

Program Records

About the Program

The purpose of the Materials Science and Mechanical Engineering program is to provide a multidisciplinary research perspective in materials sciences and mechanical engineering disciplines and to train problem-solvers of the future that are aware of increased global competition and latest global challenges. This graduate level training aims to motivate students, accordingly to their respective fields, to conduct groundbreaking research in the broad fields of materials sciences or to provide practice of mechanical engineering applicable to diverse industries. Students of the program will participate in an advanced education, research and development period to gain creative and innovative thinking in various fields of science, engineering, and technology. They will develop themselves to be responsible and ethical professionals for their future careers. This graduate program is fully conducted in English.

Materials Science and Mechanical Engineering program of Abdullah Gül University has a young and dynamic core faculty who are themselves graduates of renowned universities around the world and Turkey and the bring their research and work experiences into the program. The quality of research our faculty members conduct is on par with the best institutes of Turkey in the field. This will be reflected by the broad understanding of our graduates who will be equipped with capabilities to conduct R & D with their theoretical and technical understanding in broad scientific and engineering fields.

Program Outcomes

Materials Science and Mechanical Engineering graduate program provides students with the ability to access, analyze and evaluate knowledge/information in scientific research. The students will be equipped with the up-to-date practices, and use this knowledge in realizing experimental work based research activities in their scientific fields. They will develop new and original ideas and methods, design complex systems and processes, and invent novel/alternative solutions in their designs. Students will be able to apply their mechanical engineering education to address the full range of technical and societal problems with creativity, imagination, confidence and responsibility. Besides, students will retain the intellectual curiosity that motivates lifelong learning and allows for a flexible response to the rapidly evolving challenges of the 21st century. The students can communicate effectively in spoken and written English.

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| Qualification Awarded | Doctor of Philosophy |
| Length of Program & Credits | 4 Years / 240 ECTS |
| Level of Qualification | Full time |
| Field of Study | Graduates of the program can pursue careers in research and R & D institutions or in various industrial areas. |
| Admission Requirements | Bachelors or Masters degree diploma; Proof of English proficiency (YDS, YÖKDİL, TOEFL or Abdullah Gül University English Proficiency Exam); Have enough ALES grades stated by the program The Equivalency Table between 4.00 and 100 Grading Systems prepared by Council of Turkish Higher Education (YÖK) serves as the basis for GPA conversions. The ALES score of applicants who apply to a PhD program with only a bachelor's degree should be minimum 80 and their GPA should be minimum 3.00/4.00. |
| Graduation Requirements & Regulations | Students have to fulfill all courses in the program curriculum with a minimum GPA of 3.00 out of 4.00 and must satisfy 240 ECTS credits. |
| Occupational | Our approach in our graduate level training is to motivate students to conduct |

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| Profiles of Graduates | groundbreaking research in materials science or mechanical engineering. Our graduate program is conducted in English. Each candidate for the M.Sc. degree must submit a thesis based on original research and/or application in related fields. The graduate program consisting of courses and an original M.Sc. thesis can be completed as early as by the end of three semesters. Our graduates will be able to continue their doctoral and post-doctoral studies at AGU or world-leading universities, and also will be able to work in many advanced technology companies both in Turkey and in the World. |
| Access to Further Studies | Graduates with cumulative GPA of at least 3.00/4.00 graduate degree may apply to PhD program |
| Assessment & Grading Policy | Based on Abdullah Gul University Undergraduate Education and Examination Regulation rules;. |

Based on Abdullah Gul University Undergraduate Education and Examination

Regulation rules;.

