Ankara Yıldırım Beyazıt Üniversitesi, Disiplinlerarası Biyomedikal Teknolojiler İngilizce Yüksek Lisans Programı (Tezli)

1. Programın Genel Tanımı

Temel motivasyonumuz, biyomedikal teknolojiler alanındaki ulusal ve uluslararası mevcut gelişmelere katkıda bulunmak, bu alanda yeniliklere öncülük etmek, sanayi ile işbirliği halinde uygulamaya yönelik bilimsel nitelikli çalışmaları yönlendirmek ve gerçekleştirmektir

● Üniversitemizin fen, sağlık ve mühendislik alanlarında biyomedikal teknolojiler ile ilgili çalışmalar yapan öğretim üyelerini ortak bir programda bir araya getirerek mevcut bilgi birikiminden öğrencilerin yararlanmalarını sağlamak,

● Yapılacak disiplinlerarası tez ve projeleri ortak bir bakışla planlamaya yönelik oluşturulacak bilimsel işbirlikleri ile farklı birimlerdeki laboratuvar olanaklarının da ortaklaşa ve daha verimli kullanımını sağlamak,

● Üniversite-sanayi işbirliğini geliştirerek ulusal ve uluslararası biyomedikal pazarın ve sektörün taleplerine cevap verebilecek bilimsel araştırmalar yapılmasını teşvik etmek yine önceliklerimiz arasında bulunmaktadır.

Biyomedikal Teknolojiler programında yüksek lisans eğitimi alacak öğrenciler;

● Bireysel ve gruplar halinde deney, tasarım ve projeler geliştirerek alanlarında uzmanlaşacak,

● Bilimsel problemleri belirleyebilme ve çözebilme becerileri kazanacak,

● Elde edecekleri iletişim ve liderlik yeteneklerinden istifade ederek karşılaştıkları sorunların çözümünde etkin roller oynayabilecek,

● Yetki ve sorumluluk alabilen, gerektiğinde inisiyatif kullanabilen bağımsız araştırmacılar olarak yetiştirilecek,

● Bilimsel araştırma süreçlerinin tüm aşamalarıyla ilgili kavrama ve farkındalığa sahip olacak ve yeni teknolojilerle ilgili kendini sürekli olarak yenileyebilecek,

● Ülkemizin uluslararası alandaki rekabet gücünü arttıracak projeler hazırlayabilecek ve görev alabilecek,

● Tez, makale, kitap ve patent şeklinde bilimsel çıktılar üretecektir.

2. Programa kabul edilecek öğrenci sayıları

	Programa Başlayacak Öğrenci Sayısı		Toplam Öğrenci Sayısı
	Güz	İlkbahar	
1. Yıl	12	8	20
2. Yıl	16	10	26

3. Yıl	16	10	26
4. Yıl	16	10	26
Genel Toplam	60	38	98

3. Programa öğrenci kabul koşulları;

Disiplinlerarası Biyomedikal Teknolojiler Yüksek Lisans Programı'na başvuru koşulları şunlardır:

a) Yurt içinde lisans eğitimi veren bir yükseköğretim kurumunun (veya YÖK denkliği olan yurt dışı yükseköğretim kurumunun) Fen, Mühendislik, Tıp, Eczacılık, Dişçilik ve Veterinerlik Fakültelerinden mezun öğrenciler başvurabilir.

b) Gerekli Lisans Ortalaması: >2.25/4.00

c) Gerekli ALES puanı: >70 (son 5 yılda alınmış olması kaydıyla)

d) Programın dili İngilizce olduğu için adayların YDS, YÖKDİL veya eşdeğer dil sınavlarından en az 60 puan almış olmaları gerekir. Eğitim dili İngilizce olan programlarda yabancı dil hazırlık sınıfından muaf tutulacak sınavlara sahip olmayan adayların üniversitemiz tarafından yapılan Yabancı Dil Muafiyet Sınavı'na girmeleri gerekmektedir.

e) Bunların dışındaki başvuru ile ilgili diğer hususlarda AYBÜ Fen Bilimleri Enstitüsü giriş koşulları geçerlidir.

