

ABDULLAH GÜL UNIVERSITY
GRADUATE SCHOOL OF ENGINEERING AND SCIENCE
ADVANCED MATERIALS AND NANOTECHNOLOGY MSC. PROGRAM
COURSE DESCRIPTION

Course Name	Code	Semester	T+P Hour	Credit	ECTS
Processing and characterization of ceramic materials	AMN 533	FALL - SPRING	3 + 0	3	10

Prerequisite Courses -

Type of the Course	Selective
Language of Instruction	English
Coordinator of the Course	Assist. Prof. İlker ERDEM
Lecturer(s) of the Course	Assist. Prof. İlker ERDEM
Assisting Personnel	-
Objective of the Course	Introduction of Fundamentals of ceramic materials: ceramic raw materials, processing techniques, characterization methods and technical properties
Learning Outcomes	1. Learning types of ceramic materials and their utilization in different applications 2. Learning raw materials of ceramics 3. Learning properties of ceramic materials 4. Learning techniques used for characterization of technical properties of ceramic materials 5. Learning fundamental techniques for ceramic material processing
Course Content	• Introduction of types of ceramic materials and their application areas, • Introduction of structure of ceramic materials, • Introduction of processing techniques for ceramic materials, • Introduction of characteristics of ceramic materials, • Introduction of characterization methods for ceramic materials, • Advanced ceramic materials and their applications

SUBJECTS, PRELIMINARY PREPARATIONS AND POST-LECTURE ACTIVITIES

Week	Subjects	Practice
1	Introduction: What are ceramic materials? Why are they important?	
2	The types of ceramic materials and their application areas: Traditional and advanced ceramics. Glasses, clay products, refractors, abrasives, cements, advanced ceramics	
3	The structure of ceramic materials: Atomic structure and chemical bonds, the relationship between structural and physicochemical properties, crystal structure and defects, phases and phase diagrams	
4	The structure of ceramic materials: Crystal structures, phases and phase diagrams	
5	Processing techniques for ceramic materials: Powder production, casting and shaping techniques, sintering	
6	Processing techniques for ceramic materials: Sol-gel method and applications	
7	Characteristics of ceramic materials: Electrical, optic, physical, thermal, chemical properties	
8	Characterization of ceramic materials: Thermal characterization techniques, size distribution analysis, methods for porosity determination	
9	Characterization of ceramic materials: Microscopic techniques, crystallographic techniques, mechanical properties evaluation	
10	Midterm	

11	Different applications of advanced ceramics: Microelectromechanics (MEM) systems, optic fibers	
12	Different applications of advanced ceramics: Bearings, ballistic applications, piezoelectric materials	
13	Different applications of advanced ceramics: Solid oxide fuel cells, electronic ceramics, ceramic sensors	
14	Different applications of advanced ceramics: Biomaterial applications	
15	Different applications of advanced ceramics: Filtration applications	

SOURCES/REFERENCES

Course Notes	The notes and the slides of the course
Other References	1. W.D. Callister, "Material Science and Engineering: An Introduction", Seventh Edition, John Wiley & Sons, Inc., NY, 2007. 2. W.D. Kingery, "Introduction to Ceramics", Second Edition, Wiley Interscience, NY, 1975. 3. K. Li, "Ceramic Membranes for Separation and Reaction", John Wiley & Sons Ltd., West Sussex, 2007. 4. R.R. Bhavde, "Inorganic Membranes Synthesis, Characteristics and Applications", Van Nostrand Reinhold, NY, 1991.

MATERIAL SHARING

Documents	The lecturing slides of the course are shared on canvas or another online application
Homeworks	
Exams	
Projects	

EVALUATION METHODS

IN-TERM ACTIVITIES	QUANTITY	WEIGHT, %
Midterm Exam	1	30
Homework	4	5
Term Project	1	25
Final Exam	1	40
TOTAL		100
Effect of in-term Activities on Success		60
Effect of Final Exam on Success		40
TOTAL		100

Course Category

Basic Sciences and Mathematics	
Engineering Sciences	X
Social Sciences	

RELATIONSHIP BETWEEN LEARNING OUTCOMES OF THE COURSE WITH THE QUALIFICATIONS OF THE PROGRAM

No	Program Qualifications	Contribution Level				
		1	2	3	4	5
1	PQ1. Ability of Working Independently and Taking Responsibility				X	
2	PQ2. Learning Competence				X	
3	PQ3. Communication and Social Activity				X	
4	PQ4. Field-specific Competence					X

*from 1 to 5 the score increases.

ECTS / WORK LOAD TABLE			
Activities	Activities	Duration (Hour)	Total Work Load (Hour)
Lectures (including exam week: 16x total lecture hours)	15	3	45
Midterm Exam (Preparation)	1	35	35
Final Exam (Preparation)	1	45	45
Homeworks	4	10	40
Repetition of the Topics	14	5	70
Report Preparation for Term Project	1	40	40
Presentation Preparation for Term Project	1	20	20
Total Work Load			295
Total Work Load / 30			9.83
ECTS Credits			10