| Letter Grade | Coefficient | Score | Status | Letter Grade | Letter Grade |
|--------------|-------------|--------|------------------|--------------|----------------|
| A | 4,00 | 90-100 | Pass | NA | Not Attended |
| A- | 3,67 | 87-89 | Pass | W | Withdrawn |
| B+ | 3,33 | 83-86 | Pass | S | Satisfactory |
| B | 3,00 | 80-82 | Pass | U | Unsatisfactory |
| B- | 2,67 | 77-79 | Pass | P | In Progress |
| C+ | 2,33 | 73-76 | Pass | EX | Exempt |
| C | 2,00 | 70-72 | Pass | | |
| C- | 1,67 | 64-69 | Conditional Pass | | |
| D+ | 1,33 | 56-63 | Conditional Pass | | |
| D | 1,00 | 50-55 | Conditional Pass | | |
| F | 0,00 | 0-49 | Failed | | |

Program Outcomes

- P01 Accessing knowledge, evaluating and interpreting information by doing scientific research in the field of Materials Science and Mechanical Engineering
- P02 Ability to use science and engineering knowledge for development of new methods in Materials Science and Mechanical Engineering
- P03 To be able to understand and analyze materials by using basic knowledge on Materials Science and Mechanical Engineering
- P04 Design and implement analytical, modeling and experimental research
- P05 Solve and interpret the problems encountered in experimental research
- P06 Considering scientific and ethical values during the collection and interpretation of data
- P07 Integrating knowledge of different disciplines with the help of scientific methods, and completion and implementation of scientific knowledge using data

- PO8 To gain leadership ability and responsibility in disciplinary and interdisciplinary team works
- PO9 To be able to contribute to the solution of social, scientific and ethical problems encountered in the field of Materials Science and Mechanical Engineering
- PO10 To be able to define, interpret and create new information about the interactions between various discipline of Materials Science and Mechanical Engineering

| TQF-HE & Program Outcomes Coverage | Competences | | | | | | |
|---|----------------------------------|----------------------------|--|-----|----------|--------------------------|-----------------|
| | Knowledge Theoretical Conceptual | Skills Cognitive Practical | Work Independently and Take Responsibility | | Learning | Communication and Social | Field specifics |
| P01 | | X | X | | X | X | |
| P02 | X | | X | | | | X |
| P03 | X | X | X | | X | | |
| P04 | X | | X | | X | | X |
| P05 | | | X | | X | | |
| P06 | X | | X | | | | X |
| P07 | X | X | X | | | X | |
| P08 | | | X | | | X | |
| P09 | X | | X | | | X | |
| P010 | | X | | | | X | X |
| | I01 | I02 | I03 | I04 | I05 | I06 | I07 |
| Institutional & Program Outcomes Coverage P01 | X | | | | | | X |
| P02 | | X | X | | | | |
| P03 | X | | | | X | | |
| P04 | X | X | | X | | | |
| P05 | | | X | | X | X | X |
| P06 | | X | | X | | | |
| P07 | | | X | | X | X | X |
| P08 | | X | | X | X | | |
| P09 | X | | | | | X | |
| P010 | | | | | | | |

Course Description

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|---------------|---|
| Code | MSME 603 |
| Name | Macromolecular Chemistry and Physics |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall, Spring |

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| Type | Elective |
| Prerequisites | One of the following Courses: General Chemistry, Organic Chemistry, Polymer Chemistry, Materials Science etc. (undergraduate level courses) |
| Coordinator(s) | Hakan Usta |
| Content | This course focuses on fundamentals of polymer structures, types, synthesis methods, chemical and physical properties, and detailed study of their industrial and daily life applications. The topics covered in this course include chemical structures and types of polymers, polymer size properties and determination, principles and types of polymerization reactions, step polymerization reactions, addition polymerization reactions, industrial applications, radicalic polymerization reactions, molecular configurations of polymers, mechanical and physical properties of polymers. |

