

Course Name						
EXTRACTIVE METALLURGY LABORATORIES						
Code	Semester	Local Credits	ECTS Credits	Course Implementation, Hours/Week		
				Theoretical	Tutorial	Laboratory
MET 364E	6	1	3	-	-	2
Department/Program		Metallurgical and Materials Engineering Department				
Course Type		Required		Course Language		English
Course Prerequisites		MET 313E, MET 339E				
Course Category by Content, %		Basic Sciences	Engineering Science	Engineering Design	General Education	
			20	80		
Course Description		Cupellation, Refining and reduction electrolysis of copper, Copper production via sulphatizing roasting of sulfurous copper concentrates, Cementation, hydroxide precipitation and analysis techniques, Reduction electrolysis of zinc, Carbothermal reductive melting, Metallothermal reductive melting, Pelletizing of iron ore powders, Reduction of ferrous raw materials and optical investigations, Process automation and control.				
Course Objectives		Comprehensive understanding of the theoretical subjects covered in extractive metallurgy courses, dealing with the probable problems faced in industry, learning pre-treatment techniques applied to metallurgical raw materials, learning basic production methods in the fields of pyrometallurgy, hydrometallurgy and electrometallurgy, applying the engineering knowledge gained in classes to design and conduct lab-scale experiments, to analyze their results, and to work as teams.				
Course Learning Outcomes		<ol style="list-style-type: none"> 1) Comprehensive understanding of the theoretical subjects covered in extractive metallurgy courses. 2) Learning pre-treatment techniques applied to metallurgical raw materials, basic production methods in the fields of pyrometallurgy, hydrometallurgy and electrometallurgy. 3) Additionally, students will gain an understanding about the basic concepts of production processes and the relationships between the parameters, and will be able to analyze the results of experiments. 4) Getting information about planning and operating laboratory scale experiments, design and selection of process. 5) Moreover, oral and written communication skills of the students are intended to be improved by holding conversations before, during, and after the experiments to discuss the setting up the experiments and their results, and by preparing a formal written report. 				
Text Book		Metallurgy Laboratory Pamphlet, and other resources defined for each experiment				
Other References						
Homework & Projects						
Laboratory Work		10 EXPERIMENTS				
Computer Use		USE OF WORD AND EXCEL, DATA EVALUATION PROGRAMS				
Other Activities		LABORATORY ORIENTATION (LAB SECURITY)				
Assessment Criteria			Quantity	Effects on Grading, %		
		Activities	-	-		
		Midterm Exams	-	-		
		Quizzes	9	20		
		Homework	-	-		
		Projects	-	-		
		Term Paper/Project	-	-		
		Laboratory Work	9 (Exp)	60 (Written Report / Experiment)		
Other Activities	Participation in the experiments	20				
Final Exam		-		-		

COURSE PLAN

Weeks	Topics	Course Outcomes
1	Registration	1
2	Introduction to metallurgical laboratories and laboratory security	1
3	Cupellation	1-5
4	Refining and reduction electrolysis of copper	1-5
5	Copper production via sulphatizing roasting of sulfurous copper concentrates	1-5
6	Cementation, hydroxide precipitation and analysis techniques	1-5
7	Reduction electrolysis of zinc	1-5
8	Carbothermal reductive melting	1-5
9	Metallothermal reductive melting	1-5
10	Pelletizing of iron ore powders	1-5
11	Reduction of ferrous raw materials and optical investigations	1-5
12	Make-up experiments	1-5
13	Make-up experiments	
14	Make-up experiments	

Relationship between the Course and Metallurgical & 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)			X
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)			
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

<u>Prepared by</u> All Faculty Members	<u>Date</u> December 2020	<u>Signature</u>
---	------------------------------	------------------