No. 48

Attachment No.3		**Course syllabus for First cycle studies**			
1.	**Course title**	**Chemical metallurgy 1**			
2.	**Code**	MDE3M2			
3.	**Study Program**	Metallurgical digital engineering			
4.	**Study program organizer (unit,institute, department, division)**	Faculty of Technology and Metallurgy, University “Ss. Cyril and Methodius” in Skopje			
5.	**Degree (first, second, third cycle)**	First cycle			
6.	**Academic year / semester**	Second year, III sem.	7.	**Number of ECTS**	6
8.	**Instructors**	Prof. Perica Paunović			
9.	**Prerequisites for courseenrollment**	Mathematics 1			
10.	**Objectives of the course syllabus (competencies):** Acquiring knowledge of the thermodynamics and kinetics of metallurgical processes, application of thermochemical laws in metallurgical engineering, preparation of material and heat balances of processes.				
11.	**Content of the course:** 1. Definition of metallurgical processes. Thermodynamics (TD) of metallurgical systems, description of the state. Thermodynamic equation of state. 2. Zeroth principle of TD. First principle of TD. Heat capacities. Reversible and irreversible processes. Thermochemistry. Standard state. Thermochemical laws. Temperature dependence of reaction energy and enthalpy. Phase transformation processes. Heat balance of metallurgical processes. Second principle of TD. Entropy. Thermodynamic potentials. Third principle of TD. 3. Equilibria in metallurgical systems. Phase equilibrium of a single-component system. Clausius-Clapeyron equation. Phase rule. Equilibria in two-component systems. Ideal and real solutions. Activity, fugacity, and pressure. 4. Chemical equilibrium. Law of mass action. Relationship between Gibbs energy and equilibrium constant. Thermodynamic assessment of the direction of chemical reactions. 5. Kinetics of metallurgical processes				
12.	**Study methods:** Lectures and exercises, consultations, project (homework, seminar) assignments, home study (exam preparation)				
13.	**Total available time**	210			
14.	**Allocation of available time**				
15.	**Teaching activities**	15.1.	Lectures	45	
		15.2.	Exercises (laboratory, computational), teamwork	45	
		15.3	Industrial practice	0	
16.	**Other types of activities**	16.1.	Project assignments	20	
		16.2.	Independent assignments	20	
		16.3.	Home study	80	
17.	**Grading system**				
	17.1.	Tests: pts		80	
	17.2.	Seminar work/project, written and oral presentation: pts		10	
	17.3.	Final exam: pts		10	

18.	**Grading criteria (points/grade)**	Up to 61 points	5 (five) (F)
		From 61 to 69 points	6 (six) (E)
		From 70 to 79 points	7 (seven) (D)
		from 80 to 89 points	8 (eight) (S)
		From 90 to 95 points	9 (nine) (B)
		from 95 to 100 points	10 (ten) (A)
19.	**Prerequisites for taking the final exam**	Minimum 11 pts from activities 17.1 and 17.2	
20.	**Language in which lectures are conducted**	English	
21.	**Method for monitoring the quality of lectures**	Anonymous student survey	

22. **LITERATURE**

22.1. Compulsory literature

No.	Author	Title	Publisher	Year
1.	Perica Paunović, Ivan Mitrovski	Chemical metallurgy 1	Faculty of Technology and Metallurgy, Skopje	2024
2.				
3.				

22.2. Additional literature

No.	Author	Title	Publisher	Year
1.	C. K. Gupta	Chemical Metallurgy: Principle and Practice	WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim	2003
2.	Ž. D. Živković	Teorija metalurških procesa, opšti deo	Univerzitet u Beogradu, Tehnički fakultet u Boru	1991
3.	K. K. Prasad, H. S. Ray, K. P. Abraham	Chemical and metallurgical thermodynamics	New Age International (P) Ltd., Publishers	2007