Course Name						
IRON AND STEEL MATERIALS IN ENGINEERING APPLICATIONS						
Code	**Semester**	**Local Credits**	**ECTS Credits**	**Course Implementation, Hours/Week**		
				Theoretical	**Tutorial**	**Laboratory**
MET 444E	8	2	4	2		-

Department/Program	Metallurgy and Materials Engineering		
Course Type	Required	**Course Language**	Turkish / English
Course Prerequisites	None		

Course Category by Content, %	**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
		20	80	

Course Description	Introduction, General definitions. Principles of production and alloying practice of iron and steel materials. Influence of alloying elements on properties of iron and steel materials. The classification of iron and steel materials. Iron and steel materials norms at the national and international standards. Steel materials for engineering applications. Structural steels, heat-treatable and surface-hardening steels for vehicle and machine construction, spring steels, free cutting steels, , low alloy high strength steels (micro alloyed steels), steel sheets and strips for pipes, vessel and automotive body, stainless steels and heat resisting steels, tool and mould steels, ultra high-strength steels, armour steels and special – purpose steels. Cast irons for engineering applications. Selection criteria of iron and steel materials for engineering applications.
Course Objectives	1. Make students gain the standard concept at engineering materials 2. Make students gain the knowledge of designing iron and steel materials which are engineering materials according to requirements 3. Make students obtain the qualifications to solve the engineering problems 4. Make students comprehend the concept of quality 5. Make students consider relations between quality of the product and manufacturing processes
Course Learning Outcomes	Students who pass the course are expected to 1.Understand the standard concept of engineering materials. 2.Design the steel and the cast iron which are engineering materials according to requirements. 3.Understand the solutions to the engineering problems. 4.Improve the quality of engineering materials. 5.Gain the ability to consider and comprehend the relationships between the production processes and the quality of the product.
Textbook	Lecture notes
Other References	**1.** Ferrous Physical Metallurgy; Anil Kumar Sinha; Butterworth Publications, 1989. **2.** Steel: A Handbook for Materials Research and Engineering, Volume 1: Fundamentals, Volume 2: Applications; the German Iron and Steel Institute, P.O. Box 105164D-4000 Dusseldorf 1, 1992
Homework & Projects	Preparation of personal homework and written reports about Iron and Steel Materials in Engineering Applications.
Laboratory Work	
Computer Use	Ability to use Word and Excel programs. Powerpoint and Visio familiarly is an advantage.
Other Activities	Presentation of project group studies, discussion, evaluation.

Assessment Criteria	**Activities**	**Quantity**	**Effects on Grading, %**
	Midterm Exams	**2**	**40**
	Quizzes		
	Homework		
	Projects		
	Term Paper/Project	**1**	**10**
	Laboratory Work		
	Other Activities		
	Final Examination	**1**	**50**

COURSE PLAN

Weeks	Topics	Course Outcomes
1	Introduction. General definitions. Principles of production and alloying practice of iron and steel materials.	1
2	Principles of production and alloying practice of iron and steel materials. Influence of alloying elements on properties of iron and steel materials.	1, 2
3	The classification of iron and steel materials. Iron and steel materials norms at the national and international standards.	1, 2
4	Steel materials for engineering applications. Structural steels.	1, 2, 3, 4, 5
5	Heat-treatable and surface-hardening steels for vehicle and machine construction. Spring steels, free cutting steels.	1, 2, 3. 4, 5
6	MIDTERM EXAM 1	
7	Low alloyed high strength steels (micro alloyed steels), steel sheets and strips for pipes, vessel and automotive body.	1, 2, 3, 4, 5
8	Stainless steels and heat resisting steels.	1, 2, 3, 4, 5
9	Tool and mould steels.	1, 2, 3, 4, 5
10	Ultra high-strength steels, armour steels and special steels.	1, 2, 3, 4, 5
11	MIDTERM EXAM 2	
12	Cast irons for engineering applications.	1, 2, 3, 4, 5
13	Selection criteria of iron and steel materials for engineering applications.	1, 2, 3, 4, 5
14	Presantation of studies, discussion, evaluation.	1, 2, 3, 4, 5

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)			
3	Ability to design a system or a process, taking into consideration of the desired specifications, quality, ethics and environment. (ABET:c)	X		
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)			
7	An understanding of current/contemporary issues and impact of engineering solutions in broad cultural, national and global levels;. (ABET:h, j)	X		
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			
	PROCESSING		X	
	COST/PERFORMANCE		X	
	QUALITY/ENVIRONMENT	X		
	DESIGN PROCESS OR PRODUCT			X
MATERIAL CLASSES	METAL			X
	CERAMICS			
	POLYMERS			
	COMPOSITES			

1: Little, 2. Partial, 3. Full

Prepared by	Date	**Signature**
Assist Prof. Dr. C. Fahir ARISOY	March 2013	