No. 39

Course syllabus for First cycle studies						
1.	**Course title**	**Heat treatment**				
2.	**Code**	MDE7M4				
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**	Fourth year VII semester	7.	**Number of ECTS**	4	
8.	**Instructors**	Prof. Dafinka Stoevska Gogovska				
9.	**Prerequisites for course enrollment**	Physical metallurgy 2				
10.	**Objectives of the course syllabus (competences):** Study of heat treatment processes and their effect on microstructure and properties.					
11.	**Content of the course:** General principles of heat treatment. Annealing without phase transformation (homogenization, recrystallization, internal stresses, soft annealing). Annealing with phase transformation (complete, incomplete, normalization, coarse grain). Quenching (quenching agents, quenching depth, quenching methods). Surface quenching (flame, contact, electrolyte, induction). Stress relieving (improvement, aging). Thermochemical treatment (cementation, nitriding, carbonitriding, diffusional metallization). Thermomechanical treatment (VTMO, NTMO, PTMO). Heat treatment of various constructional parts and tools. Heat treatment of cast iron. Heat treatment on aluminium and copper based alloys. Hygienic and technical protection in the heat treatment units.					
12.	**Study methods:** Lectures and exercises, consultations, project (homework, seminar) assignements, home study (exam preparation)					
13.	**Total available time**	120 hours				
14.	**Allocation of available time**					
15.	**Teaching activities**	15.1.	Lectures	30 hours		
		15.2.	Exercises (laboratory,computation), teamwork	30 hours		
		15.3	Industrial practice	0 hours		
16.	**Other types of activities**	16.1.	Project assignments	10 hours		
		16.2.	Independent assignments	10 hours		
		16.3.	Home study	40 hours		
17.	**Grading system**					
	17.1.	Tests		80 points		
	17.2.	Seminar's work/project (presentation> written and oral)		10 points		
	17.3.	Final exam		10 points		
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.	J. S. Magdeski	Heat treatment of metals	Internal material	2001
		2.				
		3.				
	22.2.	Additional literature				
		No.	Author	Title	Publisher	Year
		1.	G.E. Totten	Steel Heat Treatment – Equipment and Process Design Handbook, Second ed.	Taylor&Francis Group	2007
		2.	G.E. Totten	Steel Heat Treatment – Metallurgy and Technology, Handbook, Second ed.	Taylor&Francis Group	2006
		3.		Heat Treating, ASM Handbook, vol. 4	ASM International	1991
		4.	A. Gulyaev	Physical metallurgy, vol. 2	Mir Publishers, Moscow	1980