 to 70 points	7 (seven) (D)
		from 71 to 80 points	8 (eight) (S)
		From 81 to 90 points	9 (nine) (B)
		from 91 to 100 points	10 (ten) (A)
19.	**Prerequisites for taking the final exam**	Minimum 11 points from activities 16.1 and 16.2.	
20.	**Language in which lectures are conducted**	Macedonian and English language	
21.	**Method for monitoring the quality of lectures**	Anonymous surveys	

22. **LITERATURE**

22.1. Compulsory literature

No.	Author	Title	Publisher	Year
1.	Lisichkov K.	Internal materials on transfer phenomena		
2.	Bird, R.B., W.E.Stewart and E.N.Lightfood	Transport Phenomena, Second Edition	John Wiley&Sons	2002
3.				

22.2. Additional literature

No.	Author	Title	Publisher	Year
1.	G.H. Geiger and D.R. Poirier	Transport Phenomena in Materials Processing	TMS, Pittsburgh	1994
2.				
3.				