**Program Records**

| | |
|---|---|
| **About the Program** | The purpose of our graduate program is to inform multidisciplinary research perspective in materials science and nanotechnology, and to educate tomorrow's problem-solvers in light of increased competitiveness and new global challenges. Our approach in our graduate level training is to motivate students to conduct ground breaking research in materials science and nanotechnology. Our graduate program is conducted in English. |
| **Program Outcomes** | Advanced Materials and Nanotechnology 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/or original ideas and methods; design complex systems or processes and invent novel/alternative solutions in their designs. The students can communicate effectively in spoken and written English. |
| **Qualification Awarded** | Master's Degree |
| **Length of Program & Credits** | 2 Years |
| **Level of Qualification** | Full time |
| **Field of Study** | Students who have completed the graduate program can work in various public institutions and organizations and in private sector on their related subject area. |
| **Admission Requirements** | Bachelor's diploma; Proof of English proficiency (YDS, YÖKDİL, TOEFL or Abdullah Gül University English Proficiency Exam); Have enough ALES grades stated by the program |
| **GENERAL RULES** | 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.<br>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. |
| **Recognition of Credit Mobility** | Courses taken outside of the program could be transferred in accordance with the associated principals of the Abdullah Gul University Undergraduate Education and Examination Regulation rules by the respective management board |
| **Recognition of Credit Mobility** | Courses taken outside of the program could be transferred in accordance with the associated principals of the Abdullah Gul University Undergraduate Education and Examination Regulation rules by the respective managementboard. |
| **Graduation Requirements & Regulations** | Student has to complete all courses in the program curriculum with a minimum GPA of 3.00. 120 ECTS |
| **Occupational Profiles of Graduates** | Our approach in our graduate level training is to motivate students to conduct ground breaking research in materials science and nanotechnology. 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.<br>Our graduates will be able to continue their doctoral and post-doctoral studies at AGU and the world-leading universities, and also will be able to work in many advanced technology companies both in our country 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 programm |
| **Assessment & Grading Policy** | Based on Abdullah Gul University Undergraduate Education and Examination Regulation rules;. |
| | Letter Coefficient Score Status Letter Letter Grade |

| | Grade | | | | 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** | PO1 | Accessing knowledge, evaluating and interpreting information by doing scientific research in the field of Materials Science and Nanotechnology |
| | PO2 | Ability to use science and engineering knowledge for development of new methods in Materials Science and Nanotechnology |
| | PO3 | To be able to understand and analyze materials by using basic knowledge on Materials Science and Mechanical Nanotechnology |
| | PO4 | Design and implement analytical, modeling and experimental research |
| | PO5 | Solve and interpret the problems encountered in experimental research |
| | PO6 | Considering scientific and ethical values during the collection and interpretation of data |
| | PO7 | 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 Nanotechnology |
| | PO10 | To be able to define, interpret and create new information about the interactions between various discipline of Materials Science and Nanotechnology |

| **TQF-HE & Program Outcomes Coverage** | | **Knowledge** | **Skill** | **Competences** | | | |
|---|---|---|---|---|---|---|---|
| | | Theoretical Conceptual | Cognitive Practical | Work Independently and Take Responsibility | Learning | Communication and Social | Field specifics |
| | P01 | X | | | X | | |
| | PO2 | X | X | | | | X |
| | PO3 | X | X | X | X | | |
| | PO4 | | | X | X | | X |
| | PO5 | | | X | X | | |
| | PO6 | X | | X | | | X |
| | PO7 | X | X | X | | X | |
| | PO8 | | | X | | X | |
| | PO9 | X | | X | | X | |
| | PO10 | | X | | | X | X |

| **Institutional & Program Outcomes Coverage** | | IO1 | IO2 | IO3 | IO4 | IO5 | IO6 | IO7 |
|---|---|---|---|---|---|---|---|---|
| | P01 | X | | | | | | X |
| | PO2 | | X | X | | | | |
| | PO3 | X | | | | X | | |
| | PO4 | X | X | | X | | | |
| | PO5 | | | X | | X | X | X |
| | PO6 | | X | | X | | | |
| | PO7 | | | X | | X | X | X |
| | PO8 | | X | | X | X | | |
| | PO9 | X | | | | | X | |
| | PO10 | | | | | | | |

