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					
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	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.					
Textbook	Metallurgy Laboratory Pamphlet, and other resources defined for each experiment					
Other References	-					
Homework & Projects	-					
Laboratory Work	10 experiments					
Computer Use	WORD, EXCEL, Data Evaluation Programs					
Other Activities	Laboratory Orientation (Lab Security)					
Assessment Criteria	**Activities**		**Quantity**		**Effects on Grading, %**	
	Midterm Exams		-		-	
	Quizzes		-		-	
	Homework		9		20	
	Projects		-		-	
	Term Paper/Project		-		-	
	Laboratory Work		-		-	
	Other Activities		9 (Exp)		60 (Written Report / Experiment)	
	Final Exam		Participation in the experiments		20	

COURSE PLAN

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

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			

1: Little, 2: Partial, 3: Full

Prepared by	**Date**	**Revision #**	**Signature**
All Faculty Members	December 2020		