Course Name						
CHEMICAL METALLURGY I						
Code	**Semester**	**Local Credits**	**ECTS Credits**	**Course Implementation, Hours/Week**		
				Theoretical	**Tutorial**	**Laboratory**
MET 313E	5	2	4	2	-	-

Department/Program	Metallurgical and Materials Engineering		
Course Type	Required	**Course Language**	English
Course Prerequisites	MET 215E and MET 224E		

Course Category by Content, %	**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
		70%	30%	-

Course Description	Principles history of metallurgy, definitions and concept, relationship between basic sciences, minerals and ores, raw materials (ores, concentrates, scraps, reused / recycled materials), Ore dressing, scrap classification, Comminution, fracture mechanisms, energy and power requirements, liberation, machine selection, machine types, crushers, grinders, Mineral separation, particle settling phenomena, particle separation, classification, mechanical classifiers, hydraulic classifiers, hydrocyclones, Screening, ideal and actual screens, material balances, types of screens, gravity concentration, magnetic separation, electrostatic separation, Flotation, flotation chemistry, surfactants, sulfide flotation, flotation systems, dewatering, sedimentation, flocculation, filtration, thermal drying, evaporation. Fundamentals of pyrometallurgy, hydrometallurgy and electrometallurgy
Course Objectives	1. To provide introductory concepts and techniques related with mineral processing/raw materials preparations for metallurgical processes with examples 2. To teach fundamental concepts and methods of metallurgical processes
Course Learning Outcomes	Students who pass the course will be able to: 1. Know history of metallurgy, fundamental definitions and concept of metallurgy 2. Identify metallurgical raw materials 3. pretreatment operations, ore processing and surface enlargement methods 4. Learn reduction operations and separation techniques. 5. Comprehend the general characteristics of pyrometallurgy hyrometallurgy electrometallurgy
Textbook	• C K. Gupta, Chemical Metallurgy, Wiley-Vch, 1997. • F. Habashi, Handbook of Extractive Metallurgy, Wiley-Vch, 1997.
Other References	• P. C. Hayes, Process Selection in Extractive Metallurgy, Hayes Pub. Co., 1985. • T. Rosenqvist, Principles of Extractive Metallurgy, McGraw-Hill, 1983. • B. A. Wills, Mineral Processing Technology, Pergamon Press, 1989. • J. J. Moore, Chemical Metallurgy, Butterworths, 1981. • F. Y. Bor, Ekstraktif Metalurji Prensipleri, 1 ve 2 cilt, İTÜ Matbaası, 1989. • F. Pawlek, Metallhüttenkunde, Walter de Gruyter, 1983. • İ. Duman, Kimyasal Metalurji Ders Sunuları, 2004.
Homework & Projects	-
Laboratory Work	-
Computer Use	-
Other Activities	**-**

Assessment Criteria	**Activities**	**Quantity**	**Effects on Grading, %**
	Midterm Exams	2	50
	Quizzes		
	Homework		
	Projects		
	Term Paper/Project		
	Laboratory Work		
	Other Activities		
	Final Exam	1	50

COURSE PLAN

Weeks	Topics	Course Outcomes
1	Principles history of metallurgy, definitions and concept, relationship between basic sciences, minerals and ores, raw materials (ores, concentrates, scraps, reused / recycled materials)	1
2	Ore dressing, scrap classification	1-2
3	Comminution, fracture mechanisms, energy and power requirements, liberation, machine selection, machine types, crushers, grinders	1-2-3
4	Mineral separation, particle settling phenomena, particle separation, classification, mechanical classifiers, hydraulic classifiers, hydrocyclones	2-3
5	Screening, ideal and actual screens, material balances, types of screens, gravity concentration, magnetic separation, electrostatic separation	2-3-4
6	Flotation, flotation chemistry, surfactants, sulfide flotation, flotation systems, dewatering, sedimentation, flocculation, filtration, thermal drying, evaporation	3-4-5
7	1st mid term exam	
8	Introduction to general characteristics of pyrometallurgy hyrometallurgy electrometallurgy	5
9	Fundamentals of pyrometallurgy I	3-4-5
10	Fundamentals of pyrometallurgy II	4-5
11	Fundamentals of pyrometallurgy III	5
12	Fundamentals of hydrometallurgy and electrometallurgy I	3-5
13	2nd mid term exam	
14	Fundamentals of hydrometallurgy and electrometallurgy II	3-4-5

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)	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)	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 **Prof. Dr. Onuralp Yücel**	Date **March 2013**	**Signature**