## Course Descriptions

| | |
|---|---|
| Code | **AMN 502** |
| Name | **Nanoscience and Nanotechnology** |
| Hour per week | 3 (3 + 0) |
| Credit 3 | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall/Spring |
| Type | Compulsory |
| Prerequisites | The course has no specific prerequisites |
| Coordinator(s) | Assist. Prof. Dr. Ali DURAN |
| Description | This course aims to raise awareness about nano term, and present the fundamentals, present and future potentials of nanoscience and the latest developments in nano scale materials and devices.The course covers the following topics: The Fundamentals of Nanotechnology and Nanomaterials, The Basics of Nanocharacterization, Recent Applications of Nanotechnology, General Knowledge for Choosing Proper Processes, Materials and Technology for nanofabrication. |

| | |
|---|---|
| Code | **AMN510** |
| Name | **Introduction to Biomaterials** |
| Hour per week | 3 (3 + 0) |
| Credit 3 | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall/Spring |
| Type | Elective |
| Prerequisites | None |
| Coordinator(s) | Assist. Prof. Dr. Erkin Aydın |
| Description | This course intends to introduce the students with the broad field of biomaterials; teach them mechanical, chemical, and biological properties of various biomaterials classes; and provides fundamental knowledge about strategies of selection of biomaterials according to the various requirements of application site within the body<br>The following topics are covered:<br>i. Characterization of materials |

| | |
|---|---|
| | ii. Metallic, polymeric, ceramic, and composite biomaterials<br>iii. Structural properties of materials and their effects on biomaterials properties<br>iv. Tissue reaction against implants<br>v. Biomaterials for soft tissue replacement<br>vi. Biomaterials for hard tissue replacement<br>Tissue engineering materials and regenerative medicine |

| | |
|---|---|
| Code | **AMN560** |
| Name | **Controlled release and drug delivery** |
| Hour per week | 3 (3 + 0) |
| Credit 3 | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall/Spring |
| Type | Elective |
| Prerequisites | None |
| Coordinator(s) | Assist. Prof. Dr. Erkin Aydın |
| Description | This course covers the basic concepts and approaches for controlled release and delivery of drugs. The following topics are covered:<br>i. Routes of application for classic and controlled drug delivery systems: Intravascular, oral, transdermal, transmucosal, and other routes.<br>ii. Main examples for controlled drug release including membrane encapsulated reservoir devices, bioerodible polymers, matrix systems, polymers containing pendant drug substituents, and osmotic systems.<br>iii. Nanocarriers: Types, design, and characterization of Lipid based-,inorganic-, polymeric-, and virus based nanocarriers<br>iv. Use of nanoparticles in diagnosis and monitoring of diseases<br>v. Delivery systems for siRNA, DNA, Proteins & Peptides<br>vi. Drug targeting<br>vii. Biodistribution, toxicology, EPR effect<br>viii. Preclinical and clinical stage formulation examples |

| | |
|---|---|
| Code | **AMN568** |
| Name | **Molecular Biology for Engineers** |
| Hour per week | 3 (3 + 0) |
| Credit 3 | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |

| | |
|---|---|
| Semester | Fall/Spring |
| Type | Elective |
| Prerequisites | None |
| Coordinator(s) | Assist. Prof. Dr. Aysun Cebeci Aydın |
| Description | The course aims to teach basic molecular biology to engineering students. The course content includes the following topics: History of molecular biology, building blocks of the cell, genes, DNA replication, RNA, transciption and translation |

| | |
|---|---|
| Code | **AMN575** |
| Name | **Recent Topics in Biotechnology** |
| Hour per week | 3 (3 + 0) |
| Credit 3 | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall/Spring |
| Type | Elective |
| Prerequisites | None |
| Coordinator(s) | Assist. Prof. Dr. Aysun Cebeci Aydın |
| Description | This course introduces the fundamentals of biotechnology and updates students with the recent developments in the field of biotechnology. The course covers the following topics: History of biotechnology, molecular biology techniques, plant biotechnology, animal biotechnology, antimicrobials and drug discovery, industrial biotechnology, stem cell research, nanobiotechnology and ethics. |

