

## FACULTY OF SCIENCE

The Faculty of Science was established as a result of the restructuring in 1993, and was affiliated to Eskişehir Technical University, which was established with the Law No. 7141 published in the Official Gazette No. 30425 dated May 18, 2018 with all its infrastructure and staff. Biology English, Physics, Statistics (30% in English), Chemistry (30% in English) and Mathematics Programs are conducted in the Faculty of Science and these programs are four-year (8 semesters) programs. Four-year undergraduate education and training activities are carried out in the departments of Biology, Physics, Statistics, Chemistry and Mathematics. 30% English education is applied in Chemistry and Statistics Programs. English preparatory English education for one year has been started by opening interdisciplinary Business Analytics, CBRN and Nanoscience Minor Programs with the 2021-2022 Academic year; It is also wanted to expand the opportunities for students to benefit from foreign resources by supporting Advanced English courses and optional English-taught branch courses during undergraduate education. In addition to branch courses, elective courses with social and cultural content are also offered, thus it is aimed to expand students' perspectives through courses offered on different subjects in addition to their areas of expertise. Our aim is to provide expertise to our students by teaching education in laboratories and classrooms equipped with advanced technology in the light of the basic elements of science, as well as to enable them to grow up as Atatürkist, contemporary, creative, rational, self-confident, questioning researcher individuals.

Dean	: Prof.Dr. Yeliz MERT KANTAR
Vice-Dean	: Assoc. Prof.Dr. Özer GÖK
Vice-Dean	: Assoc. Prof.Dr. Nesil ERTORUN
Secretary to the Faculty	: Ayfer OLCAY

### STAFF

#### Professors:

Meryem AKBELLEN, Emrah AKYAR, Handan AKYAR, Ferhat ALTUNSOY, Hülya ALTUNTAŞ, Özgür ALVER, Muhittin ARSLANYOLU, Ahmet Şenol AYBEK, Hüseyin AZCAN, Şenay BULUT, Taner BÜYÜKKÖROĞLU, Mehmet CANDAN, Hakan CEBECİ, Müjdat ÇAĞLAR, Yasemin ÇAĞLAR, İlhami ÇELİK, Nedim DEĞİRMENÇİ, Bünyamin DEMİR, Süleyman DEMİR, Rasime DEMİREL, Ali DENİZ, Yılmaz DERELİ, Sedef DİKMEN, Sibel DİLTEMİZ, Serkan Ali DÜZCE, Nihal EGE, Barış ERBAŞ, Murat ERDEM, Burcu ERDOĞAN, Yüksel ERGÜN, Arzu ERSÖZ, Kıymet GÜVEN, Tülay HURMA, Deniz HÜR, Haluk HÜSEYİN, Betül KAN KILINÇ, İbrahim KANİ, Abidin KILIÇ, Metin KUL, Nihal KUŞ, H.Mehtap KUTLU, Murat LİMONCU, Yeliz MERT KANTAR, Yasemin MUTLU, M.burçin MUTLU, Ali ÖZCAN, Adnan ÖZCAN, Asiye Safa ÖZCAN, Ayça ÖZCAN, Nülfir ÖZDEMİR, Yunus ÖZDEMİR, Elif ÖZTETİK, Uğur SERİNCAN, Emel SÖZEN, Sevil ŞENTÜRK, Murat TANIŞLI, Engin TIRAŞ, Evren TURAN, Cengiz TÜRE, Berrin TÜYLÜ, İlhan USTA, Ülkü Dilek UYSAL, Elif YAMAÇ, Berna YAZICI, Filiz YILMAZ, Meral YILMAZ CANKILIÇ, Nalan YILMAZ SARIÖZLÜ, Cem YÜCE, Ersin YÜCEL, Filiz ALANYALI

#### Associate Professors:

Şükrü ACITAŞ, Sabiha AKSAY, Şirin AKTAY, Filiz ALANYALI, Zerrin AŞAN, İlker AVAN, Özlem BİÇEN ÜNLÜER, Harun BÖCÜK, Nuray CANDEMİR, Nezahat ÇETİN, Yasemin DEMİRCİOĞLU, Bilge ERDEM, Utku ERDOĞAN, Emel ERGENE, Emel ERMiŞ, Nesil ERTORUN, Özer GÖK, Ertuğrul İZCİ, Nazmiye KERVAN, Gözde KILIÇ, Volkan KILIÇ, Mustafa KULAKCI, Elif Mine ÖNCÜ KAYA, Özer ÖZDEMİR, Recep Sulhi ÖZKÜTÜK, Züleyha ÖZTAŞ, Kadir Özgür PEKER, Mustafa SALTAN, Neslihan ŞAHİN, Figen TAKIL MUTLU, Hakan ÜNVER, Adem Ersin ÜREYEN, Gülçin IŞIK, Bahar KARAMAN

#### Faculty Members:

Metin ALTAN, Burcu ARPAPAY, Nisa ASLAN, Türkay AYTEKİN AYDIN, Özge BAĞLAYAN, Alper BEKKİ, Hüseyin BERBER, Halil BERBER, Mustafa ÇAVUŞ, Derya ÇELİK, Zafer DİKMEN, Dilek ELMALİ, Oğuz ERTUĞRUL, Halil GAMSIZKAN, Sultan Funda GÖRKEM, İlknur GÜVENÇ, Çiğdem KALATHILPARMBİL, H.Açelya KAPKAÇ, Bahar KARAMAN, Fatma Diğdem KOPARAL, Levent TERLEMEZ, Didem TOZKAN, İsmail YENİLMEZ, Seçil ŞENTORUN

#### Lecturers:

Caner AYDINLI, Erdoğan ÇAKIR, Züliyet ÇELİKBİLEK, Belma DEĞİRMENÇİ, Halil ERYILMAZ, Tülay TIRAŞ, Tülay TOLAN

#### Research Assistants:

Emre AKDOĞAN, Burak ARATAN, Burak BERBER, Samet BİLA, Gökçe ÇAKMAK, Arsen DEMİROĞLU, Mehmet ERGEN, Orkun ERGÜRHAN, Hanefi Gezer, Hatice GÜNEY, Cenk İÇÖZ, Erhan İLTER, Pınar KAPÇI, Merve KESKİNOĞLU İNCE, Halenur ÖZER, Edanur TAŞTAN, Ayşe TORUN, Gizem TUTAR, Seyfettin TÜRK, Mustafa UZUN, Dilek YALÇIN, Kübranur YILMAZ, Emrullah YILMAZ

## DEPARTMENT OF BIOLOGY

The Department of Biology consists of six departments: General Biology, Zoology, Botany, Ecology, Molecular Biology and Basic and Industrial Microbiology. The science of biology, which aims to understand living creatures and living systems, is divided into many sub-branches in terms of research topics. The laboratories in our department have the appropriate infrastructure and technological equipment to enable students to make practical applications related to the courses, as well as to conduct advanced research studies. Projects supported by the biology department faculty members, Eskişehir Technical University, TÜBİTAK and TÜSEB are carried out with the participation of students, and collaborations are maintained with universities, research laboratories and centers at the national and international levels. Dec. Graduates of the Department of Biology can work in the academic staff of universities. In addition, they can find job opportunities in laboratories affiliated to health institutions, private research institutes, organizations affiliated to the Ministry of Agriculture, Forestry and Environment, food and pharmaceutical industries. Graduates who have the necessary certificate can teach in private or public schools. The department cooperates with various international universities, research laboratories and centers.

Department Head : Prof.Dr. Berrin TÜYLÜ  
 Deputy Department Head : Dr. Lecturer Gülçin IŞIK  
 Deputy Department Head : Assoc. Prof.Dr. Recep Sulhi ÖZKÜTÜK

### PROGRAM

<b>I.Semester</b>				<b>II.Semester</b>			
BiY103	Biomathematics	3+0	3.0	BiY104	Biophysics	3+0	4.0
BiY117	General Biology I	4+0	6.0	BiY108	Biophysics Laboratory	0+2	3.0
BiY119	General Biology Laboratory I	0+4	3.0	BiY118	General Biology II	4+0	6.0
EKiM103	General Chemistry	4+0	4.0	BiY120	General Biology Laboratory II	0+4	3.0
iSG401	Occupational Health and Safety I	2+0	2.0	iSG402	Occupational Health and Safety II	2+0	2.0
JEO101	General Geology	2+0	2.0	iST209	Biostatistics	3+0	3.0
KiM131	General Chemistry Laboratory	0+2	2.0	KiM208	Organic Chemistry	3+0	4.0
TÜR125	Turkish Language I	2+0	2.0	TÜR126	Turkish Language II	2+0	2.0
	<i>Seçmeli Dersler</i>	--	3.0		<i>Yabancı Dil Dersleri</i>	--	3.0
	<i>Yabancı Dil Dersleri</i>	--	3.0				
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			30.0				30.0

<b>III.Semester</b>				<b>IV.Semester</b>			
BiY213	Cryptogams	2+0	2.5	BiY216	Microbiology II	2+0	2.5
BiY215	Microbiology I	2+0	2.5	BiY218	Microbiology Laboratory II	0+2	2.0
BiY217	Microbiology Laboratory I	0+2	2.0	BiY220	Seed Plants	2+0	3.0
BiY219	Cryptogams Laboratory	0+2	2.0	BiY222	Seed Plants Laboratory	0+2	2.0
BiY221	Plant Morphology	2+0	2.5	BiY224	Vertabrate Animals	2+0	2.5
BiY223	Plant Morphology Laboratory	0+2	2.0	BiY226	Vertabrate Animals Laboratory	0+2	2.0
BiY225	Cytology	2+0	2.0	BiY228	Arthropoda	2+0	2.5
BiY227	Cytology Laboratory	0+2	2.0	BiY230	Arthropods Laboratory	0+2	2.0
BiY229	Invertabrate Animals	2+0	2.5	BiY232	General Ecology	2+0	3.0
BiY231	Invertabrate Animals Laboratory	0+2	2.0	BiY234	General Ecology Laboratory	0+2	2.0
BiY239	Molecular Biology	2+0	2.0	TAR166	Atatürk's Principles and History of Turkish Revolution II	2+0	2.0
BiY241	Molecular Biology Laboratory	0+2	2.0		<i>Seçmeli Dersler</i>	--	4.5
TAR165	Atatürk's Principles and History of Turkish Revolution I	2+0	2.0				
	<i>Seçmeli Dersler</i>	--	2.0				
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30.0 30.0

**V.Semester**

BiY305	Molecular Cell Physiology	2+0	2.5
BiY339	Physiology of Animals	2+0	2.5
BiY341	Physiology Laboratory of Animals	0+2	2.0
BiY371	Biotechnology	2+0	2.5
BiY373	Biotechnology Laboratory	0+2	2.0
BiY395	Biochemistry I	2+0	2.5
BiY397	Biochemistry Laboratory I	0+2	2.0
BiYSJ301	Internship	0+2	5.0
	<i>Mesleki Seçmeli Dersler</i>	--	9.0
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			30.0

**VI.Semester**

BiY354	Plant Physiology	2+0	2.5
BiY356	Plant Physiology Laboratory	0+2	2.0
BiY358	Genetics	2+0	2.5
BiY360	Genetic Laboratory	0+2	2.0
BiY396	Biochemistry II	2+0	2.5
BiY398	Biochemistry Laboratory II	0+2	2.0
	<i>Mesleki Seçmeli Dersler</i>	--	13.5
	<i>Seçmeli Dersler</i>	--	3.0
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			30.0

**VII.Semester**

BiY405	Developmental Biology I	2+0	3.0
BiY412	Plant Geography	2+0	3.0
BiY414	Zoogeography	2+0	3.0
BiY457	Molecular Genetics	2+0	3.0
BiY489	Graduation Project I	0+4	7.0
	<i>Mesleki Seçmeli Dersler</i>	--	9.0
	<i>Seçmeli Dersler</i>	--	2.0
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			30.0

**VIII.Semester**

BiY402	The Evolution	2+0	3.0
BiY404	Human Biology	2+0	3.0
BiY406	Developmental Biology II	2+0	3.0
BiY490	Graduation Project II	0+4	7.0
	<i>Mesleki Seçmeli Dersler</i>	--	14.0
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			30.0

**Foreign Language Courses**

ALM175 (Ger)	German I	3+0	3.0
ALM176 (Ger)	German II	3+0	3.0
BiY399	Economic Zoology	2+0	4.0
FRA175 (Fra)	French I	3+0	3.0
FRA176 (Fra)	French II	3+0	3.0
İNG187 (Eng)	English I	3+0	3.0
İNG188 (Eng)	English II	3+0	3.0

**Elective Courses**

BEÖ155	Physical Education	2+0	2.0
ESTÜ101	Introduction to University Life	0+1	2.0
ESTÜ111	Volunteering Works	1+2	4.0
ESTÜ112	Cyber Security for Everyone	2+0	2.0
ESTÜ113	Design Thinking	3+0	3.0
ESTÜ114	Visual Thinking	3+0	3.0
ESTÜ115	Photographic Viewpoint	2+1	3.0
ESTÜ116	Computer Aided Design I	3+0	3.0
ESTÜ117	Computer Aided Design II	3+0	3.0
ESTÜ118	Visual Thinking with Concepts	3+0	3.0
ESTÜ119	Flute	3+1	3.0
ESTÜ120	Solfege	3+1	3.0
ESTÜ121	Piano	3+1	3.0
ESTÜ122	Guitar	3+1	3.0
İNG325 (Eng)	Academic English III	3+0	3.0
İNG326 (Eng)	Academic English IV	3+0	3.0
MÜZ155	Turkish Folk Music	2+0	2.0
MÜZ157	Traditional Turkish Art Music	2+0	2.0
SAN155	Hall Dances	0+2	2.0
SNT155	History of Art	2+0	2.0
SOS155	Folkdance	2+0	2.0

THU203	Community Services	0+2	3.0
TÜR120	Turkish Sign Language	3+0	3.0

### Area Elective Courses

BiY313	Ethology	2+0	4.0
BiY316	Endocrinology	2+0	4.0
BiY317	Mycology	2+0	4.0
BiY318	Insect Ecology	2+0	4.0
BiY319	Enzymology	2+0	4.0
BiY326	Biodiversity and Flora of Turkey	2+0	4.0
BiY328	Paleontology	2+0	4.0
BiY329	Environmental Impact Assessment	2+0	4.0
BiY330	Techniques in Systematic Botany	2+0	4.0
BiY334	Biological Control	2+0	4.0
BiY336	Ornithology	2+0	4.0
BiY343	Hydrobiology	2+0	4.0
BiY352	Introduction to Lichenology	2+0	4.0
BiY367	Microorganisms and Energy	2+0	4.0
BiY369	Medical Plants	2+0	4.0
BiY374	Immunology	2+0	4.0
BiY375	Forensic Biology	2+0	4.0
BiY376	Virology	2+0	4.0
BiY377	Foodborne Pathogenic Microorganisms	0+3	5.0
BiY378	Statistical Applications in Biology	2+0	4.0
BiY379	Histology	0+3	5.0
BiY383	Microbial Techniques	0+3	5.0
BiY384	Plant Ecology	2+0	4.0
BiY385	Comparative Anatomy and Morphology of Animals	2+0	4.0
BiY386	Microbial Ecology	2+0	4.0
BiY388	Molecular Biology Techniques	2+0	4.0
BiY390	Wastewater Microbiology	2+0	4.0
BiY391	Cell Signaling Mechanisms	2+0	4.0
BiY392	Human Gene Therapeutics and Recombinant Production	2+0	4.0
BiY393	Techniques and Practicing of Grant Proposal Writing	2+0	4.0
BiY394	Entrepreneurship in Biology:Design and Development	2+0	4.0
BiY401	Plant Mineral Nutrition	2+0	4.0
BiY408	Embryology	2+0	4.0
BiY409	Human Genetics	2+0	4.0
BiY410	Medical Microbiology	2+0	4.0
BiY413	Soil-Plant Relation	2+0	4.0
BiY415	Fish Biology	2+0	4.0
BiY416	Aquaculture	2+0	4.0
BiY421 (Eng)	Molecular Biology of Development	2+0	4.0
BiY424	Biology of Cancer	2+0	4.0
BiY426	General Parasitology	2+0	4.0
BiY427	Cosmetics Microbiology	2+0	4.0
BiY430	Genetic Toxicology	2+0	4.0
BiY431	Introductory Bioinformatics	2+0	4.0
BiY433	Plant Genetic Engineering	2+0	4.0
BiY433 (Eng)	Plant Genetic Engineering	2+0	4.0
BiY434	Plant Biotechnology	2+0	4.0
BiY435	Hydrobotany	2+0	4.0
BiY436	Ethnobotanic	2+0	4.0
BiY439	Microbial Biotechnology	2+0	4.0
BiY440	Animal Toxins	2+0	4.0
BiY445	Biological Anthropology	2+0	4.0
BiY451	Diagnostic Microbiology	2+0	4.0
BiY455	Microbial Physiology	2+0	4.0
BiY462	Actinomycetes and Antibiotics of Actinomycetes	2+0	4.0
BiY465	Clinical Biochemistry	2+0	4.0
BiY467 (Eng)	Conservation Biology	2+0	4.0
BiY468	Oxidative Stress and Antioxidants	2+0	4.0
BiY468 (Eng)	Oxidative Stress and Antioxidants	2+0	4.0
BiY469	Forensic Entomology	2+0	4.0

BiY470	Environmental Biology	2+0	4.0
BiY471 (Eng)	Molecular Microbial Ecology	0+3	5.0
BiY471	Molecular Microbial Ecology	0+3	5.0
BiY472	Nutritional Biochemistry	2+0	4.0
BiY472 (Eng)	Nutritional Biochemistry	2+0	4.0
BiY473	Biophotography	2+0	4.0
BiY474	Medical Parasitology	0+3	5.0
BiY475	Mycotoxins	2+0	4.0
BiY476	Food Microbiology	2+0	4.0
BiY477	Microfungus Identification Methods	0+3	5.0
BiY478	Plant Identification and Herbarium Techniques	0+3	5.0
BiY479	Astrobotany	2+0	4.0
BiY480	Industrial Microbiology	2+0	4.0
BiY482	Introductory Molecular Biotechnology	2+0	4.0
BiY484	Molecular Microbiology Techniques	0+3	5.0
iNG361 (Eng)	English for Specific Purposes I	2+0	4.0
iNG362 (Eng)	English for Specific Purposes II	2+0	4.0

## **CHEMICAL BIOLOGICAL RADIOLOGICAL AND NUCLEAR (CBRN) DEFENSE MINOR PROGRAM**

Within the scope of global policies, it is aimed to gain knowledge about preventing, recognizing, defending and reducing the impact of CBRN risks, which are increasing in trend. In the event of any possible attack, epidemic or accident, educating undergraduate students and graduates who have a Deceptive and interdisciplinary approach to the subject will be important not only from the point of view of public health, but also from the point of view of national security. This program provides added value by educating students who master the precautions, defense and mitigation procedures to be taken in case of CBRN attacks, accidents and risks that are likely to create a national security vulnerability. The information required to be obtained within the scope of this program includes the recognition, control, reduction of effects, defense of CBRN warfare agents. The skills acquired within the scope of this information include an approach that can create a detection system not only theoretically but also practically, and also triggers a perspective that can create innovative technologies for defense and decontamination. It will be encouraged that the knowledge, skills and approaches obtained from the program will be presented as an intellectual property product or a scientific article.

### **PROGRAM**

<b>I.Semester</b>				<b>II.Semester</b>			
KBRN301	Biological Security and Defense	2+0	3.0	KBRN302	CBRN National and International Legislation in Defense	2+0	3.0
KBRN305	Nuclear Radiation and Its Threats	3+0	4.0	KBRN303	CBRN Defense Approaches and Components	2+0	3.0
	<i>Seçmeli Dersler</i>	--	9.0	KBRN304	Detection, Diagnosis and Interdisciplinary Laboratory Studies of CBRN War Agents	2+1	5.0
				KBRN306	Approach and Crime Scene Management in CBRN Cases	2+0	3.0
					<i>Seçmeli Dersler</i>	--	6.0
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			16.0				20.0

### **Elective Courses**

KBRN307	Chemical Threats	2+0	3.0
KBRN308	Ecological Risk Analysis	2+0	3.0
KBRN309	Biological Threats	2+0	3.0
KBRN310	Cellular and Genetic Toxicity from CBRN Threats	2+0	3.0
KBRN312	Food Safety and Sanitation	2+0	3.0
KiM217	Basics About Safe Working Techniques in Chemistry Laboratories	2+0	3.0

## **DEPARTMENT OF PHYSICS**

The Department of Physics aims to teach basic knowledge of physics to our students by using modern technologies with all the teaching staff. The duration of the undergraduate program is 4 years. In order for a student to graduate, he/she must take the Graduation Project I and II courses in his/her senior year, be successful in all courses and have an average of above 2.0. The language of education is Turkish. Graduates of this department can become researchers in their fields, as well as serve in research and development laboratories of various institutions and organizations, modern analysis and quality control laboratories, educational institutions if they acquire the necessary educational formation. There is a master's and doctoral program in our department. Our graduate students enroll in one of the fields of Atomic and Molecular physics, General physics, Solid State Physics and High Energy-Plasma Physics. Research laboratories, Eskişehir. It is equipped with devices at a level that can conduct scientific research with projects received from Technical University and TUBITAK.

