

Course Name						
MATERIALS CHEMISTRY						
Code	Semester	Local Credits	ECTS Credits	Course Implementation, Hours/Week		
				Theoretical	Tutorial	Laboratory
MET 228E	4	2	3	2	-	-
Department/Program		Metallurgical and Materials Engineering				
Course Type		Required		Course Language		English
Course Prerequisites		None				
Course Category by Content, %	Basic Sciences		Engineering Science		Engineering Design	General Education
	30		50		20	
Course Description		<p>This course provides introductory information to explain the material properties via their place in the periodic table.</p> <p>General approach to the surface properties of solids, the synthesis of inorganic materials through the gas, solution and solid reactions, and fundamental properties of materials such as thermal, optic, magnetic, etc by means of the bonding structure of materials, coordination chemistry and common electrochemical behavior of materials.</p>				
Course Objectives		<p>The scope of lecture is to give:</p> <ul style="list-style-type: none"> the general explanation of material properties in the periodic table. the idea behind the construction of periodic table. the influence of chemical bonding types and complex structures of materials to material properties solubility rules, acids, bases, pH, buffers, ligand exchange, redox reactions the examination of amorphous solids, glass, slags, boron and metal borides, metal carbides and metal nitrides, metal oxides, intermetallics, transition metals by taking the structure of materials into account. the electrical conductivity, optical and thermal properties of materials the synthesis of inorganic materials through the gas, solution and solid reactions, the electrochemical behaviors and properties of metals 				
Course Learning Outcomes		<p>Students who pass the course will have knowledge on;</p> <ol style="list-style-type: none"> the fundamental principles that underlie materials chemistry, elements and compounds, chemical formulas and reactions and relation between Periodic table and location of elements the influence of chemical bonding types and complex structures of materials to their properties the structure of materials, the complex compounds inorganic molecules, liquids and solutions structural solid state chemistry the chemistry of inorganic surfaces synthesis of inorganic material electrochemical behavior of materials 				
Textbook		<p>The Inorganic Chemistry Of Materials, Paul J. van der PUT, Preum Press, NY, ISBN 0-306 45731-8-2007</p> <ul style="list-style-type: none"> Course Hand outs 				
Other References		<p>Materials Chemistry, Bradley D. Fahlman, Published by Springer, ISBN 978-1-4020-6119-6 (HB) and ISBN 978-1-4020-6120-2 2008</p> <p>Harry L Allcock Introduction to Materials Chemistry, 2008, John&Wiley, ISBN 978-0-470-29333-1</p>				
Homework & Projects						
Laboratory Work						
Computer Use						
Other Activities						
Assessment Criteria	Activities		Quantity		Effects on Grading, %	
	Midterm Exams		1		20	
	Quizzes		4		20	
	Homework		2		20	
	Projects					
	Term Paper/Project					
	Laboratory Work					
	Other Activities					
Final Exam		1		40		

Weeks	Topics	Course Outcomes
1	The Technology of Materials , The role of chemistry in Materials science, Fundemantal Principles that underlie materials chemistry	I - VIII
2	The Periodic Table , Fundemantal Principles that underlie materials chemistry, Introduction to elements and compounds, chemical formulas and reactions	I
3	The Chemical Bond , Electrons in Atomic Shells, Orbitals: Molecular Orbital and Valence Bond Models, The Coordinative Bond in Complexes Bonding in Ionic Compounds,	I, II, III
4	Inorganic Molecules, Liquids and Solutions , solubility rules, acids, bases, pH, buffers Ligand Exchange, Redox Reactions,	I, IV
5	Structural Solid State Chemistry , Crystal Chemistry, Amorphous Solids, Glass, Slags,Boron and, Metal Borids, Carbides and Nitrides, metal Oxides, Intermetallics, Transition metals,	I, III, IV,V
6	Structural Solid State Chemistry , Intrinsic Properties, Electron Conductivity,Dielectric Properties, Ion Conductivity, Magnetic, Mechanical, Optical, Chemical, Thermal Properties	I, III, IV,V
7	Structural Solid State Chemistry , Intrinsic Properties, Electron Conductivity,Dielectric Properties, Ion Conductivity, Magnetic, Mechanical, Optical, Chemical, Thermal Properties	I, III, IV,V
8	Solid State Reactions , Types of Reactions of Solids,The Chemistry of Oxide, Sulfide and others,	I, III, IV,V
9	The Chemistry of Inorganic Surfaces , Surface Chemistry,Inorganic Colloids, Converting Solids by Reaction with a Gaseous Recactant, Chemical Vapor Deposition,	IV, VI
10	The Chemistry of Inorganic Surfaces , The Pyrolylise, Powder Synthesis, High-Temperature Corrosion Surface Modification by Immobilization of Molecules	IV, VI
11	Synthesis of Inorganic Material , Inorganic Synthesis, Solid State Reactions Synthesis from Liquids, Preparation from Melts,	II, VII
12	Synthesis of Inorganic Material , Hydrothermal Processes, Sol-Gel Method, A Gas-Phase Techniques, Physical Vapor Deposition, Chemical Vapor Deposition, Plasma Synthesis	II, VII
13	Electrochemical behavior of materials , material and water interaction, Eh-pH, corrosion, electrochemical reduction and dissolution	I, VIII
14	Different types of materials and Materials in Advanced Technology	

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)			
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)			
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)			
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			
	PROCESSING	x		
	COST/PERFORMANCE	x		
	QUALITY/ENVIRONMENT	x		
	DESIGN PROCESS OR PRODUCT		x	
MATERIAL CLASSES	METAL			x
	CERAMICS			x
	POLYMERS			
	COMPOSITES			

1: Little, 2. Partial, 3. Full

Prepared by Prof. Dr. Yılmaz Taptik Prof. Dr. Servet TİMUR Assist. Prof. Dr. Nuri SOLAK	Date March 2013	Signature
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