4. Yüksek lisans derecesi almak için alınması gereken zorunlu ve seçmeli dersler;

a) Her bir dönem ayrı ayrı olmak üzere Ders, Tez veya Proje kredileri ile AKTS kredi bilgilerini tablo olarak,

1. Yarıyıl		**T**	**U**	**K**	**AKTS**
BMTXX	Fundamentals of Biomedical Engineering	3	0	3	10
FBE900	Research Methods and Ethics	3	0	3	10
BMTXX	Elective Course	3	0	3	10
BMTXX	Elective Course	3	0	3	10
2. Yarıyıl					
BMTXX	Elective Course	3	0	3	10
BMTXX	Elective Course	3	0	3	10
BMTXX	Elective Course	3	0	3	10
BMT600	M.Sc. Seminar	0	2	0	10
3. Yarıyıl					
BMT600	M.Sc. Seminar	0	2	0	10
BMT601	M.Sc. Thesis	0	1	0	20

4. Yarıyıl					
BMT600	M.Sc. Seminar	0	2	0	10
Seçmeli Dersler (Elective Course List)					
BMTXX	Introduction to Bioinformatics & Biomedical Applications	3	0	3	10
BMTXX	Physiology for Engineers	3	0	3	10
BMTXX	Nanotechnology for Engineering and Medicine	3	0	3	10
BMTXX	Biomaterials and Biocompatibility	3	0	3	10
BMTXX	Advanced Topics in Analytical Chemistry	3	0	3	10
BMTXX	Cellular Biology and Biochemistry	3	0	3	10
BMTXX	Structure and Function of Biomolecules	3	0	3	10
BMTXX	Advanced Topics on Medical Biotechnology	3	0	3	10
MSE503	Advances in Nanocomposite Technology	3	0	3	10
MSE507	Polymers for Advanced Technologies	3	0	3	10
MSE509	Surface Modification Technology	3	0	3	10
MSE537	Advanced Materials Characterization Techniques	3	0	3	10
MSE540	Nanofabrication Techniques	3	0	3	10
MSE547	Fundamentals of Electrochemical Science	3	0	3	10
MSE550	Biosensors: Physical and Chemical Properties	3	0	3	10
EE502	Optical Sensors	3	0	3	10
EE519	Robotics	3	0	3	10
EE584	Applied Machine Learning	3	0	3	10
ESE519	Power Electronics	3	0	3	10
MCE508	Advanced Mechanics of Materials	3	0	3	10
CENG597	Numerical Optimization	3	0	3	10

(***Lisansüstü Eğitim ve Öğretim Yönetmeliği Madde 6:*** *Tezli yüksek lisans programı toplam yirmi bir krediden az olmamak koşuluyla en az yedi ders, bir seminer dersi ve tez çalışmasından oluşur. Seminer dersi ve tez çalışması kredisiz olup başarılı veya başarısız olarak değerlendirilir. Tezli yüksek lisans programı bir eğitim-öğretim dönemi 60 AKTS kredisinden az olmamak koşuluyla seminer dersi dahil en az sekiz ders ve tez çalışması olmak üzere toplam en az 120 AKTS kredisinden oluşur.*

Madde 11: *Tezsiz yüksek lisans programı toplam otuz krediden ve 60 AKTS'den az olmamak kaydıyla en az on ders ile dönem projesi dersinden oluşur.*

b) Derslerin kodu ve içerikleri;

