

Course Name						
EXTRACTIVE METALLURGY OF NON-FERROUS METALS						
Code	Semester	Local Credits	ECTS Credits	Course Implementation, Hours/Week		
				Theoretical	Tutorial	Laboratory
MET 474E	8	2	4	2	-	-
Department/Program	Metallurgical and Materials Engineering Department					
Course Type	elective				Course Language	ENGLISH
Course Prerequisites	None					
Course Category by Content, %	Basic Sciences	Engineering Science	Engineering Design	General Education		
	-	% 60	% 40	-		
Course Description	Metals such as; Copper, Zinc, Cadmium, Mercury, Lead, Aluminum, Antimony, Chrome, Tungsten, Molybdenum, and Gold, Silver and Platinum group metals –either produced in Turkey or to be potentially produced, are taught in the following contents; etymology and history, physical and chemical properties, standards, chemical compounds and alloys, production and consumption statistics, world ore reserves, production techniques, flow sheets, environmental problems, extraction and raffination technologies – from primary or secondary sources, the furnaces used in extraction processes, converters, leaching, sedimentation and electrolysis. Processes, selected for the production of a given metal, are explained both in terms of the physico-chemical properties of metals and in relation to each others.					
Course Objectives	<ol style="list-style-type: none"> To teach the properties of non-ferrous metals, their production technologies, -starting from their ores and scrap, and all the economical aspects. To Emphasize the importance of recycling of non-ferrous metals 					
Course Learning Outcomes	Students who pass the course will be able to: <ol style="list-style-type: none"> Learn the fundamental concepts of; metallurgical pre-treatment methods, production of metals from ore, concentrate and secondary sources. Identify the beneficiation of byproducts materialize during the metal production, within the framework of technology-environment-ecology. Conduct a detailed and individual research about a production of a specific metal, as part of their responsibility. Emphasize the strategic importance of raw and supplementary materials in the production, and explain the concepts of technological and economical feasibility. 					
Textbook	Biswas, A.K. , Davenport, W.G., Extractive Metallurgy of Copper, Pergamon Press, 1994 Addemir, O. , Açma, E., Arslan C., ÇİNKO, Sistem yayıncılık, 1994. Burkin, A.R. , Production of Aluminium and Alumina, John Wiley & Sons, 1987. Grimwade, M. , Introduction to Precious Metals, Newnes Technical Books, London , 1985					
Other References						
Homework & Projects	Presentation projects will be given to the students and all of the presentations will be done at the last lesson. Presentations will last 15 minutes oral work and 15 minutes answer-question. Presentations may be used as a source for final exam.					
Laboratory Work						
Computer Use						
Other Activities						
Assessment Criteria	Activities	Quantity	Effects on Grading, %			
	Midterm Exams	MIN 1	% 30			
	Quizzes					
	Homework					
	Projects					
	Term Paper/Project	MIN 1	% 20			
	Laboratory Work					
Other Activities						
Final Exam	1	% 50				

COURSE PLAN

Weeks	Topics	Course Outcomes
1	General Outlook of the Non-Ferrous Metals Production Metallurgy	I
2	Metallurgy of Copper (Etymology, Minerals, Ore Processing, Production Techniques)	I
3	Copper Refinement, Copper Production from Secondary Sources	I
4	Copper Refinement, Copper Production from Secondary Sources (continued)	I-II
5	Zinc Production, Pyro-, Hydro-, and Electro-Metallurgical Routes of Zinc Production	II
6	Problems faced with in Zinc Production, Beneficiation of Secondary Sources	II
7	Metallurgy of Lead (Production, Refinement, and Electrolysis), Lead Recycling	II
8	Aluminum Production	III-IV
9	Aluminum Production	III-IV
10	Aluminum Electrolysis and Aluminum Production from Secondary Sources	III
11	Metallurgy of Chrome, Molybdenum and Tungsten	III
12	General Information about Antimony, Minerals, Production and Fields of Use, Antimony in the Metallurgy of Lead and Copper	IV
13	Metallurgy of Precious Metals	IV
14	Project –Presentation of the Assignment, Discussion and Evaluation	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)			
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)	x		
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		x	
	POLYMERS			
	COMPOSITES			

1: Little, 2. Partial, 3. Full

Prepared by	Date	Signature
Assoc. Prof. Dr. C. Bora Derin	March, 2013	