Department Head : Prof.Dr. Abidin KILIÇ  
 Deputy Department Head : Assoc. Prof.Dr. Neslihan ŞAHİN  
 Deputy Department Head : Dr. Lecturer Özge BAĞLAYAN

### PROGRAM

<b>I.Semester</b>				<b>II.Semester</b>			
EMAT111	Calculus I	4+2	7.5	EMAT112	Calculus II	4+2	7.5
FİZ115	Physics I	4+2	7.0	FİZ116	Physics II	4+2	7.0
FİZ117	Physics Laboratory I	1+2	3.0	FİZ118	Physics Laboratory II	1+2	3.0
KİM121	General Chemistry Laboratory I	0+3	2.0	KİM122	General Chemistry Laboratory II	0+3	2.0
KİM133	General Chemistry I	5+0	6.0	KİM134	General Chemistry II	5+0	6.0
TAR165	Atatürk's Principles and History of Turkish Revolution I	2+0	2.0	TAR166	Atatürk's Principles and History of Turkish Revolution II	2+0	2.0
	<i>Seçmeli Dersler</i>	--	2.5		<i>Seçmeli Dersler</i>	--	2.5
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			30.0				30.0
<b>III.Semester</b>				<b>IV.Semester</b>			
EMAT211	Differential Equation	3+1	4.5	FİZ212	Statistical Physics	4+0	5.0
FİZ229	Mathematical Methods in Physics I	4+0	5.0	FİZ218	Modern Physics	4+0	5.0
FİZ231	Waves and Optics	4+0	5.0	FİZ230	Mathematical Methods in Physics II	4+0	5.0
FİZ233	Waves and Optics Laboratory	0+2	2.0	TER206	Thermodynamics	4+0	5.0
TÜR125	Turkish Language I	2+0	2.0	TER210	Thermodynamics Laboratory	0+2	2.0
	<i>Seçmeli Dersler</i>	--	8.5	TÜR126	Turkish Language II	2+0	2.0
	<i>Yabancı Dil Dersleri</i>	--	3.0		<i>Seçmeli Dersler</i>	--	3.0
			-----		<i>Yabancı Dil Dersleri</i>	--	3.0
			30.0				-----
							30.0
<b>V.Semester</b>				<b>VI.Semester</b>			
FİZ327	Quantum Physics I	4+0	5.0	FİZ328	Quantum Physics II	4+0	5.0
FİZ349	Classic Mechanics	5+1	6.0	FİZ346	Quantum Physics Laboratory	0+2	2.0
FİZ353	Electronics I	1+2	3.0	FİZ348	Electromagnetic Theory	5+1	6.0
FİZ355	Computer Programming for Physicists I	1+1	2.0	FİZ354	Electronics II	1+2	3.0
FİZ359	Physics for Natural Sciences	2+0	2.0	FİZ356	Computer Programming for Physicists II	1+1	2.0
FİZS401	Internship	0+2	5.0		<i>Seçmeli Dersler</i>	--	12.0
	<i>Seçmeli Dersler</i>	--	7.0				-----
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			30.0				30.0

<b>VII.Semester</b>				<b>VIII.Semester</b>			
FİZ429	Solid State Physics	4+0	5.0	FİZ428	Nuclear Physics	4+0	5.0
FİZ433	Atom and Molecular Physics	4+0	5.0	FİZ460	Graduation Project II	2+4	5.0
FİZ453	Career Development	2+0	2.0	FİZ462	Characterization Methods	1+2	3.5
FİZ459	Graduation Project I	2+4	5.0	İSG402	Occupational Health and Safety II	2+0	2.0
İSG401	Occupational Health and Safety I	2+0	2.0	<i>Seçmeli Dersler</i>		--	14.5
	<i>Seçmeli Dersler</i>	--	11.0				
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			30.0				30.0

### Foreign Language Courses

ALM175 (Ger)	German I					3+0	3.0
ALM176 (Ger)	German II					3+0	3.0
FRA175 (Fra)	French I					3+0	3.0
FRA176 (Fra)	French II					3+0	3.0
İNG187 (Eng)	English I					3+0	3.0
İNG188 (Eng)	English II					3+0	3.0

### Elective Courses

BEÖ155	Physical Education					2+0	2.0
ELO302	Application of Electronic Circuit Elements					2+0	3.0
ESTÜ101	Introduction to University Life					0+1	2.0
ESTÜ104	Academic and Life Skills					2+1	3.0
ESTÜ106	Proje Yönetimi					2+1	3.0
ESTÜ111	Volunteering Works					1+2	4.0
ESTÜ112	Cyber Security for Everyone					2+0	2.0
ESTÜ113	Design Thinking					3+0	3.0
ESTÜ114	Visual Thinking					3+0	3.0
ESTÜ115	Photographic Viewpoint					2+1	3.0
ESTÜ116	Computer Aided Design I					3+0	3.0
ESTÜ117	Computer Aided Design II					3+0	3.0
ESTÜ118	Visual Thinking with Concepts					3+0	3.0
ESTÜ119	Flute					3+1	3.0
ESTÜ120	Solfege					3+1	3.0
ESTÜ121	Piano					3+1	3.0
ESTÜ122	Guitar					3+1	3.0
ESTÜ125	Philosophy of Science					3+0	3.0
ESTÜ127	Diction					1+2	3.0
ESTÜ201	Turkish Sign Language					3+0	3.0
ESTÜ203	Introduction to Sociology					3+0	3.0
ESTÜ204	Effective Reading and Writing Skills					3+0	4.0
ESTÜ301	Science Communication					2+0	3.0
ESTÜ401	Introduction to Professional Life					1+1	2.0
FİZ113 (Eng)	Technical English					4+0	4.0
FİZ122 (Eng)	English for Physicists					4+0	4.0
FİZ304	Clean Energy Sources					2+0	3.0
FİZ318	Introduction to Heat Transfer					2+0	3.0
FİZ321	Semiconductors					2+0	3.0
FİZ322	Semiconductors Devices					2+0	3.0
FİZ329	Semiconductors Laboratory					2+0	3.0
FİZ330	Semiconductor Applied Laboratory					2+0	3.0
FİZ331	Nobel Prizes on Physics					2+0	3.0
FİZ332	Introduction to Low Temperature Physics					2+0	3.0
FİZ333	Quality Control Methods in Physics					2+0	3.0
FİZ336	Solar Photovoltaics					2+0	3.0
FİZ337	Solar Energy and Applications					2+0	3.0
FİZ339	Radioecology and Ecosystem					2+0	3.0
FİZ340	Some Applications of Physics in Medical Science					2+0	3.0
FİZ341	Metrology I					2+0	3.0
FİZ342	Metrology II					2+0	3.0

FİZ343 (Eng)	Machine Learning for Physicists	2+0	3.0
FİZ344	Geophysics and Earthquake	2+0	3.0
FİZ351	Structure and Properties of Matter	2+0	3.0
FİZ403	Spectroscopic Methods	2+0	3.0
FİZ413	Physical Foundation of Astronomy	2+0	3.0
FİZ414	Fundamentals of Astrophysics	2+0	3.0
FİZ416	Environmental Physics	2+0	3.0
FİZ425	High Energy Physics	2+0	3.0
FİZ439	Observational Data Analysis in Astrophysic	2+0	3.0
FİZ440	Structural Analysis of Solids	2+0	3.0
FİZ443	Characterization Methods	2+0	3.0
FİZ444	Satellite Data Analysis Techniques	2+0	3.0
FİZ446	Applied Heat Theory	0+2	3.0
FİZ449	Structural and Vibrational Theory of Molecules	2+0	3.0
FİZ451	Numerical Methods in Physics	2+0	3.0
FİZ457	Physics Games	2+0	3.0
FİZ464	Web Designing	1+1	3.0
FİZ466	Magnetic Materials	2+0	3.0
FİZ468	Particle Physics	2+0	3.0
İLT201	Interpersonal Communication	3+0	4.5
İNG325 (Eng)	Academic English III	3+0	3.0
İNG326 (Eng)	Academic English IV	3+0	3.0
İŞL301	Human Resources Management	3+0	4.0
MEK308	Fluid Mechanics	2+0	3.0
MÜZ151	Short History of Music	2+0	3.0
MÜZ157	Traditional Turkish Art Music	2+0	2.0
PZL302	Marketing Management	3+0	4.5
RTV281	Digital Literacy	2+2	4.0
SAN155	Hall Dances	0+2	2.0
SNT155	History of Art	2+0	2.0
SOS155	Folkdance	2+0	2.0

## NANOSCIENCE MINOR PROGRAM

The main purpose of the program is for our students who have enrolled in the program to have knowledge about the structure of matter in the Nanoscale order, to study the applications of this knowledge in different disciplines, to convert information into practice in the Nanoscale Research Laboratory of the Physics Department. This program will contribute to research studies conducted at the nanoscale order to contribute towards meeting the need for manpower. The information that needs to be obtained within the scope of this program is to know the structure of nanoscale material, to make nanoscale characterization of the material, to evaluate the availability of organic and inorganic materials for technological products.

### PROGRAM

<b>I.Yarıyıl</b>				<b>II.Yarıyıl</b>			
NANO301	Characterization Techniques for Nanoscience and Nanotechnology	3+0	5	NANO302	Nanotoxicology	3+0	5,0
NANO303	Basics of Nanoscience and Nanotechnology	3+0	5	NANO304	Hybrid Nanomaterials and Applications	3+0	5,0
	<i>Elective Courses</i>	--	8,0		<i>Elective Courses</i>	--	7
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			18,0				17,0



## Elective Courses

NANO305	Synthesis and Characterization of Nanomaterials	2+0	3
NANO307	Fundamentals of Micro and Nanofabrication	2+0	3
NANO309	Low-Dimensional Semiconductors	2+0	3
NANO311	Color and Color Science	2+0	3
NANO306	Electrochemistry Applications of Nanomaterials	2+0	3
NANO308	Molecular Biotechnology	2+0	3
NANO310	Nanoparticules: Antimicrobial Activities, Applications And Toxicity	2+0	3
NANO312	Introduction to Bionanotechnology	2+0	3
FİZ327	Quantum Physica I	4+0	5
FİZ328	Quantum Physics II	4+0	5
FİZ346	Quantum Physics Laboratory	0+2	2
FİZ429	Solid SPhysics	4+0	5
KİM336	Surface and Thermal Analysis Methods	1+2	3

## DEPARTMENT OF STATISTICS (30% ENGLISH)

The Department of Statistics consists of the Departments of Statistical Information Systems, Statistical Theory, Applied Statistics and Probability Theory and Processes. In addition to the theoretical courses offered in the department, there are application-oriented computer laboratories with the necessary database to provide specialization in the field. The aim of the department is to train qualified researchers who can determine the data sources and flow channels related to comprehensive experiments and observations in a system using the technologies of the day, centralize the data and produce the necessary information by commenting on the behavior of the relevant system as a result of the necessary solutions. Graduates of the Department of Statistics, as well as academic staff of universities, in the banking and insurance sector, research companies, quality control and inventory evaluation units of the public and private sectors, newspapers and television institutions and hospitals, etc. they can be employed in places.

Department Head	: Prof.Dr. İlhan USTA
Deputy Department Head	: Assoc. Prof.Dr. Özer ÖZDEMİR
Deputy Department Head	: Assoc. Prof.Dr. Şükrü ACITAŞ

## PROGRAM

I.Semester				II.Semester			
EMAT111 (Eng)	Calculus I	4+2	7.5	BİL168	Computer Programming	4+0	5.0
EMAT111	Calculus I	4+2	7.5	EMAT112 (Eng)	Calculus II	4+2	7.5
İST109	Document Preparation in Computer	3+0	3.5	EMAT112	Calculus II	4+2	7.5
İST109 (Eng)	Document Preparation in Computer	3+0	3.5	İST126	Probability II	4+0	6.0
İST129	Statistics I	4+0	6.0	İST126 (Eng)	Probability II	4+0	6.0
İST129 (Eng)	Statistics I	4+0	6.0	İST130	Statistics II	4+0	6.0
İST239	Probability I	4+0	6.0	İST130 (Eng)	Statistics II	4+0	6.0
İST239 (Eng)	Probability I	4+0	6.0	TAR166	Atatürk's Principles and History of Turkish Revolution II <i>Seçmeli Dersler</i>	2+0	2.0
TAR165	Atatürk's Principles and History of Turkish Revolution I <i>Seçmeli Dersler</i>	2+0	2.0			--	3.5
		--	5.0				
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			30.0				30.0

<b>III.Semester</b>				<b>IV.Semester</b>			
İST235	Linear Algebra I	4+0	5.0	BİL802	Visual Programming	4+0	4.0
İST247	Mathematical Statistics I	4+0	7.0	İST236	Linear Algebra II	4+0	5.0
İST247 (Eng)	Mathematical Statistics I	4+0	7.0	İST248	Mathematical Statistics II	4+0	7.0
MAT209	Analysis I	4+0	7.0	İST248 (Eng)	Mathematical Statistics II	4+0	7.0
TÜR125	Turkish Language I	2+0	2.0	MAT212	Analysis II	4+0	7.0
	<i>Mesleki Seçmeli Dersler</i>	--	5.0	TÜR126	Turkish Language II	2+0	2.0
	<i>Seçmeli Dersler</i>	--	4.0		<i>Mesleki Seçmeli Dersler</i>	--	3.0
					<i>Seçmeli Dersler</i>	--	2.0
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			30.0				30.0

<b>V.Semester</b>				<b>VI.Semester</b>			
İST305	Operational Research	3+0	6.0	İKT382	Econometrics I	4+0	6.0
İST309	Experimental Design I	3+0	6.0	İKT382 (Eng)	Econometrics I	4+0	6.0
İST309 (Eng)	Experimental Design I	3+0	6.0	İST311 (Eng)	Non-Parametric Statistical Methods	3+0	5.5
İST333 (Eng)	Regression Analysis	4+0	6.5	İST311	Non-Parametric Statistical Methods	3+0	5.5
İST333	Regression Analysis	4+0	6.5	İST335	Sampling	4+0	6.5
İST351	Statistical Packages I	2+0	3.0	İST352	Statistical Packages II	2+0	3.0
	<i>Mesleki Seçmeli Dersler</i>	--	5.0		<i>Mesleki Seçmeli Dersler</i>	--	6.0
	<i>Seçmeli Dersler</i>	--	3.5		<i>Seçmeli Dersler</i>	--	3.0
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			30.0				30.0

<b>VII.Semester</b>				<b>VIII.Semester</b>			
İST411	Time Series Analysis	4+0	5.0	İST430	Stochastic Processes	4+0	5.0
İST439	Graduation Project I	0+4	4.5	İST440	Graduation Project II	0+4	4.5
İST439 (Eng)	Graduation Project I	0+4	4.5	İST440 (Eng)	Graduation Project II	0+4	4.5
İST451	Multivariate Statistics I	4+0	6.0		<i>Mesleki Seçmeli Dersler</i>	--	17.0
İST451 (Eng)	Multivariate Statistics I	4+0	6.0		<i>Seçmeli Dersler</i>	--	3.5
İSTSJ402	Internship	0+2	5.0				
	<i>Mesleki Seçmeli Dersler</i>	--	5.0				
	<i>Seçmeli Dersler</i>	--	4.5				
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			30.0				30.0

### Elective Courses

ALM175 (Ger)	German I					3+0	3.0
ALM176 (Ger)	German II					3+0	3.0
BEÖ155	Physical Education					2+0	2.0
ESTÜ101	Introduction to University Life					0+1	2.0
ESTÜ102 (Eng)	Negotiation Techniques Class					2+0	3.0
ESTÜ104	Academic and Life Skills					2+1	3.0
ESTÜ106	Proje Yönetimi					2+1	3.0
ESTÜ111	Volunteering Works					1+2	4.0
ESTÜ112	Cyber Security for Everyone					2+0	2.0
ESTÜ113	Design Thinking					3+0	3.0
ESTÜ114	Visual Thinking					3+0	3.0
ESTÜ115	Photographic Viewpoint					2+1	3.0
ESTÜ116	Computer Aided Design I					3+0	3.0
ESTÜ117	Computer Aided Design II					3+0	3.0
ESTÜ118	Visual Thinking with Concepts					3+0	3.0

ESTÜ119	Flute	3+1	3.0
ESTÜ120	Solfege	3+1	3.0
ESTÜ121	Piano	3+1	3.0
ESTÜ122	Guitar	3+1	3.0
ESTÜ123	Gender Equality in Work Life	2+0	3.0
ESTÜ125	Philosophy of Science	3+0	3.0
ESTÜ127	Diction	1+2	3.0
ESTÜ201	Turkish Sign Language	3+0	3.0
ESTÜ203	Introduction to Sociology	3+0	3.0
ESTÜ204	Effective Reading and Writing Skills	3+0	4.0
ESTÜ301	Science Communication	2+0	3.0
ESTÜ401	Introduction to Professional Life	1+1	2.0
FRA175 (Fra)	French I	3+0	3.0
FRA176 (Fra)	French II	3+0	3.0
İKT151 (Eng)	Economics	3+0	3.0
İKT151	Economics	3+0	3.0
İKT213	Mathematical Economics	3+0	4.5
İLT201	Interpersonal Communication	3+0	4.5
İLT408	Effective and Pleasant Speaking Techniques	2+0	2.5
İNG325 (Eng)	Academic English III	3+0	3.0
İNG326 (Eng)	Academic English IV	3+0	3.0
İNG425 (Eng)	Academic English V	3+0	3.0
İNG426 (Eng)	Academic English VI	3+0	3.0
İSN409	Organizational Communication	3+0	4.5
İŞL101	Introduction to Business	3+0	4.5
İŞL101 (Eng)	Introduction to Business	3+0	4.5
İŞL301	Human Resources Management	3+0	4.0
İŞL421	Entrepreneurship	2+0	3.0
İŞL459 (Eng)	Project Management	2+0	5.0
MUH302	Analysis of Financial Reports	3+0	4.5
MÜZ155	Turkish Folk Music	2+0	2.0
MÜZ157	Traditional Turkish Art Music	2+0	2.0
PZL211 (Eng)	Principles of Marketing	3+0	5.0
PZL302	Marketing Management	3+0	4.5
PZL453 (Eng)	Marketing Research	3+0	4.5
SAN155	Hall Dances	0+2	2.0
SNT155	History of Art	2+0	2.0
SOS155	Folkdance	2+0	2.0
THU203	Community Services	0+2	3.0
TÜR120	Turkish Sign Language	3+0	3.0

#### Area Elective Courses

ARY202	Research Techniques	3+0	5.0
BİL801	Object Oriented Programming	4+0	4.0
İKT460 (Eng)	Financial Econometrics	3+0	4.5
İKT460	Financial Econometrics	3+0	4.5
İKT482	Econometrics II	4+0	6.0
İST228	Advanced Operation Research	3+0	4.5
İST243	Exploratory Data Analysis	2+0	3.0
İST243 (Eng)	Exploratory Data Analysis	2+0	3.0
İST249	Programing with Matlab	4+0	5.0
İST249 (Eng)	Programing with Matlab	4+0	5.0
İST256 (Eng)	Introduction to R Programming	3+0	4.5
İST257 (Eng)	Introduction to Data Science	2+0	3.0
İST331	Theoretical Hypothesis Testing	3+0	4.5
İST331 (Eng)	Theoretical Hypothesis Testing	3+0	4.5
İST332 (Eng)	Decision Making Theory	2+0	3.0
İST332	Decision Theory	2+0	3.0
İST334	Experimental Design II	4+0	6.0
İST334 (Eng)	Experimental Design II	4+0	6.0
İST337	Multivariate Time Series	3+0	4.0
İST347	Spreadsheets and Databases	3+0	3.5
İST347 (Eng)	Spreadsheets and Databases	3+0	3.5
İST349 (Eng)	Statistical Modelling Techniques	3+0	5.0

İST353	Case Studies in Data Science	3+0	5.0
İST356 (Eng)	Programming with Python	4+0	5.0
İST356	Programming with Python	4+0	5.0
İST358 (Eng)	Database and Management	3+0	4.5
İST412	Fuzzy Logic	2+0	3.0
İST413	Introduction to Artificial Neural Networks	3+0	5.0
İST415	Reliability Analysis	3+0	5.0
İST420	Demography	2+0	3.0
İST432	Simulation	4+0	4.5
İST432 (Eng)	Simulation	4+0	4.5
İST438 (Eng)	Machine Learning Methods and Applications	3+0	4.5
İST452	Multivariate Statistics II	4+0	6.0
İST452 (Eng)	Multivariate Statistics II	4+0	6.0
NÜM308	Numerical Analysis I	2+2	5.0
TKY302	Quality Control	3+0	4.5
TKY302 (Eng)	Quality Control	3+0	4.5
YBİM302	Recommender Systems	3+0	4.5
YBİM304	Mobile Programming	3+0	5.0
YİST301 (Eng)	Applied Econometrics	3+0	5.0
YİST303	Data Visualization	3+0	5.0
YPZL301	CRM and Customer Analytics	2+0	4.0
YPZL302	Social Media and Digital Marketing	3+0	5.0

### BUSINESS ANALYTICS MINOR PROGRAM

The aim of the program is to educate students equipped with the necessary general knowledge, techniques and skills that allow making the most appropriate strategies and decisions using big data that is emerging in a rapidly digitizing and digitalizing world. It is the mission of the program to contribute to data-oriented decision-making in professional life and thus to meet the need for manpower that will contribute to the maximization of benefits for the company. Students within the scope of this program; Ability to use theoretical and applied knowledge in their fields with sufficient knowledge of issues related to the scope of Business Analytics, Use descriptive, predictive and decision analytics, Work effectively individually and/or together with a team, Design according to their fields, collect data, analyze results, visualize, interpret and report, Process and analyze effectively using information technologies such as SQL, databases and Excel, Perform production planning and operational management, Master big data and artificial intelligence terminology and practice in these areas, Acquires the skills /competencies of combining marketing information with management function and applying it.