Dersin Kodu	Dersin Adı	Kredisi			AKTS
BMTXX	**Fundamentals of Biomedical Engineering**	**3**	**0**	**3**	**10**
The course provides an introduction to several areas of research found in Biomedical Engineering. Topics include basic biomechanics, bioinstrumentation systems, circuit elements and concepts, linear network analysis, bio-potentials, biosensors, various imaging techniques, fundamentals of bioinformatics and molecular engineering. A					

required class project will help students identify and formulate solutions to a problem found in the biomedical engineering field.					
BMTXX	**Fundamentals of Biological Sciences and Biotechnology**	**3**	**0**	**3**	**10**
An introduction to essential principles of biological science. Topics include, but are not limited to, the nature of science and the scientific method, chemistry for biology, biochemistry, cell structure, metabolism reproduction and genetics, gene regulation, organisms, and the theory of evolution. This course is for non-science majors.					
BMTXX	**Introduction to Bioinformatics and its Biomedical Applications**	**3**	**0**	**3**	**10**
The main topics that will be presented in this class consists of two subfields: the development of computational tools and databases, and the application of these tools and databases in generating biological knowledge to better understand living systems, being the main subject of genomics and proteomics.					
BMTXX	**Physiology for Engineers**	**3**	**0**	**3**	**10**
This course teaches students to apply knowledge of mathematics, science, and engineering to cellular and systems physiology, including function, dysfunction, and the mechanisms that underlying treatment. The course also addresses professional and ethical responsibilities associated with the development, testing, and implementation (or withholding) of biomedical devices or treatments.					
BMTXX	**Nanotechnology for Engineering and Medicine**	**3**	**0**	**3**	**10**
This course enables students to understand the science of the ``nano`` in physics, engineering, chemistry, biology and medicine, to acquire a basic understanding of the current state of the development of nanotechnologies. This will be done by giving information about the preparation and characterization techniques of various types of nanostructures, highlighting the major applications of nanoscale phenomena and structures in technology and science, leading to an understanding of innovation in the nanotechnology sector and discussing about nanoparticle-related problems and their safety assessment.					
BMTXX	**Biomaterials and Biocompatibility**	**3**	**0**	**3**	**10**
This course serves as an engineering introduction to the field of biomaterials and biocompatibility, assuming an already established background in biology and organic chemistry. The first part of the class covers the structure and properties of materials used as biomaterials including ceramics, metals, synthetic polymers, and natural materials. The structures, chemistry, and surface morphology of these materials and how these factors ultimately define the biocompatibility of a material are reviewed. The second part of the course covers host reactions to biomaterials and emphasizes on common clinical					

applications of biomaterials. The process of material selection for biocompatibility is introduced with regards to body responses including cell and tissue interaction, immunological responses, and toxicity and safety.					
BMTXX	**Advanced Topics in Analytical Chemistry**	**3**	**0**	**3**	**10**
This course will present the current research areas in analytical chemistry and comprehend the chemical and physical principles to retrieve chemical information by measurement and data evaluation and raise the awareness for applying an appropriate chemical analysis method to a societal problem. Special topics will include, but are not limited to, spectroscopy, recent developments in instrumental methods of chemical analysis, surface analysis, electroanalytical techniques and sensors/biosensors.					
BMTXX	**Cellular Biology and Biochemistry**	**3**	**0**	**3**	**10**
The course applies the basic concepts on cellular structures and various cellular phenomena taking place within a cell and among cells within tissues and organs. It should therefore allow engineering students to deepen their knowledge on cell biology and structure, fundamental biochemistry of proteins and enzymes, metabolic pathways and biosynthesis of metabolites, molecular biology including genetic coding, protein synthesis. Thus, students will gain experience in solving biomedical problems to better integrate the constraints of a biological system and to enable them to communicate with specialists in both fields.					
BMTXX	**Structure and Function of Biomolecules**	**3**	**0**	**3**	**10**
This course is designed to provide comprehensive knowledge on the molecular building blocks (nucleic acids, proteins and lipids), their structures, interactions, properties, origins, evolution together with impacts on molecular medicine, at a level suitable for graduate level students. Additionally, modern and current techniques used in structural and functional analysis of nucleic acids and proteins and applications of protein engineering with model cases will be included.					
BMTXX	**Advance Topics on Medical Biotechnology**	**3**	**0**	**3**	**10**
This course is designed to provide comprehensive knowledge on gene cloning, introduction of foreign DNA into bacterial cells, creation of recombinant DNA molecules composed of DNA from multıple sources, amplification of DNA using PCR techniques, analysis of nucleic acids (DNA and RNA) and proteins. Information from genomic and proteomic databases (genbank, swiss-prot) will be also covered.					

