Course Name						
MATERIALS CHARACTERIZATION LABORATORIES						
Code	**Semester**	**Local Credits**	**ECTS Credits**	**Course Implementation, Hours/Week**		
				Theoretical	**Tutorial**	**Laboratory**
MET 339E	5	1	3	-	-	2

Department/Program	Metallurgical and Materials Engineering Department			
Course Type	Required	**Course Language**	English	
Course Prerequisites	MET 213E			
Course Category by Content, %	**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
		% 20	% 80	
Course Description	Metallographic sample preparation 1-2, Metallography of non-ferrous metals and worked materials, Metallography of iron based materials, and quantitative metallurgy, Analysis of factors that affect the X-ray diffraction pattern, Qualitative phase analysis with X-ray diffraction, NDT tests as liquid penetration, magnetic powder, ultrasonic and radiographic methods, Ceramic raw material preparation, Granulation, Plasticity determination, Semi-wet shaping, Sintering, Characterization of ceramics, Sample analysis with electron microscope.			
(Course Objectives	It is primarily aimed in this course to show experimentally to the students the subject material they learned theoretically in courses such as materials science, metallography, analysis of factors that affect the X-ray diffraction pattern, powder materials, ceramics, 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	1. It is the aim of this course to show experimentally to the students the subject material they learned theoretically in courses such as materials science, metallography, factors effects the X-ray diffraction pattern, powder materials, ceramics, etc. 2. It is also the purpose of this course to guide the students' knowledge to be used in the design and applications of materials. 3. Learning of the material characterization methods by comparing the well known methods with newly developed techniques. 4. Getting information about materials selection and design according to their manufacturing techniques and applications areas. 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	**9 Experiments**			
Computer Use	**Use Of Word And Excel, Data Evaluation Programms**			
Other Activities	**Laborotory 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 labratory security.	1
3	Metallographic sample preparation - 1&2	1-5
4	Metallography of non-ferrous metals and worked materials, Metallography of iron based materials, and quantitative metallurgy	1-5
5	Analysis of factors that affect the X-ray diffraction pattern	1-5
6	Qualitative phase analysis with X-ray diffraction	1-5
7	Liquid penetration, magnetic powder, ultrasonic and radiographic methods	1-5
8	Experiments of ceramic and powder materials I / Preparation of powder blends and mixtures	1-5
9	Experiments of ceramic and powder materials II / Treatments before forming the ceramic materials, sintering	1-5
10	Experiments of ceramic and powder materials III / Characterization	1-5
11	Sample analysis with electron microscope	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		**X**	

1: Little, 2. Partial, 3. Full

prepared by	Date	**Signature**
All Faculty Members	March 2013	