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| Code | MSME 607 |
| Name | Fundamentals of Organic Materials and Applications |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall, Spring |
| Type | Elective |
| Prerequisites | One of the following Courses: General Chemistry, Organic Chemistry, Polymer Chemistry, Materials Science etc. (undergraduate level courses) |
| Coordinator(s) | Hakan Usta |
| Content | This course focuses on the fundamental principles of organic materials and carbon chemistry and the detailed study of their applications in materials science and mechanical engineering. The topics covered in this course include Bonding and Molecular Structure, Families of Carbon Compounds, Acids and Bases: An Introduction to Organic Reactions/Mechanisms, Nomenclature and Conformations of Alkanes and Cycloalkanes, Stereochemistry: Chiral Molecules, Ionic Reactions: Nucleophilic Substitution and Elimination Reactions. |

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|----------------|---|
| Code | MSME 608 |
| Name | Advanced Reactions in Materials Science |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall, Spring |
| Type | Elective |
| Prerequisites | MSME-607 |
| Coordinator(s) | Hakan Usta |
| Content | This course focuses on fundamental principles of organic reactions and mechanisms and the detailed study of their applications in materials science and mechanical engineering. The topics covered in this course include Alkene and Alkyne Compounds and Chemistry, Nuclear Magnetic Resonance and Mass Spectrometry, Radical Reactions, Alcohols and Ethers, Alcohols from Carbonyl Compounds, Conjugated Unsaturated Aromatic Systems, Aromatic Compounds. |

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|----------------|-----------------------------------|
| Code | MSME 676 |
| Name | Physics of Solids |
| Hour per week | 3 |
| Credit | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall/Spring |
| Type | Elective |
| Prerequisites | Quantum Physics or Modern physics |
| Coordinator(s) | Murat Durandurdu |

Description:

The aim of this course is to provide the basic knowledge about the atomic structures of crystalline and amorphous materials and to explain their mechanical, magnetic, dielectric and electrical properties. This course covers crystal structures, amorphous structures, homopolar bonds, mechanical properties, semiconductors, metals, phase transitions, paramagnetism, diamagnetism, ferromagnetism, dielectric properties, and superconductivity.

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| Code | MSME 679 |
| Name | Molecular Photochemistry |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall, Spring |
| Type | Elective |
| Prerequisites | One of the following Courses: General Chemistry, Organic Chemistry, Polymer Chemistry, Materials Science etc. (undergraduate level courses) |
| Coordinator(s) | Hakan Usta |
| Content | This course focuses on the fundamentals and working principles of photochemical and photophysical processes at the molecular level and detailed study of these processes in materials science and mechanical engineering fields. The topics covered in this course include Molecular Orbital Theory, pi-conjugated systems and orbital symmetry, UV-vis Absorption Spectroscopy, Molecular Photochemical Processes and Electromagnetic Spectrum, Photon and Wave Properties of Light, Photoelectric Effect Experiment, Quantum Concepts, Electronic Energy Levels and Fluorescence/Phosphorescence Processes, Franck-Condon Principle and Kasha's Rule in Absorption and Radiation Processes, Born-Oppenheimer Approximation in Photochemistry, Schrödinger Equation and Wave Functions in Molecules, Vibrational Wave Function and Molecular Vibrations, Organic Chromophoric Structures and Light Interactions, Organic Aromatic Compounds and Dye Materials. |

Code: **MSME 683**

Name: **Microstructure Engineering**

Hour per week 3 (3 + 0)

Credit: 3

ECTS: 7,5

Level/Year: Graduate

Semester: -

Type: Elective

Prerequisites: Basic knowledge on material science

Coordinator(s): Burak Bal

Description: This course is aimed to teach the relationship between mechanical properties of materials and microstructure and obtain a good knowledge on crystal plasticity and multi-scale modeling.

The course covers the following topics: Introduction to Material Science and Microstructure, Dislocations, Inclusion, Stacking faults, Elasticity, Plasticity, Project I presentations, Fracture, Hydrogen Embrittlement, Dislocation - Interstitials atom interactions, Dynamic Strain Aging, Microstructure under High-cycle fatigue, Crystal Plasticity Modeling and Multiscale Modeling considering microstructural changes