BMT600	**M.Sc Seminar**	**0**	**2**	**0**	**10**

Seminer dersi için, öğrencinin danışmanı ile birlikte saptayacağı bir konuda seminer hazırlaması, önceden tanımlanan süre içinde uygun bir şekilde sunması ve seminer raporunu da danışmanına teslim etmesi öngörülmüştür.

BMT601	**M.Sc Thesis**	**0**	**1**	**0**	**20**

Kredili derslerini ve seminer dersini başarı ile tamamlayan öğrencilerin, Anabilim Dalı Başkanlığının önerdiği ve Enstitü Yönetim Kurulunun onayladığı bir konuda ve tez danışmanının sorumluluğunda yaptıkları çalışmadır.

MSE542	**Methods of Applied Mathematics**	**3**	**0**	**3**	**10**

This course provides graduate students with the advanced analytical methods that will be bases for their research areas. Course contents include matrices and system of linear equations, eigenvalue problems, ordinary differential equations, series solution, special functions, partial differential equations: elliptic, parabolic and hyperbolic equations, separation of variables, Laplace transforms, Fourier transforms, Green's function, perturbation methods.

MSE503	**Advances in Nanocomposite Technology**	**3**	**0**	**3**	**10**

This course covers nanocomposites, their historical evolution, synthesis methods, advances in their fabrication techniques, and their utilization. Main extent of this course is based on nanocomposites of carbon nanostructures, such as, carbon/polymer-metals and carbon/polymer-metal oxides. Their conventional and novel synthesis procedures are described and their applications in energy and biochemical applications are extensively discussed.

MSE507	**Polymers for Advanced Technologies**	**3**	**0**	**3**	**10**

This course aims to give fundamental knowledge about polymers used in advanced technologies, their properties, applications and processing techniques. Course content include advanced polymers, their structure and properties, applications and processing of high-technology polymers, high performance polymers and engineering polymers.

MSE509	**Surface Modification Technology**	**3**	**0**	**3**	**10**

The main objective of this course is to introduce various surface modification methods used in the development and improvement of materials for specific applications. In addition to this, experimental surface characterization techniques as well as some recent &

future application trends in the surface engineering field are covered.

MSE537	**Advanced Materials Characterization Techniques**	**3**	**0**	**3**	**10**

The course will teach the basics in analytical techniques, how to characterize the structures and chemistries of materials, to select the proper characterization techniques to solve problems in research and/or industry. Course content: Analysis of microstructure by x-ray diffraction, Materials characterization by microscopy and optical techniques,Thermal analysis methods, Sample preparation for chosen characterization technique, Microstructure analysis by using characterization result.

MSE540	**Nanofabrication Techniques**	**3**	**0**	**3**	**10**

The course aims to teach students the techniques to fabricate micro- and nanostructured miniaturized devices (MEMS devices), the material properties for the selection of a particular technique and the multi-dimensional perspective of nanofabrication techniques. Course contents are; Introduction to Nanotechnology, Basic and Advanced Lithography Techniques, Basic and Advanced Deposition Techniques, Bonding Methods, Etching Methods (Dry and Wet etch), Scanning Probe Methods, Molecular Assembly, Techniques developed towards Molecular Machines and Recent Advancements in Nanotechnology.

MSE547	**Fundamentals of Electrochemical Science**	**3**	**0**	**3**	**10**

This course covers the fundamentals of electrochemical science, starting with an introduction to electrochemistry. The following lectures will cover the essential parameters of an electrochemical cell with a brief explanation of different types of electrolyte solutions and reactions at the electrode surface. Later, electroplating, anodization, corrosion, and electropolishing will be discussed.