### PROGRAMI

I.Yarıyıl			II.Yarıyıl		
YİŞA301 Introduction to Business Analytics	4+0	6,0	YİŞA302 Business Analytics and Operations Management	4+0	6,5
YİŞA303 The Basics of Marketing	3+0	4,5	YİŞA304 Big Data and Artificial Intelligence	3+0	4,5
Elective Courses	--	11,0	Elective Courses	--	9,0
		-----			-----
		<b>21,5</b>			<b>21,0</b>

#### Elective Courses

BİL409	Decision Support Systems	3+0	6,0
BİM213 (İng)	Data Structures and Algorithms	2+2	5,5
BİM309 (İng)	Artificial Intelligence	3+0	4,5
BİM311 (İng)	Systems Analysis and Design	3+0	4,5
ENM407 (İng)	Systems Analysis(Sistem Analizi)	3+0	5,0
ENM421	Introduction to Data Science	2+1	4,5
ENM440 (İng)	Introduction to Data Mining	3+0	4,5
ENM444	Supply Chain Modeling and Analysis	3+0	4,5
ENM448 (İng)	Project Planning and Management	3+0	6,0
İKT460 (İng)	Financial Econometrics	3+0	4,5
İST256 (İng)	Introduction to R Programming	3+0	4,5
İST332 (İng)	Decision Making Theory	2+0	3,0
İST356	Programming with Python	4+0	5,0
İST358 (İng)	Database and Management	3+0	4,5

İST411	Time Series Analysis	4+0	5,0
İST438 (İng)	Machine Learning Methods and Applications	3+0	4,5
İŞL417	Management Information System	3+0	4,5
LOJ401 (İng)	Logistics Management and Models	3+0	6,0
PZL302	Marketing Management	3+0	4,5
PZL452 (İng)	Revenue Management and Pricing (Gelir Yönetimi ve Fiyatlandırma)	3+0	6,0
REK448	Brand Management	3+0	4,0
YBİM302	Recommendation Systems	3+0	4,5
YBİM304	Mobile Programming	3+0	5,0
YİST301 (İng)	Applied Econometrics	3+0	5,0
YİST303	Data Visualization	3+0	5,0
YPZL301	CRM and Customer Analytics	2+0	4,0
YPZL302	Social Media and Digital Marketing	3+0	5,0

## DEPARTMENT OF CHEMISTRY (30% ENGLISH)

Chemistry is a basic science that has a strong interaction with many branches of science such as physics, biology, engineering and pharmacy. These branches of science are heavily intertwined with chemistry or are supported by chemistry. In addition, knowledge of chemistry is necessary in the development and application of technology in many fields. The Department of Chemistry consists of Analytical Chemistry, Inorganic Chemistry, Biochemistry, Organic Chemistry and Physical Chemistry departments. The courses given have been created at an advanced level in order to cover basic chemistry knowledge and taking into account the five mentioned departments. In addition to the facilities provided by Eskişehir Technical University, the research laboratories are equipped with devices at a level that can conduct scientific research with projects received from TÜBİTAK. The aim of the chemistry department is to train personnel who can solve the problems required by the industry in research laboratories, who can conduct independent research, who are equipped with sufficient knowledge and skills to perform all kinds of chemical analysis, and to equip these personnel with the latest knowledge of science and technology. Graduates of this department can become researchers in their fields, as well as provide useful and productive services in research / development laboratories of various institutions and organizations, modern analysis and quality control laboratories, educational institutions if they acquire the necessary educational formation.

Department Head : Prof.Dr. Filiz YILMAZ  
Deputy Department Head : Prof.Dr. Sibel DİLTEMİZ  
Deputy Department Head : Assoc. Prof.Dr. Emel ERMİŞ

## PROGRAM

I.Semester				II.Semester			
BİY127	Biology for Chemists I	2+0	2.0	BİY128	Biology for Chemists II	2+0	2.0
EMAT111	Calculus I	4+2	7.5	EMAT112	Calculus II	4+2	7.5
(Eng)				(Eng)			
EMAT111	Calculus I	4+2	7.5	EMAT112	Calculus II	4+2	7.5
FİZ107	Physics Laboratory I	0+2	1.5	FİZ108	Physics Laboratory II	0+2	1.5
FİZ107 (Eng)	Physics Laboratory I	0+2	1.5	FİZ108 (Eng)	Physics Laboratory II	0+2	1.5
FİZ129	Physics I	4+0	6.0	FİZ130	Physics II	4+0	6.0
FİZ129 (Eng)	Physics I	4+0	6.0	FİZ130 (Eng)	Physics II	4+0	6.0
KİM121	General Chemistry Laboratory I	0+3	2.0	KİM122	General Chemistry Laboratory II	0+3	2.0
KİM121 (Eng)	General Chemistry Laboratory I	0+3	2.0	KİM122 (Eng)	General Chemistry Laboratory II	0+3	2.0
KİM133	General Chemistry I	5+0	6.0	KİM134	General Chemistry II	5+0	6.0
KİM133 (Eng)	General Chemistry I	5+0	6.0	KİM134 (Eng)	General Chemistry II	5+0	6.0
TÜR125	Turkish Language I	2+0	2.0	TÜR126	Turkish Language II	2+0	2.0
	<i>Seçmeli Dersler</i>	--	3.0		<i>Seçmeli Dersler</i>	--	3.0
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			30.0				30.0
III.Semester				IV.Semester			
İSG401	Occupational Health and Safety I	2+0	2.0	İSG402	Occupational Health and Safety II	2+0	2.0
KİM221	Analytical Chemistry Laboratory I	0+6	3.0	KİM222	Analytical Chemistry Laboratory II	0+6	3.0
KİM221	Analytical Chemistry Laboratory I	0+6	3.0	KİM222	Analytical Chemistry Laboratory II	0+6	3.0
(Eng)				(Eng)			

KİM257	Inorganic Chemistry I	4+0	5.0	KİM240	Instrumental Analysis I	3+0	4.0
KİM257 (Eng)	Inorganic Chemistry I	4+0	5.0	KİM276	Analytical Chemistry II	4+0	5.0
KİM275	Analytical Chemistry I	4+0	5.0	KİM276 (Eng)	Analytical Chemistry II	4+0	5.0
KİM275 (Eng)	Analytical Chemistry I	4+0	5.0	KİM278 (Eng)	Organic Chemistry II	4+0	5.0
KİM277 (Eng)	Organic Chemistry I	4+0	4.0	KİM278	Organic Chemistry II	4+0	5.0
KİM277	Organic Chemistry I	4+0	4.0	KİM334	Inorganic Chemistry II	4+0	5.0
TAR165	Atatürk's Principles and History of Turkish Revolution I <i>Seçmeli Dersler</i>	2+0	2.0	KİM334 (Eng)	Inorganic Chemistry II	4+0	5.0
		--	9.0	TAR166	Atatürk's Principles and History of Turkish Revolution II <i>Seçmeli Dersler</i>	2+0	2.0
						--	4.0
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			30.0				30.0

### V.Semester

KİM321 (Eng)	Organic Chemistry Laboratory I	0+4	4.0
KİM321	Organic Chemistry Laboratory I	0+4	4.0
KİM325	Inorganic Chemistry Laboratory I	0+3	4.0
KİM325 (Eng)	Inorganic Chemistry Laboratory I	0+3	4.0
KİM337 (Eng)	Organic Chemistry III	4+0	6.0
KİM337	Organic Chemistry III	4+0	6.0
KİM343	Instrumental Analysis II	3+0	4.0
KİM345	Physical Chemistry I	3+0	5.0
KİM359	Literature Searching	1+0	1.0
	<i>Mesleki Seçmeli Dersler</i>	--	5.0
	<i>Seçmeli Dersler</i>	--	1.0
			----
			30.0

### VI.Semester

KİM322 (Eng)	Organic Chemistry Laboratory II	0+4	4.0
KİM322	Organic Chemistry Laboratory II	0+4	4.0
KİM324	Physical Chemistry Laboratory I	0+3	4.0
KİM326	Inorganic Chemistry Laboratory II	0+3	4.0
KİM326 (Eng)	Inorganic Chemistry Laboratory II	0+3	4.0
KİM346	Physical Chemistry II	3+0	5.0
KİM358	Instrumental Analysis III	4+0	4.0
KİM358 (Eng)	Instrumental Analysis III	4+0	4.0
	<i>Seçmeli Dersler</i>	--	9.0
			----
			30.0

### VII.Semester

KİM401 (Eng)	Biochemistry I	3+0	3.0
KİM401	Biochemistry I	3+0	3.0
KİM409	Chemistry in Industry	3+0	4.0
KİM423	Industrial Chemical Laboratory	0+4	3.0
KİM435	Physical Chemistry III	4+0	4.0
KİM435 (Eng)	Physical Chemistry III	4+0	4.0
KİM447	Instrumental Analysis Laboratory I <i>Mesleki Seçmeli Dersler</i>	0+4	3.0
	<i>Seçmeli Dersler</i>	--	10.0
		--	3.0
			----
			30.0

### VIII.Semester

KİM402 (Eng)	Biochemistry II	3+0	3.0
KİM402	Biochemistry II	3+0	3.0
KİM408	Atom and Molecular Chemistry	2+0	2.0
KİM412	Biochemistry Laboratory	0+3	3.0
KİM425	Physical Chemistry Laboratory II	0+3	3.0
KİM425 (Eng)	Physical Chemistry Laboratory II	0+3	3.0
KİM448	Instrumental Analysis Laboratory II <i>Mesleki Seçmeli Dersler</i>	0+4	3.0
	<i>Seçmeli Dersler</i>	--	13.0
		--	3.0
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			30.0

## Elective Courses

ALM175 (Ger)	German I	3+0	3.0
ALM176 (Ger)	German II	3+0	3.0
BEÖ155	Physical Education	2+0	2.0
BİL425	Computer Assisted Chemical Calculations	2+0	3.0
BIY461	Biotechnology	2+0	3.0
ESTÜ101	Introduction to University Life	0+1	2.0
ESTÜ111	Volunteering Works	1+2	4.0
ESTÜ112	Cyber Security for Everyone	2+0	2.0
ESTÜ113	Design Thinking	3+0	3.0
ESTÜ114	Visual Thinking	3+0	3.0
ESTÜ115	Photographic Viewpoint	2+1	3.0
ESTÜ116	Computer Aided Design I	3+0	3.0
ESTÜ117	Computer Aided Design II	3+0	3.0
ESTÜ118	Visual Thinking with Concepts	3+0	3.0
ESTÜ119	Flute	3+1	3.0
ESTÜ120	Solfege	3+1	3.0
ESTÜ121	Piano	3+1	3.0
ESTÜ122	Guitar	3+1	3.0
FRA175 (Fra)	French I	3+0	3.0
FRA176 (Fra)	French II	3+0	3.0
İNG325 (Eng)	Academic English III	3+0	3.0
İNG326 (Eng)	Academic English IV	3+0	3.0
İNG425 (Eng)	Academic English V	3+0	3.0
İNG426 (Eng)	Academic English VI	3+0	3.0
işL475	Techno-Entrepreneurship	3+0	4.0
KİM209	Mathematical Methods for Chemistry	2+0	3.0
KİM215	Environnant Problems	2+0	3.0
KİM217	Basics About Safe Working Techniques in Chemistry Laboratories	2+0	3.0
KİM218	Radiation in Daily Life	2+0	3.0
KİM259	History of Chemistry	2+0	3.0
KİM280	Glass Chemistry and Its Applications	2+1	3.0
KİM305	Water and Wastewater Analyses	2+0	3.0
KİM314	Textile Chemistry and Its Applications	1+2	3.0
KİM315	The Chemistry of Ceramics	2+0	3.0
KİM316	Drugs	2+0	3.0
KİM318	The Extraordinary Chemistry of Ordinary Things	2+0	3.0
KİM331	Analysis Methods in Atomic Absorption	1+2	3.0
KİM336	Surface and Thermal Analysis Methods	1+2	3.0
KİM338	X-Ray Diffraction Analysis Techniques	1+2	3.0
KİM339	Inorganic Technologies	2+0	3.0
KİM341	Green Organic Chemistry	2+0	3.0
KİM347	Food Chemistry and Technology	2+0	3.0
KİM348	Colour Chemistry and Synthesis Methods	2+0	3.0
KİM349	Structure Characterization of Organic Compounds	2+0	3.0
KİM350	Introduction to Stereochemistry	2+0	3.0
KİM353	Laboratory Accreditation	2+0	3.0
KİM354	Food Safety and Management Systems	2+0	3.0
KİM355	Hazardous Materials of Chemical and Safety I	2+0	3.0
KİM356	Hazardous Materials of Chemical and Safety II	2+0	3.0
KİM357	Introduction to Adsorption	2+0	3.0
KİM360	Introduction to Polymer Chemistry	2+0	3.0
KİM362 (Eng)	Technical Writing for Chemists	2+0	3.0
KİM415	Introduction to Heterocyclic Chemistry	2+0	3.0
KİM419	Dyestuff Chemistry	2+0	3.0
KİM427	Analysis Techniques in Gas Chromatography	1+2	3.0
KİM429	Chemistry of Main Group Elements	2+0	3.0
KİM430	Biotechnological Methods	2+0	3.0
KİM432	Organic Synthesis	2+0	3.0
KİM433	The Separation Techniques in Inorganic Chemistry	2+0	3.0
KİM434 (Eng)	Coordination Chemistry	2+0	3.0
KİM434	Coordination Chemistry	2+0	3.0
KİM437	Bioaffinity Chromatography	2+0	3.0
KİM438	Analysis Technics of Liquid Chromatography	1+2	3.0

KİM439	Work and Worker Safety for Chemists	2+0	3.0
KİM440	Polymer Technology	2+0	3.0
KİM444	Forensic Chemistry	2+0	3.0
KİM445	Introduction to Archaeological Chemistry	2+0	3.0
KİM446	Natural Polymeric Materials	2+0	3.0
KİM450	Asymmetric Organic Synthesis Introduction	2+0	3.0
KİM452	Bioinorganic Chemistry	2+0	3.0
KİM453	Chemistry and Technology of Paints	2+0	3.0
KİM454	Chemistry of Colloids	2+0	3.0
KİM455	Applied Nuclear Magnetic Resonance Spectroscopy Technics	2+0	3.0
KİM456	Chemistry of Cosmetics	2+0	3.0
MÜZ151	Short History of Music	2+0	3.0
MÜZ155	Turkish Folk Music	2+0	2.0
MÜZ157	Traditional Turkish Art Music	2+0	2.0
SAĞ222	First Aid	2+1	3.0
SAN155	Hall Dances	0+2	2.0
SNT155	History of Art	2+0	2.0
SOS155	Folkdance	2+0	2.0
THU203	Community Services	0+2	3.0
TKY404	Quality Management System	2+0	3.0
TKY409	Industrial Quality Systems	2+0	3.0
TÜR120	Turkish Sign Language	3+0	3.0

#### Area Elective Courses

KİM459	Graduation Project I	2+4	10.0
KİM459 (Eng)	Graduation Project I	2+4	10.0
KİM460	Graduation Project II	2+4	13.0
KİM460 (Eng)	Graduation Project II	2+4	13.0
KİMSJ303	Internship	0+2	5.0

### DEPARTMENT OF CHEMISTRY (ENG) (ABD STATE UNIVERSTY OF NEW YORK UNIVERSTY AT ALBANY)

Department Head : Prof.Dr. Filiz YILMAZ  
Deputy Department Head : Prof.Dr. Sibel DİLTEMİZ  
Deputy Department Head : Assoc. Prof.Dr. Emel ERMİŞ

### DEPARTMENT OF MATHEMATICS

In the Mathematics Department, education, training and research are carried out in areas such as analysis, algebra, geometry, topology, applied mathematics and mathematics education, which are the main areas of mathematics. Students of the department have the opportunity to take business, economics, social content courses offered in various departments of the university as elective courses. In this way, they have the opportunity to expand their general culture as well as their field knowledge. In addition, there are opportunities for successful students to do second major and minor. Graduates of the department who have completed a master's degree without thesis at the Graduate School of Education can work as mathematics teachers at public or private secondary education institutions. In addition, graduates can work in various public and private organizations, banks in positions such as computer scientist, researcher, planner. Successful graduates also have the opportunity to become research assistants at universities and to study abroad.

Department Head : Prof.Dr. Hüseyin AZCAN  
Deputy Department Head : Dr. Lecturer Bahar KARAMAN  
Deputy Department Head : Assoc. Prof.Dr. Utku ERDOĞAN



## PROGRAM

<b>I.Semester</b>				<b>II.Semester</b>			
EMAT111 (Eng)	Calculus I	4+2	7.5	EMAT112 (Eng)	Calculus II	4+2	7.5
EMAT111	Calculus I	4+2	7.5	EMAT112	Calculus II	4+2	7.5
FİZ107	Physics Laboratory I	0+2	1.5	MAT116	Analytic Geometry II	2+2	5.0
FİZ129	Physics I	4+0	6.0	MAT118	Abstract Mathematics II	2+2	5.0
MAT115	Analytic Geometry I	2+2	5.0	MAT818	Calculus Laboratory II	0+2	2.0
MAT117	Abstract Mathematics I	2+2	5.0		<i>Seçmeli Dersler</i>	--	7.5
MAT817	Calculus Laboratory I	0+2	2.0		<i>Yabancı Dil Dersleri</i>	--	3.0
	<i>Yabancı Dil Dersleri</i>	--	3.0				
			----				----
			30.0				30.0
<b>III.Semester</b>				<b>IV.Semester</b>			
MAT203	Linear Algebra I	4+0	5.0	MAT204	Linear Algebra II	4+0	5.0
MAT213	Computer Programming I	2+2	5.0	MAT214	Computer Programming II	2+2	5.0
MAT215	Differential Equations I	2+2	5.0	MAT216	Differential Equations II	2+2	5.0
MAT221	Analysis I	4+2	7.0	MAT222	Analysis II	4+2	7.0
TAR165	Atatürk's Principles and History of Turkish Revolution I	2+0	2.0	TAR166	Atatürk's Principles and History of Turkish Revolution II	2+0	2.0
TÜR125	Turkish Language I	2+0	2.0	TÜR126	Turkish Language II	2+0	2.0
	<i>Mesleki Seçmeli Dersler</i>	--	4.0		<i>Mesleki Seçmeli Dersler</i>	--	2.0
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			30.0				28.0
<b>V.Semester</b>				<b>VI.Semester</b>			
MAT321	Complex Analysis I	2+2	5.0	MAT322	Complex Analysis II	2+2	5.0
MAT323	Abstract Algebra I	2+2	5.0	MAT324	Abstract Algebra II	2+2	5.0
MAT325	Metric and Topological Spaces I	2+2	5.0	MAT326	Metric and Topological Spaces II	2+2	5.0
MAT327	Analysis III	4+2	7.0	MAT328	Analysis IV	4+2	7.0
	<i>Mesleki Seçmeli Dersler</i>	--	5.0		<i>Mesleki Seçmeli Dersler</i>	--	5.0
	<i>Seçmeli Dersler</i>	--	3.0		<i>Seçmeli Dersler</i>	--	3.0
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			30.0				30.0
<b>VII.Semester</b>				<b>VIII.Semester</b>			
MAT403	Real Analysis I	3+0	5.0	MAT402	Real Analysis II	3+0	5.0
MAT405	Functional Analysis I	3+0	5.0	MAT404	Functional Analysis II	3+0	5.0
MAT441	Graduation Project	0+3	6.0		<i>Mesleki Seçmeli Dersler</i>	--	10.0
MAT441 (Eng)	Graduation Project	0+3	6.0		<i>Seçmeli Dersler</i>	--	10.0
	<i>Mesleki Seçmeli Dersler</i>	--	10.0				
	<i>Seçmeli Dersler</i>	--	4.0				
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			30.0				30.0
<b>Foreign Language Courses</b>							
ALM175 (Ger)	German I					3+0	3.0
ALM176 (Ger)	German II					3+0	3.0
ESTÜ120	Solfège					3+1	3.0
FRA175 (Fra)	French I					3+0	3.0
FRA176 (Fra)	French II					3+0	3.0

İNG187 (Eng)	English I	3+0	3.0
İNG188 (Eng)	English II	3+0	3.0

### Elective Courses

BEÖ155	Physical Education	2+0	2.0
BR101	Bridge	2+0	3.0
ESTÜ101	Introduction to University Life	0+1	2.0
ESTÜ111	Volunteering Works	1+2	4.0
ESTÜ112	Cyber Security for Everyone	2+0	2.0
ESTÜ113	Design Thinking	3+0	3.0
ESTÜ114	Visual Thinking	3+0	3.0
ESTÜ115	Photographic Viewpoint	2+1	3.0
ESTÜ116	Computer Aided Design I	3+0	3.0
ESTÜ117	Computer Aided Design II	3+0	3.0
ESTÜ118	Visual Thinking with Concepts	3+0	3.0
ESTÜ119	Flute	3+1	3.0
ESTÜ121	Piano	3+1	3.0
ESTÜ122	Guitar	3+1	3.0
FİN305	Financial Mathematics	2+0	3.0
İKT107	Introduction to Economics I	4+0	6.0
İKT108	Introduction to Economics II	4+0	6.0
İKT213	Mathematical Economics	3+0	4.5
İKT309	Monetary Theory	3+0	5.0
İKT310	Monetary Policy	3+0	5.0
İKT322	International Economics	2+0	5.0
İKT324	Financial Institutions and Banking	2+0	3.0
İKT417	Financial Economics I	2+0	3.0
İKT418	Financial Economics II	2+0	3.0
İKT421	Economy of Turkey	2+0	3.0
İNG225 (Eng)	Academic English I	3+0	3.0
İNG226 (Eng)	Academic English II	3+0	3.0
İNG325 (Eng)	Academic English III	3+0	3.0
İNG326 (Eng)	Academic English IV	3+0	3.0
İNG425 (Eng)	Academic English V	3+0	3.0
İNG426 (Eng)	Academic English VI	3+0	3.0
İŞL215 (Eng)	Time Management	1+1	3.0
İŞL215	Time Management	1+1	3.0
MAT365	Creativity and Innovation Management	2+0	2.0
MÜZ151	Short History of Music	2+0	3.0
MÜZ155	Turkish Folk Music	2+0	2.0
SAN155	Hall Dances	0+2	2.0
SNT155	History of Art	2+0	2.0
SOS155	Folkdance	2+0	2.0
THU203	Community Services	0+2	3.0
TÜR120	Turkish Sign Language	3+0	3.0

