Course Name						
PRODUCTION TECHNIQUES of METALLIC POWDERS						
Code	**Semester**	**Local Credits**	**ECTS Credits**	**Course Implementation, Hours/Week**		
				Theoretical	**Tutorial**	**Laboratory**
MET 368E	6	2	3	2	-	-

Department/Program	Metallurgical and Materials Engineering Department		
Course Type	Elective	**Course Language**	English
Course Prerequisites	None		

Course Category by Content, %	**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
		70	30	

Course Description	Introduction to Powder Metallurgy and Technological Developments in Powder Industries, Defination of Powder/Particles, Powder Properties and Characterization, Powder Production Methods: Mechanical methods, Physicochemical methods, Recovery from Gas Phase (Carbonyl Method), Electrochemical Methods, Reduction of Metallic Compounds, Hydrochemical Reduction, Atomisation and Types, Carbide, Nitride and Boride Powders, Oxide Ceramic Powders, Mechanical Alloying Processes, Mechanochemical Synthesis, Sintering, Industrial Applications.
Course Objectives	1. Implementation of the importance of powders/particles for powder metallurgy applications. 2. Teaching of different powder/particles production methods 3. Teaching of different characterization techniques and approaches applied to powder/particles. 4. Providing new skills to the students for the implementation of contemporary technological applications and solution to related problem.
Course Learning Outcomes	1. Understanding the requirements and functionality of powder/particles in powder metallurgy applications. 2. Comprehension of the different powder/particles production methods by students. 3. Learning the outstanding analysis techniques in powder/particle characterization 4. Introduction to processes and products quality problems, solution proposals.
Textbook	ASM Powder Metallurgy Committee, "Metals Handbook 9th Edition Powder Metallurgy Volume 7", Metals Park, Ohio, 1984.
Other References	• ASM Powder Metallurgy Committee, "Metals Handbook 9th Edition Powder Metallurgy Volume 7", Metals Park, Ohio, 1984. • Fritz V. Lenel, "Powder Metallurgy - Principles and Application", Metal Powder Industries Federation, Princeton, NJ, 1976. • Randall M. German, "Powder Metallurgy Science", Metal Powder Industries Federation, Princeton, NJ, 1994.
Homework & Projects	
Laboratory Work	None
Computer Use	Use Of Office Applications
Other Activities	

Assessment Criteria	**Activities**	**Quantity**	**Effects on Grading, %**
	(Midterm Exams	MIN 1	% 40
	Quizzes	-	-
	Homework	-	-
	Projects	-	-
	Term Paper/Project	MIN 1	% 20
	Laboratory Work	-	-
	Other Activities	-	-
	Final Exam	1	% 40

COURSE PLAN

Weeks	Topics	Course Outcomes
1	Introduction to Powder Metallurgy and Technological Developments in Powder Industries,	1
2	Definition of Powder/Particles,	1,2
3	Powder Properties and Characterization,	1-3
4	Powder Production Methods: Mechanical Methods,	1-3
5	Physicochemical Methods,	1-3
6	Recovery from Gas Phase (Carbonyl Method),	1-3
7	Electrochemical Methods,	1-3
8	Reduction of Metallic Compounds,	1-3
9	Hydrochemical Reduction,	1-3
10	Atomization and Types,	1-3
11	Carbide, Nitride and Borides Powders,	1-3
12	Mechanical Alloying Processes, Mechanochemical Synthesis	1-3
13	Oxide Ceramic Powders, Sintering	1,4
14	Industrial Applications.	4

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)			
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	**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**
Prof. Dr. Burak Özkal	December 2020	