

| 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 | <ol style="list-style-type: none"> 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 | <ul style="list-style-type: none"> • 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: Microelectromechanic (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 | <ol style="list-style-type: none"> 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. Bhavé, "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 |