### Area Elective Courses

BİL378	Database Control Systems	2+2	5.0
BİL379	System Analysis and Design	3+0	5.0
BİL429	Object Oriented Programming	2+2	5.0
BİL430	Internet Programming	2+2	5.0
EİST221	Statistics	3+0	4.0
İST213	Probability	3+0	3.0
MAT218	Documentation with LaTeX	3+0	5.0
MAT226	Introduction to Graph Theory	3+0	5.0
MAT227	Geometry I	3+0	5.0
MAT228	Geometry II	3+0	5.0
MAT239	Discrete Mathematics	3+0	5.0
MAT239 (Eng)	Discrete Mathematics	3+0	5.0
MAT256 (Eng)	English for Mathematicians	3+0	5.0
MAT256	English for Mathematicians	3+0	5.0
MAT263	Proof Without Words	2+0	3.0
MAT265	Mathematical Softwares	3+0	5.0
MAT267 (Eng)	Mathematics with Models	2+0	3.0

MAT267	Mathematics with Models	2+0	3.0
MAT273 (Eng)	Construction of Number Systems	3+0	5.0
MAT273	Construction of Number Systems	3+0	5.0
MAT309	Advanced Programming	2+2	5.0
MAT310	Selected Topics on Computer	2+2	5.0
MAT311	Numerical Analysis I	3+0	5.0
MAT312	Numerical Analysis II	3+0	5.0
MAT313	Differential Geometry I	3+0	5.0
MAT314	Differential Geometry II	3+0	5.0
MAT318	Matrix Analysis	3+0	5.0
MAT318 (Eng)	Matrix Analysis	3+0	5.0
MAT319	Euclidean and Non-Euclidean Geometries	3+0	5.0
MAT367	History of Mathematics I	3+0	5.0
MAT368	History of Mathematics II	3+0	5.0
MAT406 (Eng)	Geometric Topology	3+0	5.0
MAT406	Geometric Topology	3+0	5.0
MAT407	Uniform Spaces	3+0	5.0
MAT407 (Eng)	Uniform Spaces	3+0	5.0
MAT408 (Eng)	Vector Analysis	3+0	5.0
MAT408	Vector Analysis	3+0	5.0
MAT409	Partial Differential Equations	3+0	5.0
MAT409 (Eng)	Partial Differential Equations	3+0	5.0
MAT410 (Eng)	Game Theory	3+0	5.0
MAT410	Game Theory	3+0	5.0
MAT412	Education of Axiomatic Geometry	3+0	5.0
MAT413	Fourier Analysis	3+0	5.0
MAT413 (Eng)	Fourier Analysis	3+0	5.0
MAT414	Dynamical Systems	3+0	5.0
MAT414 (Eng)	Dynamical Systems	3+0	5.0
MAT417 (Eng)	Calculus of Variations	3+0	5.0
MAT417	Calculus of Variations	3+0	5.0
MAT420	Tensor Analysis	3+0	5.0
MAT422	Continuous Dynamical Systems	3+0	5.0
MAT429	Galois Theory	3+0	5.0
MAT429 (Eng)	Galois Theory	3+0	5.0
MAT430 (Eng)	Linear Differential Equations	3+0	5.0
MAT430	Linear Differential Equations	3+0	5.0
MAT431 (Eng)	Introduction to Number Theory I	3+0	5.0
MAT431	Introduction to Number Theory I	3+0	5.0
MAT432 (Eng)	Introduction to Number Theory II	3+0	5.0
MAT432	Introduction to Number Theory II	3+0	5.0
MAT433 (Eng)	Fractal Geometry I	3+0	5.0
MAT433	Fractal Geometry I	3+0	5.0
MAT434 (Eng)	Fractal Geometry II	3+0	5.0
MAT434	Fractal Geometry II	3+0	5.0
MAT435	Discrete Dynamical Systems	3+0	5.0
MAT436 (Eng)	Introduction to Perturbation Methods	3+0	5.0
MAT436	Introduction to Perturbation Methods	3+0	5.0
MAT439	History of Mathematics Concepts	3+0	5.0
MAT452 (Eng)	Applications of Partial Differential Equations	3+0	5.0
MAT452	Applications of Partial Differential Equations	3+0	5.0
MAT453	Linear Programming	3+0	5.0
MAT453 (Eng)	Linear Programming	3+0	5.0
MATSJ301	Internship	0+2	5.0

## COURSE CONTENTS

**ALM175 (Ger) German I** **3+0 3.0**  
Greeting and Saying Goodbye; Introducing Yourself and Others; Giving Personal Information About Yourself; Spelling a Word; Counting up to 100; Communicating in Private Life; Telling Profession; Talking About Occupation and Business; Expressing a Problem; Introducing Family; Telling the Time; Planning Events; Making an Appointment; Saying the Names of Foods; Reading the Menu; Ordering in the restaurant; Shopping at the Market; Making A Complaint; Saying the Names of Vehicles; Asking for Address; Understanding Directions; Talking about the Illness; Reading and Writing Dates; Replying to an Invitation; Making Holiday Plans; Understanding and Talking About the Weather Forecast.

**ALM176 (Ger) German II** **3+0 3.0**

Giving Feedback; Making A Suggestion; Asking Questions; Expressing Ideas; Expressing Requests and Fears; Understanding Signs; Giving Directions; Talking about Sports; Reading and Understanding Newspapers; Ordering by Telephone; Preferring a Profession; Talking about Professions; Making a Complaint; Intercultural Communication; Comprehending Instructions for Use; Making Weather Forecast; Reading Literary Texts; Celebrating; Comprehending and Giving Recipe; Identify Things; Comprehending Adventure Stories and Movies.

**ARY202                  Research Techniques                  3+0   5.0**

Science: Definition of science, Scientific research, Technical approaches in scientific research; Research: Stages of a research, Types of research, Data collection techniques in research; Question: Definition of question, Types of question, Question forms in research, Preparation of the forms using computers: Analysis of the results: Evaluation of question forms using computer, Statistical analysis of the research results, Computer output of research results; Report writing; An Application of Research Planning.

**BEÖ155                  Physical Education                  2+0   2.0**

Definition of Physical Education and Sports; Aims, Disadvantages of Inactive Life; Various Activities for Physical Education; Recreation; Human Physiology; First Aid; Sports Branches: Definition, Rules and Application; Keep Fit Programs.

**BiL168                  Computer Programming                  4+0   5.0**

Introduction to C Programming Language; Basic Elements of C Programming Language; Variables and Values; Simple Input/Output Operations; Arithmetic Operators; Logical Operators; Control Structures; Loops; Arrays; Functions; Pointers; Operations of Files.

**BiL378                  Database Control Systems                  2+2   5.0**

Database, database management systems, basic concepts, database architecture, external, conceptual, and internal levels, data independence, data models, dependencies among entities, normal forms, design criteria, entity - relationship database systems, data definition, data manipulation and query languages, relational processes, relational algebra and examples of relational query languages, operational requirements, security, integrity, synergies, performance.

**BiL379                  System Analysis and Design                  3+0   5.0**

System functions and tools, introducing problem and problem solving rules, system development life-cycle, analyzing tools and techniques, modeling of an existing or a new information system using data flow schemas, defining data type and information requirements in data dictionary, system design and its application, computer inputs, outputs, controls and files, system development steps and system analysis, feasibility study, management function, data and information concepts, specification of information requirements, system analysis tools, classification of information systems, computer supported software programming tools.

**BiL425                  Computer Assisted Chemical Calculations                  2+0   3.0**

Creating 2D and 3D models of organic, inorganic and heterocyclic compounds with suitable chemistry software; Estimation of electron densities and thermodynamic properties of these compounds by means of MOPAC, Gaussian 98 and Chemoffice 2000 soft wares.

**BiL429                  Object Oriented Programming                  2+2   5.0**

Investigation to The Object Oriented Programming; Bringing of The Object Oriented Programming; Concepts of Class, Object, Event, Property and Method; Data Storage;Data Abstraction; Dynamic Connection; Inheritance; General Properties of Scheduled Programming Language; Variables; Control Structures, Loop; Concept of Block; Use of Classes; Examples of The Object Oriented Programming.

**BiL430                  Internet Programming                  2+2   5.0**

The Internet Protocol and Concepts of Internet; Web Site Development with HTML/JavaScript; Web Servers and Basics of Web Servers; Programming with PHP or Other Scripting Languages; Web Design with Graphics and Animation Software; An Introduction to Databases; Database Management Systems; SQL Commands and Applications; Publishing Databases on the Web;Building a Sample Database Application on the Web;

**BiL801                  Object Oriented Programming                  4+0   4.0**

Introduction to C++ Programming Language; Inline Functions; Function Overloading; Function Templates; Concepts of Class and Object; Constructors; Destructors; Friend Functions and Friend Classes; Const Objects and Const Member Functions; C++ Operator Overloading; C++ Inheritance; C++ Virtual Functions; Polymorphism.

**BiL802                  Visual Programming                  4+0   4.0**



**BiY128 Biology for Chemists II 2+0 2.0**

Chromosomal Basis of Inheritance; The Molecular Basis of Inheritance; Prokaryotes and the Origins of Metabolic Diversity; Plant Structure and Function; Introduction to Animal Structure and Function; Animal Nutrition: An overview of Food Processing, Mammalian digestive system; Circulation and Gas Exchange; Defense of the Body: Non-specific defenses against infection, Specific immunity, Immune responses; Regulation of Internal Environment: Body temperature regulation, Water balance and excretion of waste; Introduction to Regulatory Systems.

**BiY213 Cryptogams 2+0 2.5**

Definition of Plant Taxonomy; The History of Taxonomical Studies; Classification Systems; Nomenclature and Rules: Binominal nomenclature, Reasons for nomenclature, Methods; Herbarium Techniques in Cryptogams: Algae, Mosses, Ferns, Fungi; Classification in Cryptogams: Cyanophyta; Euglenophyta; Pyrrophyta; Crysophyta; Chlorophyta; Phaeophyta; Rhodophyta; Biology and Classification of Bryophyta and Pteridophyta.

**BiY215 Microbiology I 2+0 2.5**

Microorganisms in Nature; History of Microbiology; Cell Chemistry; Atoms, Molecules and Chemical Bonding, Water and its Importance, Carbohydrates, Proteins, Fatty Acids and Lipids, Nucleic Acids; Cell and Cell Structure; Prokaryotic Cell Structure, Eukaryotic Cell Structure, Importance of being small, Cell Membrane, Cell Wall, Growth in Microorganisms, Nutrition and Metabolism in Microorganisms: Autotrophy Microorganisms, Heterotrophy Microorganisms, Enzymes, Energy, Fermentation, Respiration, Anaerobic Respiration, Biosynthesis; Microbial Growth Control. Microorganisms in Nature; History of Microbiology; Cell Chemistry; Atoms, Molecules and Chemical Bonding, Water and its Importance, Carbohydrates, Proteins, Fatty Acids and Lipids, Nucleic Acids; Cell and Cell Structure; Prokaryotic Cell Structure, Eukaryotic Cell Structure, Importance of being small, Cell Membrane, Cell Wall, Growth in Microorganisms, Nutrition and Metabolism in Microorganisms: Autotrophy Microorganisms, Heterotrophy Microorganisms, Enzymes, Energy, Fermentation, Respiration, Anaerobic Respiration, Biosynthesis; Microbial Growth Control.

**BiY216 Microbiology II 2+0 2.5**

Viruses: Viral Replication, Nomenclature and Taxonomy of Viruses; Algae; Protozoa; Fungi; Bacteria; Species concept in Bacteria, Identification Methods of Bacteria, Archaeobacteria, Eubacteria; Introduction to Microbial Genetics: Genetics in Prokaryotic and Eukaryotic Microorganisms, Mutations, Extra chromosomal Inheritance; Immunology: Antigen and Antibodies, Microbial Antigens, Immune Response Polyclonal and Monoclonal Antibodies, Interaction of Antigen and Antibody. Viruses: Viral Replication, Nomenclature and Taxonomy of Viruses; Algae; Protozoa; Fungi; Bacteria; Species concept in Bacteria, Identification Methods of Bacteria, Archaeobacteria, Eubacteria; Introduction to Microbial Genetics: Genetics in Prokaryotic and Eukaryotic Microorganisms, Mutations, Extra chromosomal Inheritance; Immunology: Antigen and Antibodies, Microbial Antigens, Immune Response Polyclonal and Monoclonal Antibodies, Interaction of Antigen and Antibody.

**BiY217 Microbiology Laboratory I 0+2 2.0**

Basic Laboratory Equipments in Microbiology Laboratory; Sterilization and Disinfection; Microbiological Media and their Preparations; Staining Bacteria; Preparation Microscopic Slide, Simple staining, Negative staining, Gram staining, Endospore staining; Bacterial Motility; Measurement of Bacterial Size; Determination of Live Cell Number of Bacteria; Growth Requirements of Microorganisms; Pure Culture Techniques; Cultural Aspects of the Microorganisms. Basic Laboratory Equipments in Microbiology Laboratory; Sterilization and Disinfection; Microbiological Media and their Preparations; Staining Bacteria; Preparation Microscopic Slide, Simple staining, Negative staining, Gram staining, Endospore staining; Bacterial Motility; Measurement of Bacterial Size; Determination of Live Cell Number of Bacteria; Growth Requirements of Microorganisms; Pure Culture Techniques; Cultural Aspects of the Microorganisms.

**BiY218 Microbiology Laboratory II 0+2 2.0**

Viruses: Isolation of Bacteriophages, Plaque counting; Fungi: Macroscopic and microscopic analysis of the fungus sample, Yeasts, Molds, Plant parasitic fungi; Antimicrobial effects of some chemical substances; Determination of Minimal Inhibitory Concentration; Isolation of Streptomycin resistant mutants; Immunology; Environmental microbiology: Soil microbiology, Air microbiology, Water microbiology; Extremophilic microorganisms. Viruses: Isolation of Bacteriophages, Plaque counting; Fungi: Macroscopic and microscopic analysis of the fungus sample, Yeasts, Molds, Plant parasitic fungi; Antimicrobial effects of some chemical substances; Determination of Minimal Inhibitory Concentration; Isolation of Streptomycin resistant mutants; Immunology; Environmental microbiology: Soil microbiology, Air microbiology, Water microbiology; Extremophilic microorganisms.

**BiY219 Cryptogams Laboratory 0+2 2.0**

Practices in Cryptogam Laboratory; Cyanobacteria: Commonly Encountered Samples in Local Environment and Turkey; Crysophyta, Chlorophyta, Phaeophyta, Rhodophyta: Commonly Encountered Samples in Local Environment and Turkey; Bryophyta: Commonly Encountered Samples in Local Environment and Turkey of Anthocerotopsida, Marchantiopsida and Bryopsida; Pteridophyta: Commonly Encountered Samples in Local Environment and Turkey; Examination of Lichen Samples.

**BiY220 Seed Plants 2+0 3.0**  
General Taxonomic Principles; Plant nomenclature, Plant Classification Systems: Mechanic Systems, Natural Systems, Phylogenetic systems, Modern systems, Differentiation of the species, Spermatophyte (General Characteristics); General characteristics of Gymnospermae; Classification of Gymnospermae; Classification of Angiospermae: Magnoliopsida, Dicotyles, Liliopsida, Monocotyles.

**BiY221 Plant Morphology 2+0 2.5**  
Inner Morphology: Plant cell, Plasma membrane, Pist and, Plastids, Ergastic matters, Plant tissue, Intercellular spaces; Classification of the Plant Tissues: Meristematic tissues, Classification of meristems according to their location and origins, Permanent tissue developed by cambium, Permanent tissues, Epidermis, Parenchyma and their classification, Supporting tissue (Sclerenchyma and Collenchyma), Vascular system, Secretion system, Inner Organography, Vegetative parts of plants, Generative parts of plants, Outer Organography; Structures of vegetative parts, Structures of generative parts.

**BiY222 Seed Plants Laboratory 0+2 2.0**  
Seed Plants (Spermatophytes): Gymnospermae: Dissection and Investigation of Important Gymnospermae Groups: Pinaceae, Cupressaceae, Taxaceae; Angiospermae: General characteristics; Dicotyledons: General characteristics; Dissection and Investigation of Important Dicotyledons Groups: Magnoliidae (Ranunculaceae, Papaveraceae), Caryophyllidae (Caryophyllaceae), Dilleniidae (Malvaceae, Brassicaceae, Resedaceae), Rosidae (Rosaceae, Fabaceae, Euphorbiaceae, Linaceae, Geraniaceae, Apiaceae), Asteridae (Convolvulaceae, Boraginaceae, Lamiaceae, Scrophulariaceae, Asteraceae); Monocotyledons: Dissection and Investigation of Important Monocotyledon Groups: Commelinidae (Poaceae), Liliidae (Liliaceae, Iridaceae).

**BiY223 Plant Morphology Laboratory 0+2 2.0**  
Investigation of Plant Cells Microscopically: Preparation, Cell membrane, Cell pits, Intercellular gaps, Plastids and their types, Ergastic substances; Investigation of Plant Tissues Microscopically: Meristematic tissues, Permanent Tissues (Protective tissue, Ground tissue, Collenchymas and sclerenchyma tissues, Vascular tissue, Secretory tissue); Investigation of Inner and Outer Structures of Plant Organs Macroscopically and Microscopically: Vegetative organs (stem, leaf and root), Generative organs (flower, fruit and seed); Investigation of Inflorescent types in Plants: Inflorescent types, Flower formula and Drawing flower diagram.

**BiY224 Vertabrate Animals 2+0 2.5**  
Rules of Taxonomy; General Characters of Chordate; Origin of Chordate; Phylogeny of Chordates; The Subsystematics Groups of Chordates; Systematic of Primitive Chordates; Biology and Systematic of Cyclostomatous; Biology and Systematic of Chondrichthyes; Biology and Systematic of Osteichthyes; Biology and Systematic of Amphibians; Biology and Systematic of Reptilians; Biology and Systematic of Aves; Biology and Systematic of Mammalians.

**BiY225 Cytology 2+0 2.0**  
The Evolution of the Cell: The evolution and the properties of the prokaryotic cells and the eukaryotic cells; Chemical Structure of the Cell: Inorganic and organic composition of the cell; Cell Membrane: Structure and function of cell membrane, Transport across the cell membranes, Connection types of cell-cell and cell-matrix; Organelles with Double Membranes in the Cell: Nucleus, Mitochondria, Chloroplast; Organelles with Single Membrane in the Cell: Endoplasmic reticulum, Golgi apparatus, Lysosomes, Peroxisomes; The organelles without membrane: Ribosome, Sentrosome; Structure and Functions of the Cytoskeleton.

**BiY226 Vertabrate Animals Laboratory 0+2 2.0**  
Morphology of some Acrania species (Hemichordata, Urochordata, Cephalochordata), Morphology of some Agnatha (Cyclostomata) species, Morphology of some Chondrichthyes (Squaliformes, Rajiformes and Chimaeriformes) species, Morphology of some Osteichthyes species, Morphology of some Amphibians (Anura and Urodela) species, Morphology of some Reptilia species, Morphology of some Aves species, Morphology of some Mammalian species

**BiY227 Cytology Laboratory 0+2 2.0**  
Cytological Techniques: Slide preparation, Staining, Microscopic examination methods; Living Organization: Experiment of quasarvat formation; Examination of Cell Activity; Cell Counting Methods; Test of Cell Membrane Permeability; Examination of Cell Structures: Evaluation of different kinds of microscopes image; Examination of Cell Skeleton; Cell Division Mechanics; Relations of Cell and Surface: Relations of cell-cell and cell-matrix, Antigens of cell membrane.

**BiY228 Arthropoda 2+0 2.5**  
The General Features of Arthropods; Classifications of Arthropods; Characteristics of Malacopoda (Onychophora, Tardigrata) and Euarthropoda (Crustacea, Chelicerata, Linguatulida, Pantapoda Myriapoda, Aptergota, Pterygota): Body division, cuticle and chitin, external features, paired appendages, digestive, circulatory, respiratory, nervous reproductive systems, sense organs; Growth and Metamorphosis.

**BiY229 Invertebrate Animals 2+0 2.5**

Systematic and Taxonomy: History of systematic, Aim of taxonomy, Taxonomic system, The main characters of animals in classification, Naming of animals; Classification of invertebrate animals, Protista; Mastigophora, Sarcodina, Sporozoa, Ciliata; Animalia: Mesozoa, Parazoa, Coelenterata, Coelomata, Plathelminthes, Nemertini, Rotatoria, Nematoda, Kamptozoa, Mollusca, Annelida, Echiuroidea, Molluscoidea, Pogonophora, Echinodermata; The Phylogeny of Metazoans.

**BiY230 Arthropods Laboratory 0+2 2.0**

Collecting and preserving of Arthropods samples for scientific aim; Systematic and morphological examination of Crustacean (Entomostraca and Malacostraca) classis samples; Systematic and morphological examination of Chelicerata classis samples; Systematic and morphological examination of Linguatulida, Pentastomida) and Myriapoda classis samples; Systematic and morphological examination of Insects classis samples.

**BiY231 Invertebrate Animals Laboratory 0+2 2.0**

General Rules of Invertebrate Laboratory, Examination of single cell animals, which belonging to Protozoa subfilum. Observation of Spongia, Hydra, Jellyfish and Coral specimens, Evaluation of anatomical and morphological structure of Planaria, Trematods and Taenia, Nematoda and Acantocephala samples, Comparison of morphological and anatomical structure of Annelida specimens, Examination and determination of Mollusca, Cephalopoda and Molluscoidea specimens.

**BiY232 General Ecology 2+0 3.0**

Basic Concepts; Auto ecology and Population Ecology; Dynamics of Population; Ecology of Communities: Functional and structural features of communities, Ecosystems and Characteristics; Functional characteristics of ecosystems, Ecological cycles, Biological accumulation; Great Ecosystems in the World; Evolutional Ecology: Natural Selection, Genetic Variability, Life Strategies, Gene Banks; Applied Ecology: Ecological problems of humanity, Protection of the nature and biological variability, Economics of environment and planning, development.

**BiY234 General Ecology Laboratory 0+2 2.0**

Essential Rules in Ecological Studies: Essential rules in field and laboratory studies; Phenology and Biomass: Phenologic observations in plants and animals, biomass calculation; Decomposition; Climate: Climate components, Drawing of ombrothermic diagrams; Soil: Physical analysis of soil, chemical analysis of soil; Investigation of Water Ecosystem: Water acidity, determination of phosphate amount and hardness of water; Ecophysiology: Germination; Productivity: Determination of primer productivity, Chlorophyll identification method; Competition; Determination of Cellulose Amount; Structural Characteristics of Populations: Biodiversity, Determination of biodiversity.