MSE550	**Biosensors: Physical and Chemical Properties**	**3**	**0**	**3**	**10**

This course covers the physical and chemical properties of biosensors wıth explaining their technologies, methods and applications. Course topics includes (but not limited to) biosensor approaches such as electrochemistry, fluorescence, acoustics, and optics; aspects of selective surface chemistry including methods for biomolecule attachment to transducer surfaces; characterization of biosensor performance; blood glucose detection; fluorescent DNA microarrays; label-free biochips; bead-based assay methods. The course covers: surface chemistry and physics of selected surface chemistry materials and polymers in biosensor field usage with surface characterization methodology; modification of biomaterials surfaces.

EE502	**Optical Sensors**	**3**	**0**	**3**	**10**
The aim of the course is to learn optical sensors and to get how to apply to practical environment. Course content include Introductory concepts, Sensors and Transducers, Fundamental concepts in optics, Interferometric detection, Plasmon resonance based sensors, Thin films and bulk materials, Magnetic and Thermal sensors, Mechanical structures for sensing, Chemical sensing., Biochemical sensor, Lab-on-chip systems, Fabrication technologies.					
EE519	**Robotics**	**3**	**0**	**3**	**10**
The aim of the course is to gain the ability to research on robotic area and to provide industrial robot systems. Course content includes evolution of robots, elements of robotic systems, manipulator mathematics, homogeneous transformations, end-effector position and orientation, kinematics, inverse-kinematics, differential changes, task and path planning, manipulator dynamics, robot control, image processing in robotic systems.					
EE584	**Applied Machine Learning**	**3**	**0**	**3**	**10**
The course aims to to gain ability to have a basic understanding of the general principles of learning,, have an overview of the existing techniques for machine learning and understand how these techniques work, implement programs that learn adaptive behavior, using these techniques, to be up-to-date with the current state of the art in machine learning research, and to be able to contribute to contemporary machine learning research. Course content includes concept of machine learning, general principles of learning, current and future learning systems, development of learning systems, directions and areas within learning systems, evaluation of learning systems, specific learning approaches.					
ESE519	**Power Electronics**	**3**	**0**	**3**	**10**
The goal of the course is to provide supplements of linear and non-linear electric circuits with special emphasis towards power electronic circuits. The main topics addressed in the course regards current and voltage harmonic distortion and powers in non-sinusoidal steady-state, Power diodes and SCRs, single phase and three phases rectifiers, Power electronic switches, emerging component, basics of pulse width modulation (PWM), single-phase and three-phase inverters and others. At the end of the course students master power electronics technologies with a special emphasis towards the biomedical engineering field.					
MCE508	**Advanced Mechanics of Materials**	**3**	**0**	**3**	**10**
This course introduces students to elasticity theory and advanced topics in mechanics of solids, including three-dimensional stress and strain and their transformations, equations of compatibility, continuity and equilibrium, and strain energy methods. Specific design applications in thick-walled cylinders, shrink-fit assemblies, rotating disks, and thermal					

stresses are also covered.					
CENG597	**Numerical Optimization**	**3**	**0**	**3**	**10**
This course aims to teach numerical optimization methods for science and engineering applications. Course contents include: Optimization and its usage in real-world, Defining a given problem as a cost function, Unconstrained optimization, Conjugate gradient methods, Quasi-Newton methods, Least-squares problems, Constrained optimization and Penalty Methods.					

Anabilim Dalı Kurulu

Anabilim dalı başkanı: Doç. Dr. Nimet YILDIRIM TİRGİL

İletişim Sorumlusu: Dr. Öğr. Üyesi Ahmet UÇAR

Üyeler:

Prof. Dr. İlyas ÇANKAYA

Prof. Dr. Leyla Didem KOZACI

Doç.Dr. Fatih NAR

Doç.Dr. Metehan ERDOĞAN

Doç. Dr. Fatma Doğan GÜZEL

Dr. Öğr. Üyesi Sıtkı KOCAOĞLU

DETAYLI BİLGİ İÇİN: https://aybu.edu.tr/biomedtech/en