

Course Name						
MATERIALS PROCESSING LABORATORIES						
Code	Semester	Local Credits	ECTS Credits	Course Implementation, Hours/Week		
				Theoretical	Tutorial	Laboratory
MET 455E	7	1	3	-	-	2
Department/Program	Metallurgical and Materials Engineering Department					
Course Type	Required		Course Language	English		
Course Prerequisites	MET 364E					
Course Category by Content, %	Basic Sciences		Engineering Science	Engineering Design	General Education	
			% 20	% 80		
Course Description	Basic principles of electrochemical corrosion and galvanic corrosion, Passivation and cathodic protection, Hardness-Impact-Erichsen tests of metallic materials, Tensile-Compression-Bending tests of metallic materials, Wear-Torsion tests of metallic materials, Stress relaxation-Fatigue-Creep tests of metallic materials, Heat treatment (Tempering, Hardening, Hardening capability, Jominy test), Casting experiments, Determination of humidity amount, Sieve analysis, CO ₂ sodium silicate method for die production					
Course Objectives	It is primarily targeted in this course to experimentally show the students the subject material they learned theoretically in courses such as materials science and basic principles of electrochemical corrosion, materials mechanical testing, plastic deformation, heat treatment, casting experiments etc. It is also the purpose of this course to direct the students' knowledge to be exploited in the design and applications. Students will gain an understanding about the basic concepts of production processes and the relationships between the parameters and processes, and the correlation between structure, property, and performance of a given material, and ability to analyze the results. Moreover, oral and written communication skills of the students are intended to be improved by the conversations held before, during, and after the experiments for discussing the preparation of experiments and their results, and by preparing a formal written report.					
Course Learning Outcomes	<ol style="list-style-type: none"> 1. It is the aim of this course to experimentally show the students the subject material they learned theoretically in courses such as materials science and basic principles of electrochemical corrosion, materials mechanical testing, plastic deformation, heat treatment, casting experiments, etc. 2. Getting information about materials selection and design according to their manufacturing techniques and applications areas. 3. Students will gain an understanding about the various materials, their features and relation between structure-property-performance of the materials 4. Teaching of different characterization techniques and approaches applied to materials. 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					
Homework & Projects						
Laboratory Work	9 EXPERIMENTS					
Computer Use	USE OF WORD AND EXCEL, DATA EVALUATION PROGRAMMS					
Other Activities	LABORATORY ORIENTATION (LAB SECURITY)					
Assessment Criteria			Quantity	Effects on Grading, %		
	Activities		-	-		
	Midterm Exams		-	-		
	Quizzes		9	20 (Quiz / Experiment)		
	Homework		-	-		
	Projects		-	-		
	Term Paper/Project		-	-		
	Laboratory Work		9 (Exp)	60 (Written Report / Experiment)		
Other Activities			20 (Participation in the experiments)			
Final Exam			-	-		

COURSE PLAN

Weeks	Topics	Course Outcomes
1	Registration	1
2	Introduction to metallurgical laboratories and laboratory security.	1
3	Basic principles of electrochemical corrosion and galvanic corrosion	1-5
4	Passivation and cathodic protection	1-5
5	Hardness-Impact-Erichsen tests of metallic materials	1-5
6	Tensile-Compression-Bending tests of metallic materials	1-5
7	Wear-Torsion tests of metallic materials	1-5
8	Stress relaxation-Fatigue-Creep tests of metallic materials	1-5
9	Heat treatment (Tempering, Hardening, Hardening capability, Jominy test)	1-5
10	Casting experiments, Determination of humidity amount	1-5
11	Sieve analysis, CO ₂ sodium silicate method for die production	1-5
12	Make-up experiments	
13	Make-up experiments	
14	Make-up experiments	

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)			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>	<u>Date</u>	<u>Signature</u>
All Faculty Members	December 2020	