Course Name						
INTRODUCTION TO TECHNICAL CERAMICS						
Code	**Semester**	**Local Credits**	**ECTS Credits**	**Course Implementation, Hours/Week**		
				Theoretical	**Tutorial**	**Laboratory**
MET 476E	8	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**
	-	70		30		-
Course Description	Ceramic materials description, technical ceramics description, classification of ceramic materials, main difference of technical ceramics from traditional ceramics, production process of ceramic materials, raw material preparations, forming, sintering, classification of technical ceramics in accordance with chemical composition, oxides; Al_2O_3, MgO, ZrO_2, Carbides; SiC, B_4C, WC, TiC, Nitrides; AlN, Si_3N_4, Sialons, refractive ceramics.					
Course Objectives	1.To provide metallurgy and materials engineering students' fundamental engineering knowledge and skill, by teaching properties of traditional ceramic materials and technical ceramics, 2.To provide the knowledge of technical ceramic production processes and sintering theory, the interaction starting materials properties, production processing, sintering parameters, on microstructure and properties of technical ceramics. 3.To give ability to apply knowledge of technical ceramics on engineering problems.					
Course Learning Outcomes	Students who pass the course will be able to: 1.Understand main properties of ceramics materials, classification of ceramic materials, properties of traditional ceramics, definition of technical ceramics, and properties of technical ceramics, difference between traditional and technical ceramics, 2.Know about ceramic materials processing; raw materials preparations, shape forming, sintering. 3.Understand classification of technical ceramics in accordance with chemical composition, main properties of these ceramics. 4.Understand properties, processing and application areas of oxide ceramics, carbides and nitrides. 5.Understand some refractory ceramics					
Textbook	1.Carbides, Nitrides and Boride Materials Synthesis and Processing, Alan W.Wiemer, Champman &Hill, ISBN 0 412 5406006, 1992. 2.Ceramic Materials, Processes, Properties and Applications, P. Boch, J.C.Niepce ISTE 2007.					
Other References						
Homework & Projects	A term project will be given to students for participation course. This project will be presented during course and counted as mid-term exam.					
Laboratory Work	-					
Computer Use	-					
Other Activities	-					
Assessment Criteria	**Activities**		**Quantity**		**Effects on Grading, %**	
	Midterm Exams					
	Quizzes					
	Homework					
	Projects					
	Term Paper/Project		**1**		**50**	
	Laboratory Work					
	Other Activities					
	Final Exam		**1**		**50**	

COURSE PLAN

Weeks	Topics	Course Outcomes
1	Introduction to ceramic materials, definition of ceramic Materials, classification of ceramic materials; traditional ceramics and technical ceramics, brief history of technical ceramics	1
2	Ceramic bonding, properties of ceramic materials and technical ceramics.	1
3	Ceramic Materials and technical ceramics processing; raw Materials preparation. Shape forming process, sintering processes	2
4	Classification of technical ceramics in accordance with chemical composition: Silicate ceramics	2,3
5	Oxide technical ceramics: Al_2O_3, MgO	3,4
6	Oxide technical ceramics: ZrO_2	3,4
7	Carbide technical ceramics: SiC, B_4C	3,4
8	Carbide technical ceramics: TiC, WC	3,4
9	Nitride technical ceramics: AlN, Si_3N_4- Student presentations	3,4,5
10	Nitride technical ceramics: Sialons, refractory ceramics -Student presentations	3,4,5
11	Boride technical ceramics TiB_2 -Student presentations	3,4,5
12	Boride technical ceramics ZrB_2,HfB_2 -Student presentations	4,5
13	Student presentations	4,5
14	Student presentations	4,5

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, analyze and interpret data, and use engineering judgement to draw conclusions	**X**		
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			
	DESIGN PROCESS OR PRODUCT			**X**
MATERIAL CLASSES	**METAL**			
	CERAMICS AND GLASS			**X**
	POLYMER			
	COMPOSITES	**X**		
	BIOMATERIALS			

1: Little, 2: Partial, 3: Full

Prepared by	**Date**	**Revision #**	**Signature**
Prof. Dr. Filiz ÇINAR ŞAHIN	December 2020		