| | |
|---|---|
| Code | **AMN542** |
| Name | **Molecular Engineering and Soft Nanomaterials** |
| Hour per week | 3 (3 + 0) |
| Credit 3 | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Spring |
| Type | Elective |
| Prerequisites | One of the following Courses: General Chemistry, Organic Chemistry, Polymer Chemistry, Materials Science etc. (undergraduate level courses) |
| Coordinator(s) | Assoc. Prof. Dr. Hakan Usta |
| Description | This course focuses on the fundamentals of molecular engineering and soft |

| | |
|---|---|
| | nanomaterials with strong emphasis on their applications in nanotechnology, optoelectronics, air/water cleaning, and renewable/clean energy solutions. The molecular engineering approach used in this course does not only teach the fundamentals for rational design of existing soft-nanomaterials but also provides the essential skills to design next-generation soft-nanomaterials for future applications. Topics include principles of carbon chemistry, rational molecular engineering, small molecules, polymers, macromolecules, nanoscience/nanotechnology, organic/printed optoelectronics, metal(covalent)-organic frameworks, sustainability, and renewable/clean energy. |

| | |
|---|---|
| Code | **AMN517** |
| Name | **Advanced Topics in Enzyme Science and Technology** |
| Hour per week | 3 (3 + 0) |
| Credit 3 | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall/Spring |
| Type | Elective |
| Prerequisites | None |
| Coordinator(s) | Assist. Prof. Dr. Kevser Kahraman |
| Description | This course intends to focus on the technical use of enzymes in materials science and nanotechnology. It provides the theory and knowledge relevant to the enzyme technology principles including fundamental properties of enzymes, enzyme catalytic mechanisms and enzyme kinetics, enzyme production technology, isolation, purification and characterization. Techniques employed in enzyme immobilization and stabilization are also emphasized. This course aids to provide an awareness of the current and possible future applications of enzyme technologies. |

| | |
|---|---|
| Code | **AMN535** |
| Name | **Membrane Separations in Aquatic Systems** |
| Hour per week | 3 (3 + 0) |
| Credit 3 | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall/Spring |
| Type | Elective |

| | |
|---|---|
| Prerequisites | None |
| Coordinator(s) | Assoc. Prof. Dr. Nigmet UZAL |
| Description | This course provides fundamental knowledge on membrane processes in aquatic systems. This course focuses on the application of membrane processes in municipal water treatment and reuse, and industrial wastewater treatment and reuse. The course covers the topics of; membrane materials, polymers and ceramic materials and their properties, membrane fabrication techniques, characterization of membrane morphology and their methods, type and structure of membranes. |

| | |
|---|---|
| Code | **AMN 538** |
| Name | **Materials Science of Concrete** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Springs |
| Type | Elective |
| Prerequisites | - |
| Description | The course aims to provide comprehensive knowledge on materials science of concrete which is the most widely used construction material. The course covers the following topics;<br><br>Manufacture, composition and specifications of Portland cement; Portland cement hydration; microstructure of concrete; fresh and hardened properties of concrete and testing; supplementary cementing materials and blended cements; chemical admixtures; concrete at early ages; durability issues of concrete. |

| | |
|---|---|
| Code | **AMN 539** |
| Name | **Analytical Techniques in Concrete Technology** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Spring |
| Type | Elective |
| Prerequisites | - |

| | |
|---|---|
| Description | The course aims to provide comprehensive knowledge on the cutting-edge analytical techniques and procedures used to test and examine concrete and concrete-making materials. The course covers the following topics; Chemical, mineralogical and physical characterization of Portland cement and supplementary cementing materials (wet chemical analysis , XRF, XRD and laser diffraction techniques); rheological analysis of fresh mixtures of cement pastes, mortar and concrete; techniques for characterization of hardened cement paste, mortar and concrete samples: thermal analyses, XRD, SEM and mercury intrusion porosimetry. |

