

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		Metallurgical and Materials Engineering				
Course Type		Required		Course Language	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 mold steels, ultrahigh-strength steels, armor 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	The student will 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	20	
	Quizzes					
	Homework					
	Projects					
	Term Paper/Project			1	10	
	Laboratory Work					
	Other Activities					
	Final Exam			1	50	

COURSE PLAN

Weeks	Topics	Course Outcomes
1	Introduction. General definitions. Principles of production and alloying practice of iron and steel materials.	1,2,5
2	Principles of production and alloying practice of iron and steel materials. Influence of alloying elements on properties of iron and steel materials.	1,2,3,4,5
3	The classification of iron and steel materials. Iron and steel materials norms at the national and international standards.	1,2,3,4,5
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	Heat-treatable and surface-hardening steels for vehicle and machine construction. Spring steels, free cutting steels.	1,2,3,4,5
7	Low alloyed high strength steels (micro alloyed steels), steel sheets and strips for pipes, vessel and automotive bodies.	1,2,3,4,5
8	Stainless steels and heat resisting steels.	1,2,3,4,5
9	Tool and mold steels.	1,2,3,4,5
10	Ultra-high-strength steels and special steels.	1,2,3,4,5
11	Ultra-high-strength steels and special steels.	1,2,3,4,5
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	Discussion and general consideration of lecture	1,2,3,4,5

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, analyze 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			
	PROCESSING		X	
	COST/PERFORMANCE		X	
	QUALITY/ENVIRONMENT	X		
	DESIGN PROCESS OR PRODUCT			X
MATERIAL CLASSES	METAL			X
	CERAMICS AND GLASS			
	POLYMER			
	COMPOSITES			
	BIOMATERIALS			

1: Little, 2: Partial, 3: Full

Prepared by Asst. Prof. Dr. C. Fahir Arisoy	Date December 2020	Revision #	Signature
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