Course Name						
Extractive Metallurgy of Non-Ferrous Metals						
Code	**Semester**	**Local Credits**	**ECTS Credits**	**Course Implementation, Hours/Week**		
				Theoretical	**Tutorial**	**Laboratory**
MET 342	6	3	5	3	-	-

Department/Program	Metallurgical and Materials Engineering Department		
Course Type	Required metallurgy ops/elective materials ops	**Course Language**	Turkish
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	1. To teach the properties of non-ferrous metals, their production technologies, -starting from their ores and scrap, and all the economical aspects. 2. To Emphasize the importance of recycling of n on-ferrous metals
Course Learning Outcomes	Students who pass the course will be able to: I. Learn the fundamental concepts of; metallurgical pre-treatment methods, production of metals from ore, concentrate and secondary sources. II. Identify the beneficiation of byproducts materialize during the metal production, within the framework of technology-environment-ecology. III. Conduct a detailed and individual research about a production of a specific metal, as part of their responsibility. IV. 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 Wileyd Sns, 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 Raffination, Copper Production from Secondary Sources	I
4	Copper Raffination, 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, Raffination, 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 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		x	
	DESIGN PROCESS OR PRODUCT		x	
MATERIAL CLASSES	METAL			x
	CERAMICS		x	
	POLYMERS			
	COMPOSITES			

1: Little, 2. Partial, 3. Full

Prepared by Prof. Dr. İsmail DUMAN	Date 27.07.2009	Signature