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**
	-	50	50	
Course Description	This course will offer an introduction to the concept of alloy and alloying. The course will include the what is alloy, atomic structure, periodic table, the application of chemical bonding theories on metals, valence bonding and chemical bonding in metal and alloys,metallic alloy theories, crystal structrues of intermetallic phases and dimension analysis, alloy atandards and world wide applications, Aluminum, copper, zinc, titanium, nickel alloys.			
Course Objectives	Non ferrous metals and alloys course is an important engineering course for engineers in order to make alloys. In light of other engineering courses, this course emphasizes on • Alloy making theories and stuctural elements of alloys • Atomic structure,-Crystal structure of alloys • Alloying theories. • Solute solution alloys. Limited solution alloys. Intermediate solution alloys. Substitutional solute solution alloys. • Metastable phases. Intermetallic compounds. Covalent compounds. • Aluminium alloys and preparing techniques, Copper base alloys and preparing techniques, Zinc alloys and the other nonferrous alloying systems (Magnesium, Nickel, Titanium,…etc.)			
Course Learning Outcomes	Students who pass the course will be able to have a thorough understanding on: I. Non ferrous metal and alloys : Physical and Mechanical Properties of aluminum, copper, zinc, magnesium, titanium, nickel metals and their alloys. Economical evaluation of production and recycling methods of these alloys. II. Standards on Non Ferrous Metals and Alloys. III. Intermetallic compounds. IV. Designing Nonferrous metal and alloys			
Textbook	Handouts on Nonferrous Alloys			
Other References	Wolfgang Pfeiler (Editor), Alloy Physics: A Comprehensive Reference Wolfgang Pfeiler (Editor) ISBN: 978-3-527-31321-1, Wiley, July 2007 J.R. Davis, Alloying, Understanding the Basics, ASM International, 2001,ISBN: 978-0-87170-744-4 Walter J.L, M.R. Jackson, ,. C.T. Sims Alloying ASM 1989 Titanium (Engineering Materials and Processes) Gerd Lütjering , James C. Williams, Springler-Verlag Berlin Heidelberg, 2010, ISBN 978-3-642-09054-7 Mondolfo L.F Aluminium Alloys,.Butterworths. London, 1984 Porter D.A, K.E. Easterlin Phase Transformation in Metals and Alloys, Van Nostrand Co. Ltd. 1987 Brick R.M, R.B. Gordon, A. Phillips, Structure and Properties of Alloys,. McGraw Hill, NewYork 1985 Aluminium Casting Technology AFS 1993 Casting Copper Base Alloys (AFS) 1984			
Homework & Projects				
Laboratory Work	-			
Computer Use	-			
Other Activities	-			

Assessment Criteria	Activities	**(Quantity)**	**(Effects on Grading, %)**
	Midterm Exams	**1**	**20**
	Quizzes		
	Homework	**1-2**	**10**
	Projects	**1**	**30**
	Term Paper/Project	**1**	**40**
	Laboratory Work	**-**	
	Other Activities	**-**	
	Final Exam	**-**	**-**

COURSE PLAN

Weeks	Topics	Course Outcomes
1	Atomic structure and periodic table	I
2	Metallic Alloy Theories	I
3	Metallic Alloy Theories	I
4	Crystal structrues of intermetallic phases and dimension analysis	I,IV
5	Microscopic Phase Equlibrium in Alloys	I
6	Alloy Standards and World wide applications	III
7	Molten Aluminum Preparation Techniques and Alumimum Alloys melting practices	I
8	Aluminum alloys and industrial applications	I
9	Copper and copper alloys preparation techniques and industrial applications	I
10	Zinc and Zinc alloys preparation techniques and industrial applications	I
11	Magnesium and magnesium alloys preparation techniques and industrial applications	I
12	Titanium and Titanium Alloys preparation techniques and industrial applications	I
13	Student projects presentations, discussions and evaluations.	I, II, III, IV
14	Student projects presentations, discussions and evaluations.	I, II, III, IV

Relationship between the Course and Metallurgical and Materials Engineering Curriculum

	Program Outcomes	Level of Contribution		
		1	**2**	**3**
1	Ability to apply the knowledge of mathematics, science and engineering principles to solve problems in metallurgical and materials engineering (ABET:a)		**X**	
2	Ability to characterize materials using standard and/or self designed experimental methods and to evaluate the results (ABET:b)			
3	Ability to design a system or a process, taking into consideration of the desired specifications, quality, ethics and environment. (ABET:c)	**X**		
4	Ability to communicate both orally and in the written form and to take part in, and provide leadership of the teams in the elucidation of engineering problems; (ABET:d, g)		**X**	
5	Ability to define, formulate and solve engineering problems in the development, production, processing, protection and usage of engineering materials. (ABET:e)			**X**
6	An understanding of professional and ethical responsibilities(ABET:f)			
7	An understanding of current/contemporary issues and impact of engineering solutions in broad cultural, national and global levels;. (ABET:h, j)		**X**	
8	A comprehension of the nature of engineering progress closely linked with the development of new materials and production processes. An ability to engage in life-long learning and a recognition of its necessity (ABET:i)		**X**	
9	Ability to use essential tools and techniques of modern engineering in the development, production, processing, protecting of the existing and new engineering materials. (ABET:k)		**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			
	POLYMERS			
	COMPOSITES			

1: Little, 2. Partial, 3. Full

Prepared by	**Date**	**Signature**
Assoc. Prof. Dr. Derya Dışpınar	December 2020	