**BiY239 Molecular Biology 2+0 2.0**

The Past, Present and Future of Molecular Biology; Mechanism of DNA Replication; Transcription in Prokaryotes: Operon systems; Transcription and Post-Transcriptional Regulation in Eukaryotes; Protein Synthesis and its Regulation; Post-Translational Modifications; Transport of Proteins to Membranes and Organelles; Molecular Motors; Immunoglobins and Their Molecular Mechanisms; Recombinant DNA Techniques; Methods for DNA Analysis; Methods for Protein Analysis. The Past, Present and Future of Molecular Biology; Mechanism of DNA Replication; Transcription in Prokaryotes: Operon systems; Transcription and Post-Transcriptional Regulation in Eukaryotes; Protein Synthesis and its Regulation; Post-Translational Modifications; Transport of Proteins to Membranes and Organelles; Molecular Motors; Immunoglobins and Their Molecular Mechanisms; Recombinant DNA Techniques; Methods for DNA Analysis; Methods for Protein Analysis.

**BiY241 Molecular Biology Laboratory 0+2 2.0**

Introduction of Materials and Devices; Preparation of Buffer and Solution; DNA Isolation from Onion by Basic Technique; DNA Isolation Technique: Microorganisms, Cultured cells and insect; Analysis of DNA Purity and Amount Analysis by Spectrophotometer; DNA Analysis by Agarose Gel Electrophoresis; Analysis in Gel Photographs and Calculation of DNA Fragment Sizes; Protein Isolation Technique: Plant and animal tissues; Spectrophotometric Analysis of Protein Concentration; Protein Standards Curve and Protein Concentration Calculations; Protein Analysis by Acrylamide Gel Electrophoresis; Analysis of Gel Photographs and Calculation of Protein Molecular Weights. Introduction of Materials and Devices; Preparation of Buffer and Solution; DNA Isolation from Onion by Basic Technique; DNA Isolation Technique: Microorganisms, Cultured cells and insect; Analysis of DNA Purity and Amount Analysis by Spectrophotometer; DNA Analysis by Agarose Gel Electrophoresis; Analysis in Gel Photographs and Calculation of DNA Fragment Sizes; Protein Isolation Technique: Plant and animal tissues; Spectrophotometric Analysis of Protein Concentration; Protein Standards Curve and Protein Concentration Calculations; Protein Analysis by Acrylamide Gel Electrophoresis; Analysis of Gel Photographs and Calculation of Protein Molecular Weights.

**BiY305 Molecular Cell Physiology 2+0 2.5**

Flow of Genetic Information in the Cell: Maintenance of genome, Translation of the genetic information; Cell Membrane Systems; Molecule Traffic in The Cells: Nucleus-cytoplasm traffic, ER and protein transport, Golgi and transport of



molecules, Vesicular transport; Bioenergetics and Metabolism; Cell Signaling; Cell Cycle and Regulation; Cell Differentiation; Cell Death; Stem Cells; Cancer cells; Cell Culture Techniques.

**BiY313 Ethology 2+0 4.0**

Subdivisions of Ethology; Diversity of Behavior; Stimulus; Inherent Behaviors; Reflexes; Reluctant Motions; Instinctive Behaviors; Stimulation From Birth; Balancing and Finding Location; Changing Location; Learned Behavior; Habits; Conditioned Reflex; Trial and Error; Learning by Imitation; Memory and Learning Behavior; Social Behaviors: Mating behavior, Forming groups, Fights and dominance, Behavior of home ground, Insect societies; Research Methods for Behavior; Effects of Hormones on Behavior.

**BiY316 Endocrinology 2+0 4.0**

Definition and classification of hormones; Hormonal control; Effect Mechanisms of hormones and receptors; Synthesis and Secretion of hormones; Hypophyse gland and its hormones: Vasopressin, Oxytosin, Somatotropin, Prolactin, Epiphysis; Hormonal control of calcium metabolism: Parathyroid gland and parathormone; Effects of hormones on different metabolisms; Thyroid gland and its hormones: Pancreas, Adrenal gland hormones: Mineralocorticoids, Glicorticoids, Adrenal sex hormones; Gastrointestinal hormone structure.

**BiY317 Mycology 2+0 4.0**

Morphology in Fungi; Fungal Cell, Thallus, Hypha, Special Somatic Structures, Hyphae Tissues; Fungal Growth; Asexual Reproduction, Para sexual Reproduction, Sexual Reproduction; Genetic; Differentiation of Fungi; The Nutrient Requirements of Fungi and Nutrition: Nutrient Capture; Nutrients for Fungi; Fungal Metabolism; Taxonomy of Fungi: Moulds with Simple Structure, Moulds with Complex Structure; Fungi as Plant Parasites; Fungal Parasites of Humans, Insects and Nematodes; Beneficial Activities of Fungi.

**BiY318 Insect Ecology 2+0 4.0**

The Study Principles of Insect Ecology; Habitats of Insects; Abiotic Factors in the Environment and Effects on Insects: Climate and temperature, pressure, soil, light, water and dump, ph; Biotic Factors in the Environment and the Effects on Insects; Food and Feeding Features of Insects: Feeding habits, phytophagous, saprophagus, carnivorous; Intraspecific and Interspecific Competition; Symbiosis; Prasitism; Commensalism; The Effects of Plant Environment on Insects; Population Dynamics and Growth.

**BiY319 Enzymology 2+0 4.0**

General properties: Enzyme-substrate relation; Vitamins; Differences between enzymes and normal catalytic substances; Chemical structure of enzymes; Cofactor and coenzymes: Important coenzymes and the groups they transfer; Enzyme activity: Activity of catalytic center; Factors that affect enzyme activity; Enzyme kinetics: Michealis-menten, Line-Weaver-burk plots; Conformation changes of enzyme; Enzyme specificity; Allosteric enzyme; Activators and Inhibitors: Competitive inhibition, Non-competitive inhibition; Enzyme classification.

**BiY326 Biodiversity and Flora of Turkey 2+0 4.0**

What is Biodiversity?: Ecosystem diversity, Species diversity, Genetic diversity; Process Diversity; Loss of Biodiversity; Importance and Conservation of Biodiversity; Conservation: In-situ and ex-situ conservation methods; Biodiversity in Turkey: Causes of the richness of the flora of Turkey; Floristic regions in Turkey, Characteristic - plant species which spread over these regions; Effect of land and soil use on the flora in Turkey; Conservation areas in Turkey and current situation.

**BiY328 Paleontology 2+0 4.0**

What is Palynology? What is Pollen? Pollen Structure; Pollen Morphology; The Structures of Pollens; Pollen Types; Palinology Practices; Preparation Techniques in Palynology; Materials and Methods Using in Palinologic Studies; Pollen Calendar; Allergenic Pollens.

**BiY329 Environmental Impact Assessment 2+0 4.0**

What is Environmental Impact Assessment (EIA)? Environment Law: Aim and concept, Necessity of EIA.; Regulations of Environmental Impact Assessment (EIA); Preservation Areas in Turkey and the Species Under Risk Categories; Groups to be Considered in Environmental Impact Assessment (EIA); Origin of the Flora of Turkey; General Overview of Flora in Turkey; Floristically Analyses in Environmental Impact Assessment (EIA) Studies; Fauna in Turkey; General Overview of Fauna in Turkey; Faunistic Analyses in Environmental Impact Assessment (EIA) Studies; Pollution and Pollutants; Preparing the ÇED Report and Presentation.

**BiY330 Techniques in Systematic Botany 2+0 4.0**

Classical Methods Used in Plant Classification: Sampling and Storage Methods; What is character?: Characters used in classical and modern classification; Introduction to Chemotaxonomy; Introduction to Cytotaxonomy; Molecular Techniques used in Plant Classification: Sampling and storage methods; DNA fingerprinting techniques, PCR, isozymes and allozymes; Cytogenesis; Revision Studies in Plant Classification

**BiY334 Biological Control 2+0 4.0**

The Principles of Pest Control: Natural balance, Threshold of the economic damage, Serviceable scale of finance, Projected estimates and warnings; Methods of Biological Control Against to Pests: Cultural measures, Mechanical control, Physical control, Chemical control, Quarantine measures; Biotechnical methods; Biological Control: Advantages of biological control, Features of natural predators, Efficiency of predators, Methods for biological control, Animal groups used against pests, Microbial control, Toxins of microorganism.

**BiY336 Ornithology 2+0 4.0**

Origins; Diversity of birds; History; Systematic; Form and Function: Feathers, Flight, Physiology, Feeding; Behavior and Communication: Brains and senses, Visual communication, Vocal communication; Behavior and Environment: The annual cycles of birds, Migration, Social behavior; Reproduction and Development: Reproduction, Nests and incubation, Mates, Growth and development, Parental care; Population Dynamics and Conservation; Demography, Population, Species, Communities, Conservation of Endangered species.

**BiY339 Physiology of Animals 2+0 2.5**

Nervous System: Nervous system in invertebrate animals, Nervous system in vertebrate animals, Transmission to nerve, Peripheral nervous system, Central nervous system;. Physiology of Movement: Amoeboid movement, Movement by cilia, Flagella, Muscle; Physiology of Feeding and Digestion; Physiology of Respiration: Respiration by level of body, Gill, Trachea, Lung, Respiration in vertebrate animals; Physiology of Circulation: Animals without circulation system, Open and closed circulation, Circulation in invertebrate, Circulation in vertebrate, Temperature regulation; Excretion: Excretion by level of body, Protonefridiums and nefridiums, Structure of kidney and roles of nefrons; Physiology of Sense.

**BiY341 Physiology Laboratory of Animals 0+2 2.0**

Anesthesia of Frog; Compound Action Potential and Nerve Conduction in Frog Sciatic Nerve; Physiology of Skeletal Muscle in the Frog Gastrocnemius Muscle; Cardiac Muscle Activities in the Frog heart; Electromyography; Physiology of Digestion: Factors affecting enzyme activities, Digestion of lipits; Cardiovascular Physiology: Electrocardiogram, Pulse, Blood pressure, Heart sounds; Respiratory Physiology: Lung volumes, Lung capacities, Pulmonary flow rates; The examination of Excretory Physiology in Nephridium and Mammal kidney.

**BiY343 Hydrobiology 2+0 4.0**

Scope of Hydrobiology; Hydrological Cycle; Physical and Chemical Characteristics of Waters; Aquatic Ecosystems: Lentic freshwaters (lakes, ponds, temporary waters), Lotic freshwaters (rivers, streams); Inland Salt Water and Brackish Ecosystems; Marine Ecosystems; Wetland Ecosystems; Biological Productivity and Food Change of the Aquatic Environments; Pollution and Saprobic System in the Waters; Upwelling and Red-tide in the Sea; Eutrophication.

**BiY352 Introduction to Lichenology 2+0 4.0**

Introduction; History of Lichenology; Symbiosis and Lichens; Photobionts and Mycobionts in Lichen thallus; Thallus morphology and anatomy: Cortex, Algal layer, Medulla; Lichen physiology: Photosynthesis, Respiration, Growth, Accumulation of water and mineral; Lichen biochemistry and seconder metabolites: Production and role of them in the Lichen thallus; Economical use of Lichens; Classification of Lichens; Lichenicolous lichen and lichenicolous fungi; Monitoring techniques in Lichen for pollution: In situ and the uses methods by transplanted materials.

**BiY354 Plant Physiology 2+0 2.5**

Plant and Cell Architecture; Energy, Enzymes and Gene Expression; Water and Plant Cells; Mineral Nutrition; Solute Transport; Photosynthesis: The light reaction; Carbon Metabolism; Physiology and Ecological Considerations; Respiration and Lipid Metabolism; Assimilation of Mineral Nutrients; Surface Protection and Secondary Compounds; Stress Physiology; The Cellular Basis of Growth and Morphogenesis Genesis; The Control of Flowering.Plant and Cell Architecture; Energy, Enzymes and Gene Expression; Water and Plant Cells; Mineral Nutrition; Solute Transport; Photosynthesis: The light reaction; Carbon Metabolism; Physiology and Ecological Considerations; Respiration and Lipid Metabolism; Assimilation of Mineral Nutrients; Surface Protection and Secondary Compounds; Stress Physiology; The Cellular Basis of Growth and Morphogenesis Genesis; The Control of Flowering.

**BiY356 Plant Physiology Laboratory 0+2 2.0**

Plant Analyses: Water Quantification, Quantification of Inorganic and Organic Substances; Solute Transport in Plants: Diffusion, Osmosis, Dialyses; Plant and Water: Transpiration; Photosynthesis: Chlorophyll Extraction, Separation of Dyed Substances by Paper Chromatography, Optics and Spectrum of Chlorophyll; Respiration: Anaerobic and Aerobic Respiration, Respiration Co-efficient, Growth and Developmental Physiology: Measurement of Micro- and Macroscopic Growth, Root Growth; Plant Movements: Phototropism, Effects of Light on Phototropism, Response of a Seedling to Fototropism, Geotropism; Hormones; Plant Stress Physiology: Mineral Stress with Water Culture.Plant Analyses: Water Quantification, Quantification of Inorganic and Organic Substances; Solute Transport in Plants: Diffusion, Osmosis, Dialyses; Plant and Water: Transpiration; Photosynthesis: Chlorophyll Extraction, Separation of Dyed Substances by Paper Chromatography, Optics and Spectrum of Chlorophyll; Respiration: Anaerobic and Aerobic Respiration, Respiration Co-



- BiY376 Virology 2+0 4.0**  
 History of virology; Introduction to The Viruses; The Virus Morphology and Their Chemical Structure; Replication Strategies of The Viruses; Classification and Characterization of The Viruses; Bacteriophages; Plant Viruses; Animal Viruses; Viruses with Reverse Transcriptases; Viroids; Prions; Methods for the Isolation of Viruses from Environmental Samples; Determination of Virus Abundance by Epifluorescence Microscopy; Basic Phage Electron Microscopy.
- BiY377 Foodborne Pathogenic Microorganisms 0+3 5.0**  
 Classification of Food Borne Pathogenic Microorganisms and Parasites; Food Borne Pathogenic Bacteria (E. Coli O157:H7, Salmonella spp., Thermophile Camplobacter, V. paraheamolyticus, S. aureus, B. cereus, L. Monocytogenes); Foodborne Fungi: Adverse effects on health, Mycotoxin formation mechanism and the factors influencing mycotoxin formation; Food Borne Virus; Food and Water-borne Parasites: Algal toxins; Pathogenic Microorganisms in the Advanced Analysis Techniques Rapid and Automated Methods.
- BiY378 Statistical Applications in Biology 2+0 4.0**  
 General Concepts; Sampling: Sampling theory, Distribution theory, determination of confidence scale of sampling mean for large and small samples, data collection and data classification, Determination and Applications of Distributions: Hypothesis tests, Chi-Square test, z and t distributions, Correlation and Regression Analysis, Statistical Package Programs; Decision Making; Evaluation of analysis results and its application in biological studies.
- BiY379 Histology 0+3 5.0**  
 Techniques of Microscopy; Animals Tissue and Structures; Classification of Cells; Epithelial Tissue and Classification: Epithelium, Glands; Connective Tissue: Classification of connective tissue, Connective tissue cells; Blood and Blood Cells: Erythrocyte, Leukocyte, Thrombocyte, Lymph; Cartilage Tissue and Classification: Hyaline cartilage, Elastic cartilage, Fibro cartilage; Bone Tissue and Bone Formation; Muscular Tissue and Classification: Smooth muscle, Skeletal muscle, Cardiac muscle; Nervous Tissue: Cells of nerve tissue.
- BiY383 Microbial Techniques 0+3 5.0**  
 Introduction; Cultural Methods for Counting Microorganisms; Microscopical Methods for Counting Microorganisms; Standardized Methods for Counting Microorganisms; Metabolic Methods for Counting Microorganisms; Other Methods for Counting Microorganisms; Biochemical Tests; Media And Sterilization; Indicator Microorganisms; Sampling Methods: Hydrophobic grid membrane filtration technique, Direct epifluorescence microscopy technique, Electrical impedance technique, Bioluminescence technique.
- BiY384 Plant Ecology 2+0 4.0**  
 Fundamental Concepts; Adaptation in Environment and Plant; Effects of Abiotic and Biotic Factors on Plants: Plant environment relationship, Ecological life span of plants; Power of Life; Ecological Adaptation and Evolution: Ecophene, Ecotype, Ecospecies, Ecological importance of variations between species; Spreading Plants and Migration; Importance of Plants for the Ecosystem; General Characteristics of Plant Society; Plant Formations; Characteristics of Plant Formations; Succession and Climax; Protection of Ecology: Protection of plant gene sources, Effects of pollution on plants; Ecological Conditions of Plants in Turkey; Field and Laboratory Methods for Plant Ecology.
- BiY385 Comparative Anatomy and Morphology of Animals 2+0 4.0**  
 Classification of Vertebrate Animals; Comparisons of Skin and Skin Derivatives: Examination of vertebrate skin preparations, Comparisons of Skeleton System; Comparisons of Muscle System; Comparisons of Digestion System: Dissection of Aves and mammalian digestive systems; Comparison of Coolum and Mesenteries; Comparison of Circulation Systems; Comparative Examination of Pisces Amphibian and Mammalian Circulation Systems; Comparison of Respiratory Systems; Comparison of Excretion Systems; Comparison of Reproductive Systems; Comparison of Nervous Systems: Comparative Examination of Pisces, Amphibian and Mammalian Brains; Comparison of Sense Systems.
- BiY386 Microbial Ecology 2+0 4.0**  
 Air Microbiology; Soil Microbiology; Water Microbiology: Fresh water environment, Saline water environment, Deep water microbiology, Drinking water microbiology; Extreme Environments: High temperature environments, Extreme acidic and alkaline environments, High saline environments; Biochemical Cycles: Carbon, Nitrogen, Sulfur, Phosphor, Hydrogen, Oxygen, Manganese; Plant Microorganism Interactions: Root nodule bacteria; Rumen Bacteria.
- BiY388 Molecular Biology Techniques 2+0 4.0**  
 General Aspect to the Molecular Biological Methods; DNA Isolation and Purification; DNA Analyzes: Spectral methods, Electrophoresis methods, Agarose gel electrophoresis, Pulse-field gel electrophoresis; Transformation of Bacteria; DNA Replication via PCR; Nucleic Acid Hybridization Methods: Western blot, Southern blot assay; Protein Isolation and Purification: Protein extraction, SDS-Page electrophoresis; Enzymatic Analyses and Methods for Enzyme Activity.
- BiY390 Wastewater Microbiology 2+0 4.0**

Water Circulation and Autopurification; Drinking Water and Tap Water: Treatment of drinking and tap water, Disease infected by water, Microorganisms that effect water quality; Water Pollution and Its Importance; Properties of Wastewater; Biosensors; Important Microorganisms Group in Treatment; Biological Water Treatment Systems: Active sludge, Biofilms, Biodisks; Removal of Sludge from Treatment Systems; Biotechnological Approaches to Wastewater Treatment.

**BiY391 Cell Signaling Mechanisms 2+0 4.0**

Introduction to Intracellular Signal Transduction: Signal transduction with G-protein mediated receptors, Signal transduction with enzyme-linked cell surface receptors, Ion channel receptors; Intracellular Signal Transduction Pathways: cAMP, Secondary messengers, Phospholipids, Ca<sup>2+</sup> and Calmodulin; Multiple Signaling Pathways: MAP-Kinase pathway; Signal Transduction With Nuclear Receptors; Cell Cycle Check Points: Cyclins and cyclin dependent kinases; Cell Death Pathways; Signal Pathways in Development and Differentiation: Notch, Hedgehog and WNT-Beta catenin signaling pathways; Signal Pathways in the Formation of the Cell Skeleton.

**BiY392 Human Gene Therapeutics and Recombinant Production 2+0 4.0**

Human Diseases: Genetics and physiological basis, Diagnosis, Treatments; Gene Treatment of Stem and somatic cell: Gene addition, Gene replacement, Down regulation of gene expression and Selective killing of target cells; Production of recombinant gene drugs in cell factory: E.coli, S. cerevisiae, Mammalian or human cell lines, insect cell line, Pichia pastories; Gene Transfer Tools: Viral vectors; Liposomes, Electroporation, Direct injection, Particle bombardment; Examples for Recombinant Gene Drug Production: Insulin, Erythropoietin, Interferon, Factor VIII; Examples for Gene Treatment: Adenosine deaminase enzyme gene, Severe combined immune deficiency.

**BiY393 Techniques and Practicing of Grant Proposal Writing 2+0 4.0**

Grant Description and Features: Problem, hypothesis and possible solutions; R&D and Innovation Concepts; National and International Funding Sources; Title and Abstract Writing; Subject, Scope and Literature Summary; Originality; Aims and Goals; Method, Risk Management and Plan B; Feasibility; Common Impact; Application and Grant Evaluation Process; Code of Ethics in Project Management; Examination of Grant Samples; Trial of Grant Writing.

**BiY394 Entrepreneurship in Biology: Design and Development 2+0 4.0**

Entrepreneurship: Definition; Characteristics of a Successful Entrepreneur; Self-analysis of entrepreneurs; Types of Ownership: Small firms and types of small firms, Factors effecting the success of small businesses; Biological Entrepreneurship and National Economy; Innovative Steps toward a Biological Product: Innovative planning, Prototypes; Large Production and Strategies in Marketing; Definition of Patent; Introduction to the Patent Laws and Examples of Patents in Biological Sciences; Practising Entrepreneurship in Biology Education by Developing a Project for a Marketable Biological Product.

