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	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 labratory 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

Prepared by	Date	**Signature**
All Faculty Members	March, 2013	