Course Name						
CHEMICAL METALLURGY I						
Code	**Semester**	**Local Credits**	**ECTS Credits**	**Course Implementation, Hours/Week**		
				Theoretical	**Tutorial**	**Laboratory**
MET 313E	5	2	5	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. Thermal drying, evaporation, calcining, roasting, sintering, oxidizing smelting, carbothermic, metallothermic and gas reduction reactions, reducing smelting, slags and fluxes, pyrometallurgical refining, fused salt electrolysis.
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, hydrometallurgy, electrometallurgy
Textbook	1. C K. Gupta, Chemical Metallurgy, Wiley-Vch, 1997. 2. F. Habashi, Handbook of Extractive Metallurgy, Wiley-Vch, 1997. 3. R. F. Tylecote, A History of Metallurgy, Second Edition, 2011, Maney.
Other References	1. P. C. Hayes, Process Selection in Extractive Metallurgy, Hayes Pub. Co., 1985. 2. T. Rosenqvist, Principles of Extractive Metallurgy, McGraw-Hill, 1983. 3. B. A. Wills, Mineral Processing Technology, Pergamon Press, 1989. 4. J. J. Moore, Chemical Metallurgy, Butterworths, 1981. 5. F. Y. Bor, Ekstraktif Metalurji Prensipleri, 1 ve 2 cilt, İTÜ Matbaası, 1989. 6. F. Pawlek, Metallhüttenkunde, Walter de Gruyter, 1983..
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 and 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
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
6	Flotation, flotation chemistry, surfactants, sulfide flotation, flotation systems, dewatering, sedimentation, flocculation, filtration, thermal drying, evaporation	3,4,5
7	Introduction to general characteristics of pyrometallurgy hydrometallurgy electrometallurgy	2,3,4,5
8	Introduction to general characteristics of pyrometallurgy hydrometallurgy electrometallurgy	3,4,5
9	Fundamentals of pyrometallurgy I	3,4,5
10	Fundamentals of pyrometallurgy II	4,5
11	Fundamentals of pyrometallurgy III	4,5
12	Fundamentals of hydrometallurgy and electrometallurgy I	4,5
13	Fundamentals of hydrometallurgy and electrometallurgy II	4,5
14	Fundamentals of hydrometallurgy and electrometallurgy III	4,5

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

1: Little, 2: Partial, 3: Full

Prepared by	Date	Revision #	Signature
Prof. Dr. Onuralp YÜCEL Prof. Dr. C. Bora DERİN Assoc. Prof. Dr. M. Şeref SÖNMEZ	December 2020		