**BiY395 Biochemistry I 2+0 2.5**

Biochemistry: Setting the Stage; Amino Acids, Peptides and Proteins; Protein Architecture; Biological Functions of Proteins: Hemoglobin; Protein Purification; Enzyme I: Reactions, Kinetics and inhibition; Enzyme II: Coenzymes, Regulation, Abozymes and ribozymes; Carbohydrates: Structure and biological functions; Lipids, Biological membranes and cellular transport. Biochemistry: Setting the Stage; Amino Acids, Peptides and Proteins; Protein Architecture; Biological Functions of Proteins: Hemoglobin; Protein Purification; Enzyme I: Reactions, Kinetics and inhibition; Enzyme II: Coenzymes, Regulation, Abozymes and ribozymes; Carbohydrates: Structure and biological functions; Lipids, Biological membranes and cellular transport.

**BiY396 Biochemistry II 2+0 2.5**

Basic Concepts of Cellular Metabolism and Bioenergetics; Metabolism of CH; Production of NADH and NADPH: The citric acid cycle, The glyoxylate cycle and the phosphogluconate pathway; ATP Formation by Electron-Transport Chains; Metabolism of Fatty Acids and Lipids; Metabolism of Amino Acids and Other Nitrogenous Compounds; Integration, Coordination and Specialization in Metabolism. Basic Concepts of Cellular Metabolism and Bioenergetics; Metabolism of CH; Production of NADH and NADPH: The citric acid cycle, The glyoxylate cycle and the phosphogluconate pathway; ATP Formation by Electron-Transport Chains; Metabolism of Fatty Acids and Lipids; Metabolism of Amino Acids and Other Nitrogenous Compounds; Integration, Coordination and Specialization in Metabolism.

**BiY397 Biochemistry Laboratory I 0+2 2.0**

Laboratory Rules; Introduction to Biochemistry Laboratory and Equipments; A Review of Different Concentration Concepts; Acid-Base and Buffer Solutions; Purity Control of Distilled Water; Colorimeter-Spectrometer (Identification and Principles); Denaturation and Deproteinisation; Qualitative Protein Assays; Quantitative Protein Assays; Qualitative Lipid Assays; Qualitative Carbohydrate Assays; General Evaluation. Laboratory Rules; Introduction to Biochemistry Laboratory and Equipments; A Review of Different Concentration Concepts; Acid-Base and Buffer Solutions; Purity Control of Distilled Water; Colorimeter-Spectrometer (Identification and Principles); Denaturation and Deproteinisation; Qualitative Protein Assays; Quantitative Protein Assays; Qualitative Lipid Assays; Qualitative Carbohydrate Assays; General Evaluation.

- BiY398 Biochemistry Laboratory II 0+2 2.0**  
 Laboratory Rules; Introduction to Biochemistry Laboratory and Equipments; Qualitative Amylase Determination; Liver and Kidney Function Tests; Qualitative Total Cholesterol Determination; Qualitative Creatinin Determination; Qualitative Biluribin Determination; Qualitative Urine Analysis; Microscopic Analysis of Urine; Determination of Nitrite in Various Water Samples; Phosphate and Calcium Determination in Foods; Enzyme Activity Measurements (Catalase Assay); General Evaluation. Laboratory Rules; Introduction to Biochemistry Laboratory and Equipments; Qualitative Amylase Determination; Liver and Kidney Function Tests; Qualitative Total Cholesterol Determination; Qualitative Creatinin Determination; Qualitative Biluribin Determination; Qualitative Urine Analysis; Microscopic Analysis of Urine; Determination of Nitrite in Various Water Samples; Phosphate and Calcium Determination in Foods; Enzyme Activity Measurements (Catalase Assay); General Evaluation.
- BiY399 Economic Zoology 2+0 4.0**  
 Beekeeping: Honey bees, Beekeeping equipment, Hive setup and maintenance; Silkworm Breeding: Silkworm biology, Breeding techniques, Mulberry breeding; Aquaculture: Fish farming, Shrimp farming, Oyster farming, Mussel farming, Crab farming, Crayfish and lobster farming; Poultry Farming: Chicken breeding, Turkey breeding, Duck breeding, Goose breeding, Quail breeding; Livestock Farming: Cattle breeding, Sheep breeding, Goat breeding, Pig breeding; Other Economically Important Animals.
- BiY401 Plant Mineral Nutrition 2+0 4.0**  
 The plant root system and interaction with soil; Soil and minerals; Essential elements; Techniques for growing plants in nutritional studies; Solution transport; Auxins; Gibberellins; Cytokinins; Ethylene and Abscisic acid.
- BiY402 The Evolution 2+0 3.0**  
 Progress of Evolution Concept; Progress of Scientific Idea About Evolution; Living Communities; Evidence for Evolution; Crude Materials of Evolution: Variations and modifications; Factors of Evolution: Mutations, Selections, Sexual selections and adaptation for reproduction, Isolation mechanisms, Genetic drift, Migrations; Theories of Evolution: Lamarckism, Darwinism, Mutationism, Neodarwinism; Preadaptation; Origin of New Species; Evolution of Homo sapiens.
- BiY404 Human Biology 2+0 3.0**  
 Place of human in universe; Skin and functions: Skin structure and derivatives, Functions of skin; Skeleton system: Structure and functions of skeleton system; Muscles and movement: Muscle structure and organization; Nourishment; Digestion and digestion system: Organs in digestion system; Circulation system: Movement of blood, Structure of heart and vessels; Structure and functions of blood; Respiratory system; Excretion system; Reproduction system; Neural system; Endochrin system; Structure of hormones; Sense organs
- BiY405 Developmental Biology I 2+0 3.0**  
 Ontogenesis and Embryology; Development in a Cell; Development and Living Phase; Acts of Development; Main Phases of Development: Gametogenesis, Fertilization, Segmentation, Gastrulation, Development of mesoderm and coelom; The Differentiation: The determination of development, Induction and organization zones; The organization by gradient system, Morph genesis, Histogenesis, Organ genesis; The Effects of External Factors on Development; Metamorphosis; Regeneration; Death; Development of Invertebrate Animal Groups.
- BiY406 Developmental Biology II 2+0 3.0**  
 Reproduction of Plants: Types of Reproduction, Life cycles; Reproduction of Algae; Life Cycles and Development: Chlorophyta, Chrysophyta, Phaeophyta, Rhodophyta; Life Cycles and Development in Mosses: Anthoceratae, Hepaticae and Musci; Life Cycles and Development in Ferns: Life Cycles in the Isosporic and Heterosporic Ferns; Reproduction and Development in Gymnospermae: Cone structure, ontogeny of polen and ovul; Reproduction and Development in Phanerogams; Microsporogenesis, Megasporogenesis, Fertilization, Formation of zygot and embriyo, Polyembriony, Apomyxis; Dormancy and Seed Germination; Organogenesis in Plants.
- BiY408 Embryology 2+0 4.0**  
 Description of Embryology; Reproduction: Asexual reproduction, Sexual reproduction; Male Reproduction System and Classification: Sperm, Spermatogenesis, Spermiohistogenesis; Female Reproduction System and Classification: Structure of Ovum, Oogenesis; Fertilization; Formation of Embryo: Cleavage, Blastulation, Gastrulation; Formation of Germ Layer: Development of ectodermal sheet, Development of Mesodermal sheet, Development of endodermal sheet; Organogenesis.
- BiY409 Human Genetics 2+0 4.0**  
 History; Composition of DNA in a human cell; Classification of DNA; Packaging of DNA; Structure and Types of Chromosome; Methods of Chromosome Painting; International System for Nomenclature of Human Chromosomes; Chromosome Abnormalities and Nomenclature of Chromosome Abnormalities; Analysis and Principles of Genetic Diseases; Importance of Genetic Maps and Methods for Genetic Maps; Chromosome Obtaining Methods in Clinic; Various Genetic Diseases and their Inheritance; Mitochondrial DNA; Maternal Inheritance and Related Diseases; Cancer; Carcinogen and Mutagens.

**BiY410 Medical Microbiology 2+0 4.0**

History of Epidemiology; Epidemiological Terminology; Disease Reservoirs; Infectious Disease Transmission; Hospital Infections; Airborne Transmission of Pathogens; Respiratory Infections: Bacterial; Respiratory Infections: Viral; Sexually Transmitted Diseases: AIDS, Hepatitis C; Animal-Transmitted Diseases; Foodborne Diseases; Waterborne Diseases; Public Health and Water Quality; Public Health and Its Importance; Infectious Disease and Its Importance; Pathogenic Fungi; Clinical Immunology.

**BiY412 Plant Geography 2+0 3.0**

Physiological Reactions and Adaptations: Floristic Plant Geography; Areas and Its Geographical Distributions: Uninterrupted continental areas, Interrupted continental areas, Relict areas, Vicarious areas, Endemism and endemic areas; Spreading and Migration of Plants; Main Flora Regions of the World; Formations and Categories of Plants; Aquatic Habitats; Terrestrial Plant Association; Ecological Conditions for Plant Formations in Turkey; Flora and Biogeographical Regions of Turkey; Relationships Between Natural Plant Society and Land Use in Turkey.

**BiY413 Soil-Plant Relation 2+0 4.0**

Environment and its elements; Soil and biotic factors; Soil composition, Main materials of the soil and types of rocks, Types of cutting to pieces, Classification of main matter; Soil structure: Soil organic material and importance for plants, organic factors which affect soil formation; Micro flora, Macro flora, Micro fauna, Mesofauna, Inorganic materials and nutrients in soil; Soil indicator plants; Soil-water and plant relationships: Soil reaction and plant relation, Soil profile and plant relation, factors which affect soil development, Major soil groups and vegetation types.

**BiY414 Zoogeography 2+0 3.0**

Theories on Historical Geopraphy of the World; Geological Time and Glacial Periods; Principles of Animal Distribution; Zoogeographic Regions of the World and Geographical Distributions of Animals; Biological Diversity in Turkey; Turkey's Importance in the World of Living Things; Explanation of Zoogeography in Turkey; Zoogeographic Distribution of Freshwater and Terrestrial Animals in Turkey; Zoogeographic Features of the Black Sea and the Mediterrenian.

**BiY415 Fish Biology 2+0 4.0**

Classification of the Fish; Characteristics of Classes (Cyclostomata, Chondrichthyes and Osteichthyes); General Features of Fishes: Size, external features, body covering, skeleton, digestive, circulatory, osmoregulation, respiratory, reproductive, nervous, muscular systems, colors of fish, sense organs, sound production, electric organs and lateral line organs of fish; Swimming and Locomotion; Life History of Fish; Food and Feeding of Fish; Relations to Man.

**BiY416 Aquaculture 2+0 4.0**

Importance of Aquaculture; Methods in Aquaculture; Problems in Aquaculture Farm Construction and Water for Aquaculture; Fish farming Technology and Equipment; Culture of *Cyprinus carpio*; *Oncorhynchus mykiss*; *Sparus auratus*; *Dicentrarchus labrax*; Culture of the Shrimps; Culture of Plankton for Feeding Aquatic Animals; Nutrition in Aquaculture; Diseases and Parasite Problems in Aquaculture

**BiY421 (Eng) Molecular Biology of Development 2+0 4.0**

History; Definitions and Objectives of Developmental Biology; Eukaryotic Cell Cycle and Its Regulation; Cellular Differentiation; The Universality of Development; Genomic Equivalence and Gene Expression; Developmental Potential; Determination by Cytoplasm Specification; Determination by Cell-Cell Interactions; Embryogenesis of *Caenorhabditis elegans*; Genetic Mechanism of Pattern Formation in *Drosophila*: Gradient and cascades, Homoerotic genes and homeobox motifs; Signaling Mechanisms and their Regulation; Stem Cells and Differentiation; Myogenesis; Hematopoiesis; miRNAs and Development; Apoptosis and Development. History; Definitions and Objectives of Developmental Biology; Eukaryotic Cell Cycle and Its Regulation; Cellular Differentiation; The Universality of Development; Genomic Equivalence and Gene Expression; Developmental Potential; Determination by Cytoplasm Specification; Determination by Cell-Cell Interactions; Embryogenesis of *Caenorhabditis elegans*; Genetic Mechanism of Pattern Formation in *Drosophila*: Gradient and cascades, Homoerotic genes and homeobox motifs; Signaling Mechanisms and their Regulation; Stem Cells and Differentiation; Myogenesis; Hematopoiesis; miRNAs and Development; Apoptosis and Development.

**BiY424 Biology of Cancer 2+0 4.0**

Cancer as a genetic disease and its history; Genetic variations in cancer; Variations in transform cells; Viruses and oncogenes as causing agents of cancer; Oncogenes and their proteins; Cancer types and their nomenclatures; Metastasis; Carcinogens and cancerogenicity; Cancerogenicity test methods; methods for cancer diagnosis; Molecular mechanisms of some cancer types; Recent treatment methods; Developing methods and latest studies; Avoiding cancer.

**BiY426 General Parasitology 2+0 4.0**

Concept of Parasitism and Parasites; Science of Parasitology; Symbiosis and Parasitism; Origin of Parasitism; Definitions of Parasites; Definitions of Hosts Ecology of Parasites; Naming Parasites; Taxonomy and Systematic of Parasites; Structural







Conservation of Populations and Species: In situ and ex situ conservation strategies, Practical applications, Establishing protected areas, Managing protected areas, Restoration ecology.

**BiY468 Oxidative Stress and Antioxidants 2+0 4.0**

Oxygen Toxicity; Free Radicals: Definition, Types and Formation mechanisms; Interaction of Free Radicals with Organic Molecules; Oxidative Stress; Cell, Tissue and Organs Dysfunctions as a Result of Oxidative Stress; Oxidative Stress and Diseases; Oxidative Stress and Aging; Oxidative Stress and Cancer; Endogen and Exogen Antioxidants; Antioxidant Systems; Determination of Oxidative Damage and Antioxidant Capacity in Experimental Studies.

**BiY468 (Eng) Oxidative Stress and Antioxidants 2+0 4.0**

Oxygen Toxicity; Free Radicals: Definition, Types and Formation mechanisms; Interaction of Free Radicals with Organic Molecules; Oxidative Stress; Cell, Tissue and Organs Dysfunctions as a Result of Oxidative Stress; Oxidative Stress and Diseases; Oxidative Stress and Aging; Oxidative Stress and Cancer; Endogen and Exogen Antioxidants; Antioxidant Systems; Determination of Oxidative Damage and Antioxidant Capacity in Experimental Studies.

**BiY469 Forensic Entomology 2+0 4.0**

Forensic Importance of Insects; Collection of Entomological Evidence During Death Investigation; Insect Succession on Carrion and Its Role in Determining the Time of Death; The Role of Aquatic Insects in Forensic Investigations; Estimating Postmortem Interval; Insect Development and Forensic Entomology; Laboratory rearing of forensic insects, Computer modeling of insect growth and its application to forensic entomology; Entomotoxicology: Insects as toxicological indicators and impact of drugs and toxins on insect development; DNA Techniques for Forensic Entomology.

**BiY470 Environmental Biology 2+0 4.0**

Concepts of Environmental Biology: Environmental components and pollution, Soil pollution, Water pollution, Air pollution, Noise pollution, Natural pollution; Environment Human Relationships: Population, Natural sources, Nutrition and energy; Environmental Health and Protecting Environmental Health; International Dimensions of Environment; Ecological Problems: Saving nature, Ecological balance, Prevention of pollution, Saving biological diversity, Environmental politics, Environmental economics, Environmental planning; Environmental Politics in Turkey; Environmental Problems in Turkey.

**BiY471 Molecular Microbial Ecology 0+3 5.0**

Introduction to molecular microbial ecology; Molecular techniques in microbial ecology: Isolation of nucleic acids, Amplification, Polymerase chain reaction (PCR), Fluorescence In Situ Hybridization (FISH), Denaturing Gradient Gel Electrophoresis (DGGE), Restriction digestion, Amplified Ribosomal DNA Restriction Analysis, 16S rDNA clone libraries, Sequence analysis; General overview. Introduction to molecular microbial ecology; Molecular techniques in microbial ecology: Isolation of nucleic acids, Amplification, Polymerase chain reaction (PCR), Fluorescence In Situ Hybridization (FISH), Denaturing Gradient Gel Electrophoresis (DGGE), Restriction digestion, Amplified Ribosomal DNA Restriction Analysis, 16S rDNA clone libraries, Sequence analysis; General overview.

**BiY471 (Eng) Molecular Microbial Ecology 0+3 5.0**

Introduction to molecular microbial ecology; Molecular techniques in microbial ecology: Isolation of nucleic acids, Amplification, Polymerase chain reaction (PCR), Fluorescence In Situ Hybridization (FISH), Denaturing Gradient Gel Electrophoresis (DGGE), Restriction digestion, Amplified Ribosomal DNA Restriction Analysis, 16S rDNA clone libraries, Sequence analysis; General overview. Introduction to molecular microbial ecology; Molecular techniques in microbial ecology: Isolation of nucleic acids, Amplification, Polymerase chain reaction (PCR), Fluorescence In Situ Hybridization (FISH), Denaturing Gradient Gel Electrophoresis (DGGE), Restriction digestion, Amplified Ribosomal DNA Restriction Analysis, 16S rDNA clone libraries, Sequence analysis; General overview.

**BiY472 Nutritional Biochemistry 2+0 4.0**

Introduction: Nutrient-nutrient element; an Overview of Metabolism: Catabolic-anabolic pathways, Regulation of metabolism; Carbohydrates: Metabolism of carbohydrates and disorders of carbohydrate metabolism; Lipids: Metabolism of triacylglycerols and cholesterol; Proteins: Disorders of amino acid metabolism; Nucleotides and Nucleic Acids: Metabolism of nucleotides, Gout disease; Enzymes: Regulation of enzyme activity; Hormones: Thyroid, Parathyroid, Pancreatic, Adrenal, Hypophysis and Gastrointestinal hormones; Vitamins: Factors affecting vitamin need and vitamin level, Fat and Water-soluble vitamins, Pseudovitamins; Minerals: Fundamental minerals, Essential and Non-essential minerals; Metabolism in Satiety and Starvation.

**BiY472 (Eng) Nutritional Biochemistry 2+0 4.0**

Introduction: Nutrient-nutrient element; an Overview of Metabolism: Catabolic-anabolic pathways, Regulation of metabolism; Carbohydrates: Metabolism of carbohydrates and disorders of carbohydrate metabolism; Lipids: Metabolism of triacylglycerols and cholesterol; Proteins: Disorders of amino acid metabolism; Nucleotides and Nucleic Acids: Metabolism of nucleotides, Gout disease; Enzymes: Regulation of enzyme activity; Hormones: Thyroid, Parathyroid, Pancreatic, Adrenal, Hypophysis and Gastrointestinal hormones; Vitamins: Factors affecting vitamin need and vitamin

level, Fat and Water-soluble vitamins, Pseudovitamins; Minerals: Fundamental minerals, Essential and Non-essential minerals; Metabolism in Satiety and Starvation.

**BiY473 Biophotography 2+0 4.0**

Cameras (Types of cameras); Objectives Used in Cameras (Types of Objectives); Filters; Diaphragm and Its Uses; Obturator (screen); Visors and Visor Types; Macro and Micro Photography Techniques; Microscopes and Microscope Types Adaptable to Cameras; Use of Light; Period and Degree of Light Required; Defective Shooting and Its Reasons; Solutions Used in Photography; Developing a Film; Developing Films and Printing; Measuring by Photograph; Reading out Photographs.

**BiY474 Medical Parasitology 0+3 5.0**

Symbiosis; Parasite, Conceptions of Host and Vector; Parasitism: Effects of parasite on host, Effects of host on parasite, Sources of parasites; Result of Infection; Epidemiology of Parasitosis; Signs of Parasitosis; Diagnosis of Parasitosis: Diagnosis with active, Direct examination, Indirect diagnosis; Medical Treatment of Parasitosis; Fight with Parasitosis; Important Groups of Parasites on Human: Protozoon, Worms, Arthropods.

**BiY475 Mycotoxins 2+0 4.0**

Introduction: What is the mycotoxin, History of mycotoxins; Mycotoxin Producing Molds and Their Growth Requirements; Mycotoxin and Mycotoxigenic Fungi Formation and Environmental Factors; The Effects of Mycotoxins on Humans and Other Living Organisms; Toxins of *Aspergillus* and Production Mechanisms; Toxins of *Penicillium* and Production Mechanisms; Toxins of *Fusarium* and Production Mechanisms; Other Mycotoxins; Control of Mycotoxin Formation and Detoxification Pathways; Inhibition of Mycotoxin Formation; Mycotoxin Analysis Methods.

**BiY476 Food Microbiology 2+0 4.0**

Microorganisms Important in Food Microbiology: Bacteria, Yeasts, Moulds, Viruses; Microorganism Reservoirs for Contamination of Food; Factors Affecting Growth of Microorganisms in Food: pH, Water Activity, Oxidation reduction potential; Antimicrobial substances; Chemical Changes Caused by Microorganisms; Damage in Different Kinds of Food; Food-borne Poisonings; Mycotoxin Formation in Food; Indicator Microorganisms in Food and Isolation Methods.

**BiY477 Microfungus Identification Methods 0+3 5.0**

Mycology Laboratory; Isolation, Purification and maintaining of microfungi; Morphologic Identification Methods: Culture media, Inoculation and incubation conditions; Microscopic Investigation and Identification Keys; Identification of Common Microfungi; Zygomycetes; Identification of Common Microfungi: *Aspergillus*; Identification of Common Microfungi: *Penicillium*; Identification of Common Microfungi: *Fusarium*; Identification of Common Microfungi: *Alternaria*, *Cladosporium*, *Stachybotrys*; Chemical Identification of Microfungi; Molecular Identification of Microfungi; Molecular Identification of Microfungi.

**BiY478 Plant Identification and Herbarium Techniques 0+3 5.0**

Taxonomy; Principles of Systematic Studies: Subjects and Principles of Taxonomic Studies; Taxonomic Categories; Plant Nomenclature; Binominal Nomenclature; Plant Identification: Aim of the identification, Learning scientific names, Tools used in plant identification, Plant identification methods and using plant identification keys, Types of plant identification keys, Key using techniques, Herbarium techniques: Field study methods, Collecting the plant materials, Dried and labeled plant materials, Plant conservation and preservation methods, Herbarium methods of special plant taxa, Preparing plant database and herbarium managing systems.

