Course Name						
NON-FERROUS ENGINEERING MATERIALS						
Code	**Semester**	**Local Credits**	**ECTS Credits**	**Course Implementation, Hours/Week**		
				Theoretical	**Tutorial**	**Laboratory**
MET 378E	6	2	3	2	-	-
Department/Program	Metallurgical and Materials Engineering					
Course Type	Elective		**Course Language**	English		
Course Prerequisites	None					
Course Category by Content, %	**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**		
	10	50	40	-		
Course Description	This course will offer an introduction to the concept of alloy and alloying systems. The course will include the what is alloy, metallic alloy theories, alloy standards and world wide applications, material characteristic effects by alloying, alloying techniques, examples of non-ferrous metallic systems: aluminum alloys, copper alloys, noble metal alloys, titanium alloys, refractory alloys, high-entropy alloys, super alloys.					
Course Objectives	Non-ferrous Engineering Materials course is an important engineering course for engineers in order to make alloys. In light of other engineering courses, this course emphasizes on 1. Alloy making theories and structural elements of alloys 2. Atomic structure,-Crystal structure of alloys 3. Alloying theories. 4. Solute solution alloys. Limited solution alloys. Intermediate solution alloys. Substitutional solute solution alloys. 5. Metastable phases. Intermetallic compounds. Covalent compounds. 6. Aluminum alloys and preparing techniques, Copper base alloys and preparing techniques, Titanium alloys, and the other nonferrous alloying systems.					
Course Learning Outcomes	Students who pass the course will be able to have a thorough understanding on: 1. Nonferrous Engineering Materials: Physical and Mechanical Properties of aluminum, copper, titanium, nickel-based alloys, high-entropy, refractory, noble metal alloys. Economical evaluation of production methods of these alloys. 2. Standards on Non Ferrous Metals and Alloys. 3. Intermetallic compounds. 4. Designing Nonferrous metal and alloys					
Textbook	Handouts on Nonferrous Alloys					
Other References	1. Wolfgang Pfeiler (Editor), Alloy Physics: A Comprehensive Reference 2. Wolfgang Pfeiler (Editor) ISBN: 978-3-527-31321-1, Wiley, July 2007. J.R. Davis, Alloying, 3. Understanding the basics, ASM International, 2001, ISBN: 978-0-87170- 744-4. 4. Walter J.L, M.R. Jackson, C.T. Sims Alloying ASM 1989 5. Mondolfo L.F Aluminium Alloys,.Butterworths. London, 1984 6. Goldsmith H.J. Interstitial Alloys, Butterworths. London, 1967 7. Porter D.A, K.E. Easterlin Phase Transformation in Metals and Alloys, Van Nostrand Co. Ltd. 1987 8. Brick R.M, R.B. Gordon, A. Phillips, Structure and Properties of Alloys,. McGraw Hill, NewYork 1985					
Homework & Projects	1 Group Project and Presentation					
Laboratory Work	None					
Computer Use	None					
Other Activities	None					
Assessment Criteria	**Activities**		**Quantity**	**Effects on Grading, %**		
	Midterm Exams		**1**	**30**		
	Quizzes		**-**	**-**		
	Homework		**-**	**-**		
	Projects		**1**	**30**		
	Term Paper/Project		**-**	**-**		
	Laboratory Work		**-**	**-**		
	Other Activities		**-**	**-**		
	Final Exam		**1**	**40**		

COURSE PLAN

Weeks	Topics	Course Outcomes
1	General introduction to alloying systems	1-4
2	Metal characteristics affected by alloying (physical, service properties)	1-4
3	Alloying for mechanical properties, strengthening mechanisms	1,3,4
4	Alloy standards and world wide applications	2
5	Effects of properties of alloying elements on base metal systems	1,3,4
6	Alloying techniques	1,4
7	Titanium and titanium alloys, preparation techniques and industrial applications	1,4
8	Aluminum alloys and industrial applications	1,4
9	High-entropy alloys and preparation techniques	1,4
10	Refractory metal alloy systems and preparation techniques	1,4
11	Noble metal alloys preparation techniques and industrial applications	1,4
12	Super alloys, preparation techniques and industrial applications	1,4
13	Student projects presentations, discussions and evaluations.	1,4
14	Student projects presentations, discussions and evaluations.	1,4

Relationship between the Course and Metallurgical and Materials Engineering Curriculum

	Student Outcomes	Level of Contribution		
		1	2	3
1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering science and mathematics			X
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare as well as global, cultural, social, environmental and economic factors		X	
3	An ability to communicate effectively with a range of audiences			X
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts		X	
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	X		
6	An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgement to draw conclusions			
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	X		

1: Little, 2: Partial, 3: Full

Course relationships with major elements of the field and material classes

		Level of Contribution		
		1	2	3
MAJOR ELEMENT OF THE FIELDS	STRUCTURE			X
	PROPERTIES			X
	DESIGN EXPERIMENT/ANALYSE DATA		X	
	PROCESSING			X
	COST/PERFORMANCE		X	
	QUALITY/ENVIRONMENT	X		
	DESIGN PROCESS OR PRODUCT			X
MATERIAL CLASSES	METAL			X
	CERAMICS AND GLASS			
	POLYMER			
	COMPOSITES			
	BIOMATERIALS			

1: Little, 2: Partial, 3: Full

Prepared by	Date	Revision #	Signature
Doç. Dr. Derya Dışpınar	December 2020		