| | |
|---|---|
| Code | **AMN557** |
| Name | **Dietary Fiber and Bioactive Food Components** |
| Hour per week | 3 (3 + 0) |
| Credit 3 | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall/Spring |
| Type | Elective |
| Prerequisites | None |
| Coordinator(s) | Assist. Prof. Dr. Kevser Kahraman |
| Description | This course offers the students an overview of the physiological and nutritional function and health benefits of dietary and bioactive food components. It provides the fundamental concepts and knowledge related to dietary fiber and bioactive components of foods, the role of of fibers and bioactive food components and prebiotics in promoting health, the determination methods of dietary fiber, resistant starch and bioactive food components. This course covers the following topics: Types and sources of dietary fiber; Fiber fermentation, prebiotics & probiotics; Recent developments in the production and application of dietary fiber; Resistant starch and health effects of resistant starch; Dietary fiber determinations methods; Effect of dietary fiber on Glycemic index (GI); Determination of GI of foods in-vitro; Bioactive food components; Antioxidant activity determination methods; Nutraceuticals and Functional Foods and Regularoty aspects and health claims related to fiber enrichment |

| | |
|---|---|
| Code | **AMN580** |
| Name | **Advanced Food Chemistry** |
| Hour per week | 3 (3 + 0) |

| | |
|---|---|
| Credit | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall/Spring |
| Type | Elective |
| Prerequisites | NA |
| Coordinator(s) | Assist. Prof. Dr Kevser Kahraman |
| Description | This course offers students an overview of the chemical and physical properties of the major and minor food components and their changes during processing, handling and storage. This course will also provide deep information on the relationship between the chemical structure of the food components and the reactions occurring in food in those stages. The course covers the following topics: Fundemantals of Food Chemistry, Physical and Chemical Properties of Water, Carbohydrates including simple sugars, sugar derivatives, oligosaccharides, polysaccharides, dietary fibers, proteins (physical and functional properties), Lipids and Enzymes. |

| | |
|---|---|
| Code | **AMN574** |
| Name | **Computational Materials Science** |
| Hour per week | 5 (3 + 2) |
| Credit | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall/Spring |
| Type | Elective |
| Prerequisites | Knowledge of lunix/unix operating system |
| Coordinator(s) | Prof. Dr. Murat Durandurdu |
| Description | The aim of this course is to provide the theory, methods, and applications of quantum mechanical software SIESTA used for computational study of materials. This course covers the applications of Density Functional Theory on crystals, disordered materials and nanomaterials, calculations of their electronic and mechanical properties, modeling amorphous materials and studying temperature/pressure induced phase transformations. |

| | |
|---|---|
| Code | **AMN541** |
| Name | **Modern Physics** |
| Hour per week | 3 |
| Credit | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall/Spring |
| Type | Elective |
| Prerequisites | None |
| Coordinator(s) | Prof. Dr. Murat Durandurdu |
| Description | This course offers an introduction to our modern understanding of nature at the atomistic level. Topics include Einstein's special theory of relativity, the theory of quantum mechanics, wave-particle duality, the nature of atoms, statistical mechanics and solid-state physics. |

| | |
|---|---|
| Code | **AMN555** |
| Name | **Quantum Mechanics** |
| Hour per week | 3 |
| Credit | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall/Spring |
| Type | Elective |
| Prerequisites | None |
| Coordinator(s) | Prof. Dr. Murat Durandurdu |
| Description | The aim of this course is to introduce the concepts and techniques of the Quantum Mechanics, which has gained much importance in many scientific and engineering fields (materials science, nanotechnology and electronic devices). This course covers the basic principles of the Quantum Mechanics: wave properties, uncertainty principles, Schrödinger equation and operators and their basic applications such as one dimensional problems, central field problems, harmonic oscillator, angular momentum and perturbation theory. |

| | |
|---|---|
| Code | **AMN521** |
| Name | **Solid State Physics** |
| Hour per week | 3 |
| Credit | 3 |
| ECTS | 7,5 |
| Level/Year | Graduate |
| Semester | Fall/Spring |
| Type | Elective |
| Prerequisites | None |
| Coordinator(s) | Prof. Dr. Murat Durandurdu |
| Description | The aim of this course is to provide the basic knowledge about the atomic structures of solids and to explain their physical and electrical properties using quantum theory. This course covers crystal structures, symmetries, Bragg diffraction, reciprocal lattice, brillouin zones, bondings, lattice vibrations: phonons, thermal properties, Einstein model, Debye model, Hall effect, free electron model, Fermi gas, semiconductors and fermi surfaces. |