**BiY479 Astrobotany 2+0 4.0**

Astrobiology: What is Astrobiology?, What is Astrobotany?; History of Astrobotany: Founders of Astrobotany; Origins of Life and the Environment: The first periods of the world, Origin of life, Signs of early life; Life: Life on earth, Cell, Chemistry of life, Network of life, Life in extreme environments; Life in the Solar System: Which earths may be habitable, Sunlight and habitability of inner planets, the search for life on Venus, the search for life on Mars, the search for life on Ceres, the search for life on Jupiter, the search for life on Saturn's moons, the search for life in Pluto; Exoplanets: Habitable zone, Bio signatures; Recent advances in astrobotanical applications.

**BiY480 Industrial Microbiology 2+0 4.0**

Soil Microbiology; Air Microbiology; Water Microbiology; Assimilation of Metal; Microbial Production of Biogas; Production of Hydrogen; Microbial Insecticides; Production of Single-Cell Protein; Baker's Yeast Production; Production of Ethyl Alcohol by Microorganisms; Production of Alcoholic Beverages; Antibiotic Production; Enzyme Production; Vitamin Production; Microbial Fat Production; Production of Amino Acids; Lactic Acid Production; Microbial Production of Citric Acid Acetone- Butanol Isopropanol Butyric Acid and Other Organic Acids.

**BiY482 Introductory Molecular Biotechnology 2+0 4.0**

Introduction to Molecular Biotechnology: Definition and its history, Biological systems in molecular biotechnology; Recombinant DNA Technology; Heterologous Protein Production in Prokaryotic and Eukaryotic Cells; Directed Multiple Mutagenesis and Protein Engineering; Molecular Diagnostics of Human Diseases Based on DNA; Human Therapeutic Genes; Recent Developments in Human Gene Therapy; Regulations on Biotechnological Patent Rights in Turkey and the World.

**BİY484 Molecular Microbiology Techniques 0+3 5.0**

DNA Extraction from Prokaryotic Cells I (Traditional Method); DNA Extraction from Prokaryotic Cells II (Commercial kit); RNA Extraction; Hybridization; 16S rRNA Amplification by Polymerase Chain Reaction Techniques; DNA Cloning; DNA Sequencing; Real-Time Polymerase Chain Reaction; Denaturing Gradient Gel Electrophoresis Technique; Fluorescein in situ Hybridization Technique; Sodium Dodecyl Sulphate Polyacrylamide Gel Electrophoresis of the Whole Cell Bacterial Proteins.

**BİY489 Graduation Project I 0+4 7.0**

Science Ethics; Determining a Special Topic in Biology; Searching Biological Abstracts and Other Abstracts: Abstract scanning by subject, Abstract scanning by author, Abstract scanning by terminological terms; Introduction of Important Journals in the Field of Biology; Using Tool and Chemical Catalogs; Using Handbooks and Textbooks; Internet Usage: Accessing data with YÖK documentation center, accessing data with TUBITAK and other research centers; Evaluation of Obtained Information; Establishing the Work Program of the Project

**BİY490 Graduation Project II 0+4 7.0**

Reviewing the Work Program and Plan Determined within the Scope of Graduation Project II Course; Realization of Experimental Studies and Field Studies, Evaluation of Experimental Results and Field Studies, Making Necessary Revisions under the Supervisor's Control, Writing and Submitting a Scientific Text by the Student Who Takes the Course, Publishing the Project Results in the Abstract Booklet

**BİYSJ301 Internship 0+2 5.0**

İşçi Sağlığı ve İş Güvenliği Eğitimi; Biyoloji Bölümü Uygulama Alanlarını Giren İş Yerleri Tanıtımı; Çalışma Yapılan İş Yeri İle İlgili Genel Bilgiler: Örgütlenme, Personel yapısı, Görev dağılımları, İşyeri/Laboratuvar yapısı; Laboratuvar ya da İşyeri Günlük İş Planları; Yapılan İşler ve Uygulanan Yöntemler; İş Yerindeki Mesleki Donanımlar ve Yazılımlar; Rapor Hazırlama; Rapor Sunma

**BRİ101 Bridge 2+0 3.0**

Introduction to Bridge; History; Basic Concepts; Bidding; Play; Hand Evaluation; Point Count; Opening Bids; Bidding Goals; Responses to one No-trump; More on Point Count; Responses to one of a Suit; Rebids by Opener; Declarer Play; Overcalls; Takeout Doubles; Two Club Opening; Weak Bids; No-Trump Structure; The Stayman Convention; Minor Suit Responses; Bidding after a Raise; Slam Bidding; Defensive Play.

**EİST221 Statistics 3+0 4.0**

Verinin Tablo ve Grafiksel Gösterimi, Sütun, Pasta, Nokta, Dal-Yaprak Grafiği, Histogram; Merkezi Eğilim ve Değişkenlik Ölçüleri; Kutu Grafiği; Nokta Tahmin; Örneklem Dağılımları; Tek Örneklem Dayalı Güven Aralığı Oluşturma: Anakütle ortalaması ve oranı için güven aralığı; Hipotez Testleri: Hata olasılıkları, P-değeri; Tek Örneklem Dayalı Hipotez Testi: Anakütle ortalaması ve oranına ilişkin testler; Çift Örneklem Dayalı İstatistiksel Çıkarım: İki anakütle ortalaması ve oranı için güven aralığı oluşturma ve hipotez testi; Basit Doğrusal Regresyon Analizi: En küçük kareler yöntemi, Modelin anlamlılığının sınanması; Korelasyon Katsayısı.

**EKİM103 General Chemistry 4+0 4.0**

Properties and measurement of matter: Elements, Compounds, Mixtures; Measuring; Atoms, Atomic Theories and Mole Concept; Periodic table and some atomic properties; Naming elements and compounds; Chemical Reactions and Stoichiometry: Chemical Calculations; Chemical Reactions in Solutions and Aqueous Solutions; Chemical Bonds and Intermolecular Forces; acids and bases; Titrations; Chemical Kinetics

**ELO302 Application of Electronic Circuit Elements 2+0 3.0**

General Information About the Structure of Semiconductors; P-n Junction; Threshold Voltage; Forward and Reverse Bias; Ohmic Contact; Substrate Cleaning Techniques; Metal-Semiconductor Contact and Schottky Diode; Bipolar Junction Transistor; Field Effect Transistor; Photodiode; Electrical Measurements of Some Electronic Circuit Elements.

**EMAT111 Calculus I 4+2 7.5**



**ESTÜ106 Proje Yönetimi 2+1 3.0**

Project Management Fundamentals: Definition of project; Human Resources and Communication Management; Quality Management in Projects; Procurement Planning in Projects; Stakeholders Management; Gantt Chart; Causality Relationship Between Activities; SWOT Analysis; Planning of Risk Management in Projects; Project Compression Analysis and Cost Management; Project Resources and Resource Scheduling; Project Monitoring with Earned Value Management; Control and Progress in Line with the Objective of the Projects; R&D Sample Projects; Project Practices.

**ESTÜ111 Volunteering Works 1+2 4.0**

Management and Organization Concepts; The Concept of Volunteering and Volunteer Management; Fundamental Volunteering Areas (Disaster and Emergency, Environment, Education and Culture, Sports, Health and Social Services etc.); Project Development Related to Volunteer Work and Participation in Volunteer Work in the Field; Ethics, Moral, Religious, Traditional Values and Principles in Volunteer Work; Participation in Voluntary Work in Public Institutions, Local Governments and Non Government Organizations (NGOs); Risk Groups in Society and Volunteering; Immigrants and Volunteering.

**ESTÜ112 Cyber Security for Everyone 2+0 2.0**

Basic Concepts: Computer components and definitions; Software: System software, Application software; Computer Networks: Concept of Network and Internet; Malware and Network Attacks: Viruses, Attacks; Computer and Access Security: Password selection, File sharing, Backup; Internet security: SSL, Fake websites; Security on Social Platforms: Fake news and people; Security Analysis: System analysis, Network traffic analysis; System and Network Security: Network security, System security, Mobile device security; Information Security Management System: ISO 27001; Personal Data Protection Law: PDLP procedures; Information Technology Law: Information crimes and punishments.

**ESTÜ113 Design Thinking 3+0 3.0**

Design Thinking Concepts: Design thinking, Human-centered design, User research, Problem identification, Problem definition, Empathy, Idea development, Creativity, Idea elimination and selection, Low-precision prototyping, High-precision prototyping, User tests, Usage tests, Usability, Revision and iteration, Visual thinking, User-centered design, Design processes and innovation, applications, Presentation techniques.

**ESTÜ114 Visual Thinking 3+0 3.0**

Visual Thinking Concepts: Concepts of abstract and concrete, Point, Line, Surface, Volume, Composition, Repetition, Rhythm, Hierarchy, Harmony, Contrast, Measuring and scale; Presentation Techniques: Sketch, Color, Tone, Order; Visual Perception and Gestalt Theory: Figure-ground relationship, Proximity principle, Similarity principle, Completion principle, Continuity principle, Simplicity principle, Depth perception, Psychological effect; Visual Communication: Image reading, Image interpretation, Pictogram, Ideogram, Logotype.

**ESTÜ115 Photographic Viewpoint 2+1 3.0**

Course Introduction: Project work; Research and Discussion of the Project Subject: Evaluation of research results, Successful examples from photography and graphic art, Examination of examples of selected works, Determination of application subjects, Discussion of application possibilities, Basic design elements and principles in photography and graphic design process, Trial shooting and evaluation; Light and Lighting: Color and functions of color; Photography Techniques: Visual editing, Reading photographs; Methods and Techniques in Applied Photography: Technical evaluation of photographs and development stages of the photographs; Basic Rules of Composition in Photography: Perspective, Balance, Proportion, Texture, Shape, Perspective, Lens selection and application; Shooting Process and Graphic Interventions on Photographs; Photographic View Methods: Evaluation of shooting results; Preparation of Portfolio: Portfolio evaluation, Presentation methods and techniques, Exhibition preparation methods.

**ESTÜ116 Computer Aided Design I 3+0 3.0**

Concepts of Computer Aided Design: Introducing to fusion360, Introducing interface, Surface modeling, Solid modeling; Basic Commands: Sketching, Editing, Constraints, Timeline, Parameter modification, Technical drawing; Construction Commands: Create, Inspect, Insert; Surface Modeling Tools: Creating and editing surfaces; Assembly: Adjusting, Arranging, Joint, Additional options; Freeform Modeling: T-Splines, Surface creation, Surface editing, Symmetry and tools; Visualization: Assigning material, Scene settings, Rendering methods; Various Applications.

**ESTÜ117 Computer Aided Design II 3+0 3.0**

Concepts of Computer Aided Design: Surface and solid modeling, Differences between surface and solid modeling, Surface creation, Arrangement; Sheet Metal Processing: Sheet metal processing creation and editing; Advanced Modeling Tools: Product part modeling; Introduction to Simulation: FEA simulation, Analyzing and interpreting simulation results; Generative Design: Generative design concept, Generative design tools, Simulating and evaluating generative design results; Manufacturing Tools: 3D printing, Introduction to CAM, Introduction to electronics.

**ESTÜ118 Visual Thinking with Concepts 3+0 3.0**

Visual Thinking with Concepts: Perception as ability to know, Change of senses; Seeing and time, Seeing depth, Understanding shapes; Visual Perception: Abstraction; Static and dynamic concepts of abstraction, Context, Comparison of perception, Similarities; Image and thought: Mental images; Particular and spiritual images, Abstraction of the image, Perceived quantities, Geometry and meaning; Writing and speech: Words as images, Intuition and cognition, Perception of words, Verbal concepts and pictorial concepts; Vision in Education: Images and art, Looking and understanding, Visual education tools.

**ESTÜ119 Flute 3+1 3.0**

Breath Work: Breathing exercises the diaphragm and correctly use various activation studies; Technical Studies: Stance, Grip, Position, Fingering and embouchure work; Learning the Notes on the Flute: Learning the notes on the flute with octaves, The octave positions of the lip according to the study, A long blowing sound with learned notes; Technical Development; Proper Studies to be Determined by Instructor According to Student's Performance on the Scales: With learned notes, Sharp, Flat, Major and Minor, According to the ranking exercises scales; Flute Repertoire in the Context of Period, Style and interpretation: Selected works according to student performance from periods in music history.

**ESTÜ120 Solfege 3+1 3.0**

Octave of the Tone to be Specified According to The Groups; The Signs Used in Writing Music; Signs Spelling Rules; Staff and Additional Lines; Arrays and Intervals; Major and Minor Scales, Interests, and Varieties: Natural, Harmonic, Melodic; Measure and Time; The Terms of the Transaction; Marks of Dynamics; The Expression of Terms; According to Student Level and Profile to be Created Reading Pieces by the Teacher; Reading with Piano Accompaniment; Rhythmic Perception and Rhythmic Reading, and Only Two Voice Dictation Skills; to be Able to Read on Different Keys, to be Able to Read Complex Rhythmic Pieces with Piano Accompaniment Two, Three, Four-Voices Dictation Skills; Ability to Read Ceremonial Solfege, Atonal Solfege.

**ESTÜ121 Piano 3+1 3.0**

Starting Position on the Piano: By taking into consideration to correct position of hands, Arms, Fingers, And feet; Technical Development Exercises: Etudes, Scales, Chords and arpeggios studies; Techniques of Touching Piano Keyboard, Staccato, Legato, Non Legato; Information About Dynamics; Working with Learning Notes and Octaves: One hand and double hand into small pieces-small parts; Style and in the Context of Your Comment Piano Repertoire: Baroque, Classical, Romantic, And modern Turkish composers will be given according to the performance of student works.

**ESTÜ122 Guitar 3+1 3.0**

Theoretical studies: Writings symbols used in music; Basic information About Solfege; The Structural Characteristics of the Guitar; Guitar History; Introduction to Guitar: Learning the notes on guitar; Learning the Names of the Right Hand and The Left Hand; Technical Exercises on the Guitar; Scales; Arpeggios; Slurs; Barres; Repertoire: Proper studies to be determined by instructor according to student's performance on the scales; To Recognition of the Different Disciplines During The Phase of Prima Vista; To Make Conscious About Playing Together; Improving to Stage Performance.

**ESTÜ123 Gender Equality in Work Life 2+0 3.0**

Understanding Gender; Historical and Social Foundations of Gender Equality; Gender and Education; Gender and STEM; Status of Women's Employment in Turkey: Decent work conditions and gender equality, Status of women's employment in the world; Production and Reproduction of Feminine and Masculine Identities in Work Life; Importance of Gender Equality in Work Life; International Norms and Standards on Gender Equality in Work Life; Legal Framework and National Policies on Women's Employment in Turkey; Gender and Leadership; Project Presentations.

**ESTÜ125 Philosophy of Science 3+0 3.0**

The Emergence of Philosophy; Socrates and Post-Socratic Greek World; Epistemology: Types of knowledge, Knowledge criteria, The relationship between truth and reality; What is science?; Scientific method and process (1): Description, Explanation; Scientific method and process (2): Scientific law and theory; Scientific Objectivity and Historicity; Science and Logic: Deduction, Induction and Analogy; Validity Problems of Scientific Statements: Verifiability, Falsifiability, Possibility, Necessity; Science, Nature and Society: Faith, Ideology, Scientific attitude, Paradigm, Distinction of the scientific from the unscientific.

**ESTÜ127 Diction 1+2 3.0**

Basic Elements of Diction; Pronunciation defects; Breathing Development and Diaphragm Exercises; Pronunciation Disorders: Rules about vowels; Correct Pronunciation of Words; Spelling and Pronunciation of Confused Words; Stress Exercises; Intonation Exercises; Pronunciation Exercises; Things to Do for Effective Speaking; Prepared Speech; Unprepared Speech; Vocalization Applications.

**ESTÜ129 Turkish as a Foreign Language I 2+0 2.0**

Acquaintance: Greeting, Asking about the condition of someone, Saying goodbye; Alphabet: Letters in the alphabet; Numbers: Numbers from 1 to 20, Phone numbers; Introducing Oneself: Country, nationality and language names; Kinship Terms: Using words such as mother, father, sister and brother; Classroom Language: Objects in the classroom, Commands used for classroom communication; Hours: Numbers from 20 to 100, Telling the time; Routine Activities: Talking about daily activities; Ownership: Talking about owned objects; Question Words: Who, Where, When, How; Professions: Telling one's own profession and telling someone's profession; Descriptions: Properties of the objects in the close environment, Synonyms and antonyms.

**ESTÜ130 Turkish as a Foreign Language II 2+0 2.0**

Human Body: The organs that make up the human body, Describing the external appearance of people; Clothes: Names and colours of the clothes; Foods: Names of foods and drinks, Ordering a meal; The Environment That We Live In: Parts of the house, Household items; Countries: Saying the population of a country and its neighbors; Days, Months and Seasons: Telling the date of birth; Weather: Asking and telling the weather; Hobbies: The statements that express habits and competence; Shopping: Asking and telling the price of a product; Invitations and Suggestions: Making an offer or rejecting an offer; Travelling: Talking about travelling experiences; Daily Life: Asking for something that is needed.

**ESTÜ201 Turkish Sign Language 3+0 3.0**

Deaf Society and Culture: Concept of Hearing Impaired and Deaf. Discrimination against deaf society (Audism). What is sign language? The place of it in deaf culture and social life. Sign language interpretation. 1st Grade Turkish Sign Language Education: Foundational concepts and terms. Sign language basic sentence structures and patterns, dialogue, sign language usage space and fluency, fingerspelling, use of non-manual expressions (gestures, mimicking, facial expressions, head and body positions), hand shapes and use, colours, numbers, syntax, directional verbs, self-introduction, comprehension.

**ESTÜ203 Introduction to Sociology 3+0 3.0**

Science, Society, Sociology: The comparison of physical science and social science, The Birth of Sociology, Theoretical Perspectives in Sociology: Development of sociology, classical and modern sociology; Social Change and Globalization: Theories of social change, Modernism and post-modernism, Culture and Society: Culture of sociology, Gender Equality, The socialization of gender; Work and Economy; Fordism, post-fordism, work and occupations, Political Sociology: Ideology; Sociology of Family: Family from sociological perspectives; Religion and Society; Law, Crime and Society: social deviance, Urbanization and Environment: Risk society.

**ESTÜ204 Effective Reading and Writing Skills 3+0 4.0**

The Activities Which Contribute The Reading And Writing Skills: Literary texts, Cultural and art activities; Reading Skill; Skill of Writing Efficiently: Widen one's viewpoint; Improvement of Creating Writing: To write originally impression of literary texts or activities; The Texts with Correct Expression: Spelling rules, Punctuation marks, Creating passage, Creating text, Vocabulary, The usage of dictionary; Expression Styles: Narrative expression, Descriptive expression, Explanatory expression, Definitive expression, Sampled expression, Substantive expression, Comparative expression; Types of Writing: Official writing, Fictional writing, Essays.

**ESTÜ301 Science Communication 2+0 3.0**

Science Culture And Science Communication; Actors in Science Communication Process; Open Access: Open access initiatives, Open access platforms; Role of Information Centers in Science Communication Process; Science and Technology Policies: Science-technology-invention-innovation, Science Policies and Science Communication; Academic Texts; Science Journalism: The development of science journalism, The effects of science journalism on the development of science, Writer-reader-scientist interaction ; Ethics In Science Communication; Project Presentations.

**ESTÜ401 Introduction to Professional Life 1+1 2.0**

Information about PL, What is needed for PL?, Sector Meetings, 21. Century Competencies: Improving self-awareness, Basic communication skills, Problem solving, Decision making and leadership, Teamwork; Effective Interview Techniques and Interview Simulation; Career Planning; Resume Preparation Techniques, Networking: Social networks for professional life; Project Management; Job Search Strategies.

**ESTÜ402 Coaching and Leadership 3+0 3.0**

Definition of coaching; The difference of the coaching profession from other specializations is the Basic Coaching Session; Characteristics of Coach; Harmony in Coaching Relationship; Different learning and experience styles, Coaching and



Leadership-Based Communication; Listening deeply, Asking strong questions, Giving feedback. Coaching Levels; Goal, Motivation and Action steps, Goal Setting Coaching Tool; Circle of Life, Values Assessment Coaching Tool; Determination of core values, Leadership; Vision and mission work, Holistic Leadership; Life purpose study, Leadership Styles; Teacher, Visionary, Warrior, Wise, Nourishing.

**Basic Computer Utilization**

**3+0 4.0**

**ESTÜ403**

Computers: Binary number system, Computer architecture, Input-output units, System units; Computer Software: Operating systems, Utilities; Peripheral Equipment: Printers, Scanners; Computer Security: Viruses, Worms, Trojans, Antivirus software; Basic Internet Concepts: Computer networks, Working principle; Word Processor: Editing documents, Text formatting, Working with Tables; Spreadsheet: Page structure, Cell logic, Filtering in tables, Graphics, VBA introduction; Presentation: Slide layout, Transitions, Animations; E-mail: POP3, IMAP, Exchange, Account setup; Application software: Software that comes with the operating system, PDF Reading, Compression.

**ESTÜ405**

**Computer Programming**

**3+0 5.0**

Modern Computers: Data storage, Binary system, Computer architecture, Arithmetic and logical unit; Algorithm Concept:, Algorithm design, Flow charts; Python Basics: Python versions, Integrated development environments, First program; Basic Data Types: Numerical and logical data types, Dictionaries, Sets, Lists; Variables and Operators: Variables, Operators; Control Statements: Sequential Statements, Decision Control Statements, Repetitive Statements; Functions: Creating and calling functions, Arguments, Recursive functions; Object-Oriented Approach: Classes, Objects, Methods; File Operations: Opening file, Reading file, File methods; Graphical User Interfaces.

**ETK208 (Eng) Engineering Ethics**

**1+0 2.0**

General Moral Principles; Moral Philosophy; Engineering Ethics Principles; Honesty and Responsibility in Engineering; Engineering Ethics Case Studies: Analysis of examples of situations which engineers may encounter in their professional life.

