

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	This course provides introductory information to explain the material properties via their place in the periodic table. General approach to the properties of materials, the synthesis of inorganic materials through the gas, solution and solid reactions, and fundamental properties of materials such as thermal, optic, magnetic, etc., solid state chemistry and materials characterization.					
Course Objectives	The scope of lecture is to give: 1.The general explanation of material properties in the periodic table. 2.The idea behind the construction of periodic table. 3.The influence of chemical bonding types and complex structures of materials to material properties 4.Solubility rules, acids, bases, pH, buffers, ligand exchange, redox reactions 5.Solid state chemistry 6.The electrical conductivity, optical and thermal properties of materials 7.The synthesis of inorganic materials through the gas, solution and solid reactions, 7.Properties of materials 8.The characterization of materials					
Course Learning Outcomes	Students who pass the course will have knowledge on; 1.The fundamental principles that underlie materials chemistry, elements and compounds, chemical formulas and reactions and relation between Periodic table and location of elements 2.The influence of chemical bonding types and complex structures of materials to their properties 3.The structure of materials, the complex compounds 4.Structural solid-state chemistry 5.The chemistry of materials 6.Synthesis methods 7.Characterization of materials 8.Optical, electrical, electronic, magnetic properties of materials					
Textbook	1.Fahlman, B. D., Materials Chemistry, Third Edition, Springer, The Netherlands, ISBN 978-94-024-1253-6, 2018. 2.Allcock, H. R., Introduction to Materials Chemistry, John Wiley & Sons, Inc., Hoboken, New Jersey, ISBN: 978-0-470-29333-1, 2008. 3.West, A. R., Solid State Chemistry, Second Edition, John Wiley & Sons, Ltd, United Kingdom, ISBN: 9781119942948, 2014.					
Other References	1.The Inorganic Chemistry Of Materials, Paul J. Van Der PUT, Prenum Press, NY, ISBN 0-306 45731-8-2007 Materials Chemistry and Physics, Journal, Elsevier, https://www.journals.elsevier.com/materials-chemistry-and-physics					
Homework & Projects	-					
Laboratory Work	-					
Computer Use	-					
Other Activities	-					
Assessment Criteria	Activities	Quantity		Effects on Grading, %		
	Midterm Exams	1		30		
	Quizzes					
	Homework	1		20		
	Projects					
	Term Paper/Project					
	Laboratory Work					
Other Activities						
Final Exam	1		50			

COURSE PLAN

Weeks	Topics	Course Outcomes
1	The technology of materials, the role of chemistry in materials science, what is materials chemistry?	1-8
2	The Periodic Table, Fundamental Principles that underline materials chemistry, Introduction to elements and compounds, chemical formulas and reactions	1
3	Solid State Chemistry: Crystal Structures and Crystal Chemistry	3,4
4	Solid State Chemistry: Crystal Defects, Non-Stoichiometry and Solid Solutions	3,4
5	Solid State Chemistry: Bonding in Solids	2,3,4
6	Basic synthesis and reaction chemistry: isolation of elements, materials synthesis,	5
7	Synthesis, Processing and Fabrication Methods: Solid State Reaction or Shake 'n Bake Methods, Low Temperature or Chimie Douce Methods	5,6
8	Synthesis, Processing and Fabrication Methods: Gas-Phase Methods, High-Pressure Methods, Crystal Growth	5,6
9	Crystallography and Diffraction Techniques	7
10	Other Techniques: Microscopy, Spectroscopy, Thermal Analysis	7
11	Glasses and Ceramics, Polymers	5,7,8
12	Nanomaterials	5,7,8
13	Semiconductors - Superconductors - Solid Ionic Conductors	5,7,8
14	Electrical Properties, Magnetic Properties, Optical Properties	5,7,8

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		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			
	PROCESSING	X		
	COST/PERFORMANCE	X		
	QUALITY/ENVIRONMENT	X		
	DESIGN PROCESS OR PRODUCT		X	
MATERIAL CLASSES	METAL			X
	CERAMICS AND GLASS			X
	POLYMER			
	COMPOSITES			X
	BIOMATERIALS			X

1: Little, 2: Partial, 3: Full

Prepared by Assoc. Prof. Dr. Mehmet Şeref SÖNMEZ	Date December 2020	Revision #	Signature
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