Course Name						
Technical Ceramics						
				Course Implementation, Hours/Week		
Code	**Semester**	**Local Credits**	**ECTS Credits**	**Theoretical**	**Tutorial**	**Laboratory**
MET 471 E	7	3	3	3	-	-

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, Si3N4, 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. Understand classification of technical ceramics in accordance with chemical composition, main properties of these ceramics. 3. Know about ceramic materials processing; raw materials preparations, shape forming, sintering. 4. Understand properties, processing and application areas of oxide ceramics, carbides and nitrides. 5. Understand some refractory ceramics.
Textbook	• Carbides, Nitrides and Boride Materials Synthesis and Processing, Alan W.Wiemer, Champman &Hill, ISBN 0 412 5406006, 1992. • Ceramic Materials, Processes, Properties and Applications, P. Boch, J.C.Niepce ISTE 2007.
Other References	• Introduction To Ceramics, W.D. Kingery Wiley , 1960
Homework & Projects	• 1 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 (as a presentation)	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,	I
2	description of technical ceramics, classification of technical ceramics in accordance with application areas, brief history of technical ceramics	I
3	Ceramic bonding, properties of ceramic materials and technical ceramics.	II
4	Ceramic Materials and technical ceramics processing; raw Materials preparation.	II
5	Ceramic Materials and technical ceramics processing; shape forming;	II
6	Ceramic Materials and technical ceramics processing pressing, slip casting, tape casting, injection, extrusion	II
7	Ceramic Materials and technical ceramics processing;; sintering; solid state sintering, liquid phase sintering	II
8	Ceramic Materials and technical ceramics processing; sintering; pressure assisted sintering	II
9	Classification of technical ceramics in accordance with chemical composition: Silicate ceramics	III
10	Oxide technical ceramics: Al2O3, MgO, ZrO2	III-IV
11	Oxide technical ceramics: ZrO2, Carbide technical ceramics: SiC, B4C	III-IV
12	Carbide technical ceramics: WC, TiC	IV
13	Nitride technical ceramics: AlN, Si3N4	IV
14	Nitride technical ceramics: Sialons, refractory ceramics	IV-V

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)	X		
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 and surface treatment 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			
	DESIGN PROCESS OR PRODUCT			**X**
MATERIAL CLASSES	METAL			
	CERAMICS			**X**
	POLYMERS			
	COMPOSITES	**X**		

1: Little, 2. Partial, 3. Full

Prepared by **Assoc.Prof.Filiz Şahin**	Date 5.7.2009	**Signature**