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		
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	The student will 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	1.ASM Powder Metallurgy Committee, "Metals Handbook 9th Edition Powder Metallurgy Volume 7", Metals Park, Ohio, 1984. 2.Fritz V. Lenel, "Powder Metallurgy - Principles and Application", Metal Powder Industries Federation, Princeton, NJ, 1976. 3.Randall M. German, "Powder Metallurgy Science", Metal Powder Industries Federation, Princeton, NJ, 1994
Homework & Projects	-
Laboratory Work	-
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,	1,2,3
4	Powder Production Methods: Mechanical Methods,	1,2,3
5	Physicochemical Methods,	1,2,3
6	Recovery from Gas Phase (Carbonyl Method),	1,2,3
7	Electrochemical Methods,	1,2,3
8	Reduction of Metallic Compounds,	1,2,3
9	Hydrochemical Reduction,	1,2,3
10	Atomization and Types,	1,2,3
11	Carbide, Nitride and Borides Powders,	1,2,3
12	Mechanical Alloying Processes, Mechanochemical Synthesis	1,2,3
13	Oxide Ceramic Powders, Sintering	1,4
14	Industrial Applications.	4

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

1: Little, 2: Partial, 3: Full

Prepared by	**Date**	**Revision #**	**Signature**
Prof. Dr. Burak Özkal	December 2020		