Course Name						
IRON & STEEL MAKING						
Code	**Semester**	**Local Credits**	**ECTS Credits**	**Course Implementation, Hours/Week**		
				Theoretical	**Tutorial**	**Laboratory**
MET 479E	7	2	3	2		-

Department/Program	Metallurgy and Materials Engineering			
Course Type	Elective	Course Language	English	
Course Prerequisites	None			
Course Category by Content, %	**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
		60	40	

Course Description	Introduction to iron and steel making processes. Raw materials and metallurgical pretreatments. Production of metallurgical coke. Iron ore and characterization. Sintering and peletizing of iron ore. Production of molten (pig) iron. Blast furnace and auxiliaries Principles of pig iron production at the blast furnace. Reduction of iron oxides. Bosh and heart reactions. Slag formation. Techniques for increasing blast furnace productivity. Basic principles of steel production and history processes. Steel production in basic oxygen converter. Steel production in electric arc furnaces. Deoxidation, gas purging and other ladle treatments. Principles and technologies of ingot and continuous casting methods. Technologies principles of long and flat products production. Production of sponge iron. Smelting reduction processes. Iron and steel industry in the world and Turkey.
Course Objectives	1.Understanding the basic principles and applications of steelmaking. 2.Understanding the raw materials and the effects of its properties on production 3.Understanding the basic principles of productivity and applications 4.Understanding the basic principles of the steel product quality development and applications
Course Learning Outcomes	Students who pass the course are expected to I. Understand the principles and processes of steel production. II. Understand the principles and applicability of straight and productive use of raw materials. III. Understand and apply the principles of environment-friendly production IV. Understand the principles and the applications of improving the steel quality V. Design new steel production processes
Textbook	Lecture notes
Other References	1. Mc. GANON, H. E., The Making, Shaping and Treating of Steel, United States Steel, 10. Ed., Pittsburg 1985. 2. BISVAS, A. K., Principles of Blast Furnace Ironmaking, Theory and Practice, Cootha Publishing House, 1981. 3. Publications about the course.
Homework & Projects	Homework about the steel production by evaluation of the various raw materials in the environment-friendly processes and alternative processes. Preparation of personal homework and written reports about steel production.
Laboratory Work	
Computer Use	
Other Activities	Visit to some industrial plants

Assessment Criteria	**Activities**	Quantity	Effects on Grading, %
	Midterm Exams	2	40
	Quizzes		
	Homework	1	5
	Projects		
	Term Paper/Project	1	5
	Laboratory Work		
	Other Activities		
	Final Examination	1	50

COURSE PLAN

Weeks	Topics	Course Outcomes
1	Introduction to iron and steel making processes.	I
2	Raw materials and metallurgical pretreatments. Production of metallurgical coke	II, III
3	Iron ore and characterization. Sintering of iron ore.	II, III
4	Peletizing of iron ore. Tests for detecting the properties of agglomeration products	II, III
5	Production of molten (pig) iron. History. Blast furnace and auxiliaries. Principles and production of pig iron at the blast furnace. Developing.	I, II,III
6	Reduction of iron oxides. Bosh and heart reactions. Slag formation. techniques for increasing blast furnace productivity.	I, II, III
7	MIDTERM EXAM 1, Applications.	I, II, III
8	Basic principles of steel production and history of production processes. Steel production in basic oxygen converter.	I, II, III, IV, V
9	Steel production in electric arc furnaces. Applications.	I, II, III, IV, V
10	Deoxidation and secondary metallurgy treatments. Casting technologies.	I, II, III, IV, V
11	Production of sponge iron. Smelting reduction processes.	I, II, III, IV, V
12	MIDTERM EXAM 2, Techno economical analysis of iron and steel industry in the world and Turkey.	I, II, III, IV, V
13	Analysis of steel production methods in terms of strategies of steel and raw materials.	I, II, III, IV, V
14	Applications	I, II, III, IV, V

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)			
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		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**
Asst. Prof. Dr. C. Fahir ARISOY	December 2020	