**FiN305**

Simple Interest: Description and importance of interest, Calculation of simple interest, External interest; Simple Discount: Discount calculations related to external discount method, Discount calculations related to internal discount method, Equivalent notes, Consolidation of notes, Financial assets and calculation of interest in financial markets; Compound Interest and Annuities; Normal Annuities; Debt Depreciation; Debt Pay-off with Equal Principals; Evaluation of Bonds and Stocks; Bond Valuation and Stock Valuation.

**FEL102 Introduction to Philosophy**

**2+0 2.5**

Fundamentals of Philosophy; Scope of Philosophy; History of Philosophy; Theory of Science; Theory of Knowledge; Logic; Ontology; Philosophy of Nature; Philosophy of History; Philosophy of Art; Philosophy of Language; Philosophical Anthropology; Ethics; Philosophy of Religion; Metaphysics; Schools of Philosophy; Development of Philosophical Perspective. Fundamentals of Philosophy; Scope of Philosophy; History of Philosophy; Theory of Science; Theory of Knowledge; Logic; Ontology; Philosophy of Nature; Philosophy of History; Philosophy of Art; Philosophy of Language; Philosophical Anthropology; Ethics; Philosophy of Religion; Metaphysics; Schools of Philosophy; Development of Philosophical Perspective.

**FEL401 Philosophy of Science**

**2+0 2.5**

Importance and Definition of Science: Science, Common Sense, Religion and philosophy, Formal disciplines, Science and Language, Scientific Method: Its content and boundaries, Various interpretations; Ways arriving at the phenomenon: Observation and experimentation, Logical structure of measurement; Scientific Explanation: Notion scientific law, Verification of hypothesis, Causal principle in science, Structure and Functions of Scientific Theory; Human-problems of Science: Responsibility of Scientist, Science and Humanism Importance and Definition of Science: Science, Common Sense, Religion and philosophy, Formal disciplines, Science and Language; Scientific Method: Its content and boundaries, Various interpretations; Scientific Approach: Observation and experimentation, Logical structure of measurement, Scientific Explanation, Scientific law, Verification of hypothesis, Causal principle in science, Structure and Functions of Scientific Theory, Human-problems of Science; Responsibility of Scientist, Science and Humanism.

**FiN415 (Eng) Financial Markets and Institutions**

**3+0 4.5**

Financial System; Interest Rates; Efficiency in Financial Markets; Functions of Financial Institutions; Financial Crises; Central Banks; Monetary Policy: Goals, Tools; Money Markets; Bond Market: Properties of Bonds, Bond Valuation ; Stock Market: Properties of Stocks, Stock Valuation; Banking Industry: Structure and Competition of the Industry, Management of Banks ; Insurance Companies; Investment Banks; International Financial System.

**FiZ105 Physics I**

**4+0 6.0**

Measurement and Units: Measurement, Units, Dimensional analysis; Vectors: Vector and scalar quantities, Coordinate systems and frames of reference; Kinematics: Motion in one dimension, Motion in two dimensions; Dynamics; Work and

Energy; Momentum and Collisions; Rotational Motion: Angular velocity and angular acceleration, Moments of inertia, Work and energy in rotational motion; Static Equilibrium.

**FİZ105 (Eng)      Physics I      4+0    6.0**

Measurement and Units: Measurement, Units, Dimensional analysis; Vectors: Vector and scalar quantities, Coordinate systems and frames of reference; Kinematics: Motion in one dimension, Motion in two dimensions; Dynamics; Work and Energy; Momentum and Collisions; Rotational Motion: Angular velocity and angular acceleration, Moments of inertia, Work and energy in rotational motion; Static Equilibrium.

**FİZ106              Physics II      4+0    6.0**

Electric Fields: Electric charge, Coulomb's law, Electric flux, Gauss's law; Electric Potential: Potential difference, Potential energy, Obtaining the electric field from the electric potential; Capacitors: Definition and calculation of a capacitance, Capacitors with dielectrics, Energy stored in a charged capacitor, Electric dipole in an external electric field; Electric Current; Magnetic Field: Sources of the magnetic field, Electromagnetic induction.

**FİZ106 (Eng)      Physics II      4+0    6.0**

Electric Fields: Electric charge, Coulomb's law, Electric flux, Gauss's law; Electric Potential: Potential difference, Potential energy, Obtaining the electric field from the electric potential; Capacitors: Definition and calculation of a capacitance, Capacitors with dielectrics, Energy stored in a charged capacitor, Electric dipole in an external electric field; Electric Current; Magnetic Field: Sources of the magnetic field, Electromagnetic induction.

**FİZ107              Physics Laboratory I      0+2    1.5**

SI Unit System and Dimension Analysis; Measurement and Error Calculations; Graph Analysis; Principles of Experimental Studying and Preparation of Experimental Reports; Variation of Range due to Shooting Angle; Conservation of Energy; Motion with Constant Acceleration; Measurement of Angular Velocity; Determination of Moment of Inertia; Freely Falling; Simple Pendulum; Motion on Inclined Plane; Mass-spring System; Viscosity.

**FİZ107 (Eng)      Physics Laboratory I      0+2    1.5**

SI Unit System and Dimension Analysis; Measurement and Error Calculations; Graph Analysis; Principles of Experimental Studying and Preparation of Experimental Reports; Variation of Range due to Shooting Angle; Conservation of Energy; Motion with Constant Acceleration; Measurement of Angular Velocity; Determination of Moment of Inertia; Freely Falling; Simple Pendulum; Motion on Inclined Plane; Mass-spring System; Viscosity.

**FİZ108              Physics Laboratory II      0+2    1.5**

Usage of Electrical Measuring Instruments; Security Rules in Electrical Experiments; Principles of Experimental Studying and Preparation of Experimental Reports; Parallel-Plate Capacitor; Investigation of Charge Distribution on Surface of any Conductor; Ohm's Law through DC Electric Circuits; Wheatstone Bridge; Electromagnetic Induction; Transformer; Determination of Emf and Inner Resistance; Determination of Frequency; Oscilloscope.

**FİZ108 (Eng)      Physics Laboratory II      0+2    1.5**

Usage of Electrical Measuring Instruments; Security Rules in Electrical Experiments; Principles of Experimental Studying and Preparation of Experimental Reports; Parallel-Plate Capacitor; Investigation of Charge Distribution on Surface of any Conductor; Ohm's Law through DC Electric Circuits; Wheatstone Bridge; Electromagnetic Induction; Transformer; Determination of Emf and Inner Resistance; Determination of Frequency; Oscilloscope.

**FİZ113 (Eng)      Technical English      4+0    4.0**

Technical English, Units in English, Physical Units and Concepts in English: Mechanical terms; Electric and Magnetic Terms; Modern Physics Terms; Thermodynamic Terms; Waves and Optic Terms, Mathematics and Operation Terms, Geometric Shapes in English.

**FİZ115              Physics I      4+2    7.0**

Physics and Measurement; Motion in One Dimension; Vectors; Motion in Two Dimensions; Newton's Laws; Applications of Newton's Laws; Circular Motion and Other Applications of Newton's Laws; Work and Kinetic Energy; Potential Energy and Conservation of Energy; Momentum, Collisions and Center of Mass; Rotation of Rigid Body About a Fixed Axis; Rolling Motion, Angular Momentum and Torque; Static Equilibrium and Elasticity.

**FİZ116              Physics II      4+2    7.0**

Electric Charge; Coulomb's Law; Electric Fields; Gauss Law; Electric Potential; Calculation of Electric Field from Electric Potential; Capacitance and Dielectrics; Energy Storage Through A Capacitor; Current and Resistance; Direct Current Circuits; Effect of Magnetic Field; Sources of Magnetic Field; Faraday's Law; Electromagnetic Induction; Material and Magnetization; Inductance and Circuit Oscillations.



electric potential; Capacitors: Definition and calculation of a capacitance, Capacitors with dielectrics, Energy stored in a charged capacitor, Electric dipole in an external electric field; Electric Current; Magnetic Field: Sources of the magnetic field, Electromagnetic induction. Electrostatic: Electric charge properties, Charging, Electroscope, Electric fields: Insulators and conductors, Coulomb's law, Electric flux, Gauss's law; Electric Potential: Potential difference, Potential energy, Obtaining the electric field from the electric potential; Capacitors: Definition and calculation of a capacitance, Capacitors with dielectrics, Energy stored in a charged capacitor, Electric dipole in an external electric field; Electric Current; Magnetic Field: Sources of the magnetic field, Electromagnetic induction.

**FiZ212 Statistical Physics 4+0 5.0**

Processes of Probability in Statistical Physics; Basic Concepts in Statistical Physics: Macroscopic and microscopic cases, Entropy in Statistical Physics: Entropy and temperature, Variation of the entropy with energy; Distribution Functions: Maxwell-Boltzmann distribution function, Boson and fermions distribution functions; Partition Functions: Grand Canonic distribution, Mean values of the Canonic and Grand Canonic groups; Statistical Properties of the Fermions Systems: Density of states in the Fermi gas; Statistical Physics of the Boson Systems: Model of the Einstein, model of the Debye, Boson gas.

**FiZ218 Modern Physics 4+0 5.0**

Concept of Reference Frame; Definition of the Theory of Special and General Relativity; Special Relativity Theory; Galileo Transformations; Relativity of Time (Time dilation); Length Contraction; Lorentz Transformations; Doppler Effect; Relativity of Mass; Mass and Energy; Particle Properties of Waves; Photoelectric Effect; Quantum Theory of Light; X-ray Diffraction and Bragg's Law; Compton Effect; Pair Production; Photons and Gravity; Wave Properties of Particles; Wave Function; Particle Diffraction (Davisson-Germer Experiment); Particle in a Box; Uncertainty Principle; Atomic Structure: timeline; Thomson Model of the Atom; Rutherford Model of the atom; Electron Orbits; Atomic Spectra; Spectra Series; The Bohr Atom; Nuclear Motion; Atomic Excitation; Frank-Hertz Experiment; de Broglie Wavelength; Laser. Concept of Reference Frame; Definition of the Theory of Special and General Relativity; Special Relativity Theory; Galileo Transformations; Relativity of Time (Time dilation); Length Contraction; Lorentz Transformations; Doppler Effect; Relativity of Mass; Mass and Energy; Particle Properties of Waves; Photoelectric Effect; Quantum Theory of Light; X-ray Diffraction and Bragg's Law; Compton Effect; Pair Production; Photons and Gravity; Wave Properties of Particles; Wave Function; Particle Diffraction (Davisson-Germer Experiment); Particle in a Box; Uncertainty Principle; Atomic Structure: timeline; Thomson Model of the Atom; Rutherford Model of the atom; Electron Orbits; Atomic Spectra; Spectra Series; The Bohr Atom; Nuclear Motion; Atomic Excitation; Frank-Hertz Experiment; de Broglie Wavelength; Laser.

**FiZ229 Mathematical Methods in Physics I 4+0 5.0**

Vector Analysis: Coordinate systems, Ordinary derivatives and partial derivatives of vector functions, Line integrals, Divergence theorem, Green's Theorem, Stoke's theorem; Matrices and Determinants: Linear vector spaces; Basic matrix calculations, Special matrices, Eigenvalues and eigenvectors of matrices, Calculation of determinant of a matrix, Similarity transformations; Integral Transforms and Physical Applications: Gamma and Beta functions, Laplace transforms, Fourier transforms, Fourier, Sine and cosine series, Physical applications. Vector Analysis: Coordinate systems, Ordinary derivatives and partial derivatives of vector functions, Line integrals, Divergence theorem, Green's Theorem, Stoke's theorem; Matrices and Determinants: Linear vector spaces; Basic matrix calculations, Special matrices, Eigenvalues and eigenvectors of matrices, Calculation of determinant of a matrix, Similarity transformations; Integral Transforms and Physical Applications: Gamma and Beta functions, Laplace transforms, Fourier transforms, Fourier, Sine and cosine series, Physical applications.

**FiZ230 Mathematical Methods in Physics II 4+0 5.0**

Complex Numbers: Complex plane, Algebra of complex numbers, Euler Formula, Roots and powers of complex numbers, Exponential and trigonometric functions, Hyperbolic functions, Derivatives and integrals of functions with complex variable, Residue theorem and applications, Taylor and Laurent series; Orthogonal Functions: Orthogonal polynomials and solutions of differential equations of polynomials, Legendre, Hermite and Laguerre polynomials, Bessel functions, Associated Legendre polynomials and spherical harmonics. Complex Numbers: Complex plane, Algebra of complex numbers, Euler Formula, Roots and powers of complex numbers, Exponential and trigonometric functions, Hyperbolic functions, Derivatives and integrals of functions with complex variable, Residue theorem and applications, Taylor and Laurent series; Orthogonal Functions: Orthogonal polynomials and solutions of differential equations of polynomials, Legendre, Hermite and Laguerre polynomials, Bessel functions, Associated Legendre polynomials and spherical harmonics.

**FiZ231 Waves and Optics 4+0 5.0**

Oscillatory Motion: Simple harmonic motion, Mass-spring system and pendulums, Conservation of energy, Damped and forced oscillations, Resonance; Mechanical Waves: Harmonic waves, Speed of a transverse wave, Energy in wave motion, Superposition and interference of waves, Standing waves; Sound Waves; Speed of sound waves, Interference of sound waves, The Doppler effect; The Nature of Light and Geometric Optics: The nature of light, Reflection and refraction, Huygens principle, Mirrors and lenses; Physical Optics: Interference, Diffraction, Polarization.

**FiZ233 Waves and Optics Laboratory 0+2 2.0**

Introduction to Laboratory and The Various Equipments-Instruments Used in the Laboratory; Simple Harmonic Motion; Standing Waves; Reflection and Refraction in Wave Tank; Determination of the Propagation Speed of Sound in Air; Geometric Optics; Determination of The Focal Length in Mirrors and Lenses; Young's Double-Slit Experiment;

Polarization; Refractive Index and Dispersion; Single and Multi-Slit Diffraction. Introduction to Laboratory and The Various Equipments-Instruments Used in the Laboratory; Simple Harmonic Motion; Standing Waves; Reflection and Refraction in Wave Tank; Determination of the Propagation Speed of Sound in Air; Geometric Optics; Determination of The Focal Length in Mirrors and Lenses; Young's Double-Slit Experiment; Polarization; Refractive Index and Dispersion; Single and Multi-Slit Diffraction.

**FİZ304 Clean Energy Sources 2+0 3.0**

Energy Sources, Solar Energy: Introduction, Solar angles, Solar radiation, Solar collector, Solar-power plants, Usage of solar energy in heating and in cooling; Geothermal energy: Introduction, Benefiting from geothermal fluid in electric energy generation, Potential of geothermal energy in Turkey; Wind energy: Introduction, Benefit from wind energy in electric energy generation; Hydrogen energy: Introduction, System of hydrogen energy, Methods of production hydrogen energy, Methods of production hydrogen energy, Fields of hydrogen use, Clean energy sources of Turkey.

**FİZ318 Introduction to Heat Transfer 2+0 3.0**

Introduction to Heat Transfer: The fundamental concepts, The importance of heat transfer, The basic modes of heat transfer; Heat Transfer by Conduction: Fourier's Law, Thermal conductivity, Thermal conductance, Thermal conduction resistance; Heat Transfer by Convection: Viscous flow and viscosity, The equation of momentum, Newton's law of cooling, Convection heat transfer coefficient; Heat Transfer by Radiation: Physical mechanism, Heat radiation's laws, Radiation heat transfer coefficient; Heat Transfer by Combination: The composite plane wall, Heat transfer by combined conduction and convection, Heat transfer by combined convection and radiation, The energy equality of the surface.

**FİZ321 Semiconductors 2+0 3.0**

Structure of Matter: Motion of charged particles in electric and magnetic fields, The Bohr model of the atom, Energy levels, Atomic excitation, Crystal and non-crystal line structure; Crystal defects; Semiconductor: Intrinsic semiconductor, Electron and hole, Extrinsic semiconductor (p and n-type), Fermi energy level, Mass-action law, Electrical conductivity, Mobility, Hall effect, Diffusion current, Einstein relation, Generation and recombination, Work function, Contact potential.

**FİZ322 Semiconductors Devices 2+0 3.0**

P-N Junctions: Current-voltage characteristics, Forward bias, Reverse bias, Saturation current, Dynamic resistance, Breakdown, Junction capacitance, Rectification, Maximum frequency; Special Diodes: Zener diode, Tunnel diode, Varactors, Transistors: p-n-p and n-p-n junction transistors, Fundamentals of junction transistor operation, Transistor currents, Field effect transistor (FET), n-channel junction field effect transistor (JFET) and drain characteristic, Metal-oxide-semiconductors field effect transistor (MOSFET), Thyristors, Silicon controlled rectifier (SCR), Integrated circuits; Solar Cells.

**FİZ327 Quantum Physics I 4+0 5.0**

Birth of Quantum Physics; Uncertainty Relations; Schrödinger Wave Equation; Probability Interpretation of Wave Function; Expectation Values; Time Independent Schrödinger Equation; One Dimensional Models; Potential Step; Potential Barrier; Potential of a Square Well; Potential of an Infinite Well; Harmonic Oscillator; General Formalism of Quantum Mechanics; Wave Function Space; Superposition Theorem; Dirac Bra-Ket Notation; Specific Operators, Angular Momentum, Angular Momentum Eigenfunctions. Birth of Quantum Physics; Uncertainty Relations; Schrödinger Wave Equation; Probability Interpretation of Wave Function; Expectation Values; Time Independent Schrödinger Equation; One Dimensional Models; Potential Step; Potential Barrier; Potential of a Square Well; Potential of an Infinite Well; Harmonic Oscillator; General Formalism of Quantum Mechanics; Wave Function Space; Superposition Theorem; Dirac Bra-Ket Notation; Specific Operators, Angular Momentum, Angular Momentum Eigenfunctions.

**FİZ328 Quantum Physics II 4+0 5.0**

Schrödinger Equation in Three Dimensions; Spherical Symmetric Potential; Radial Schrödinger Equation; Hydrogen Atom, Matrix Representation of Linear Operators; Spin; Interactions With Respect to Spin; Approximate Methods and Perturbation Theory; Perturbation Expansion; Time Independent Perturbation Theory; Interaction of Charged Particles with Electromagnetic Field; Landau Levels. Schrödinger Equation in Three Dimensions; Spherical Symmetric Potential; Radial Schrödinger Equation; Hydrogen Atom, Matrix Representation of Linear Operators; Spin; Interactions With Respect to Spin; Approximate Methods and Perturbation Theory; Perturbation Expansion; Time Independent Perturbation Theory; Interaction of Charged Particles with Electromagnetic Field; Landau Levels.

**FİZ329 Semiconductors Laboratory 2+0 3.0**

Fourteen Different Bravais Lattice and Solid Sphere Crystal Models; Measurement of the Distances Between Reflection Planes by Using X-ray Diffraction Patterns; Determination of the Optical Properties of the Various Materials Via Optical Absorption Spectra; Determination of the Current-voltage Characteristic of Different Materials; Conversion of Radiation Energy into Electrical Energy.

**FİZ330 Semiconductor Applied Laboratory 2+0 3.0**

Measurement of the Thickness of the Different Materials by Means of the Ellipsometer; Polarize Microscope; Photoconductivity; Luminescence experiment; Hall Effect Experiment; The Determination of Energy Band Gap of Germanium; The determination of the Electrical Conductivity of the Silicon single crystal depending on the temperature.

**FİZ331 Nobel Prizes on Physics 2+0 3.0**

What Are the Nobel Prizes Given For; Nobel Prizes in Physics From 1901 to 1920; Nobel Prizes in Physics From 1921 to 1940; Nobel Prizes in Physics From 1941 to 1960; Nobel Prizes in Physics From 1961 to 1970; Nobel Prizes in Physics from 1971 to 1980; Nobel Prizes in Physics From 1981 to 1990; Nobel Prizes in Physics From 1991 to 2000; Nobel Prizes in Physics From 2001 to 2010; Nobel Prizes in Physics from 2010 to This Year; Some Classifications About Nobel Prizes.

**FİZ332 Introduction to Low Temperature Physics 2+0 3.0**

Vacuum, Vacuum Pumps; Pressure Gages; Leak Detectors; Cryoliquids; Properties of Solids at Low Temperatures; Heat Transfer; Thermal Noise; Thermal Isolation; Cryoliquid Transfers; Refrigerators and Refrigerator Types; Low Temperature Sensors; Instrumentation of Cryogenics.

**FİZ333 Quality Control Methods in Physics 2+0 3.0**

Aspects of Physics In Scope of Industrial Cooperation in Turkey; Quality: Definition of quality, Primary element of quality, Factors affecting quality; Quality Control: Aim of the quality control, Requirement for quality control, Department of quality control, Total quality management; Destructive quality control: Tension, compression and bending test methods; Non-Destructive Quality Control: Eddy current method, Magnetic particle method, Liquid penetrant method, Ultrasonic testing, Radiographic methods.

**FİZ336 Solar Photovoltaics 2+0 3.0**

Introduction to Solar Photovoltaic (PV): A history of PV; Silicon PV: Semiconductors and doping, pn junction, The PV effect, Monocrystalline silicon cells; Crystalline PV: Polycrystalline silicon, Silicon ribbons and sheets, Gallium arsenide; Thin Film PV: Amorphous silicon, Other thin film PV Technologies; Other PV Technologies: Multijunction PV cells, Concentrating PV systems, Silicon spheres, Photoelectrochemicals cells; Electrical characteristics of silicon PV cells and modules; PV systems for power; Costs of energy from PV; Environmental impact and safety of PV systems.

**FİZ337 Solar Energy and Applications 2+0 3.0**

Introduction: Power and energy, Energy sources; Solar Energy: Structure of the Sun, The solar constant, The solar radiation spectrum, The Sun's total radiation; Solar radiation measurement, Solar radiation recorder, Solar energy measurement, Geometry of solar radiation, Latitude and longitude, Inclination, Sun angles; Solar energy applications: Solar collectors, Heating the buildings with solar energy, Active and passive solar heating systems.

**FİZ339 Radioecology and Ecosystem 2+0 3.0**

Ecosystem: Physical and biological components of ecosystem, The causes instability, disorder, harm or discomfort to the ecosystem; Air Pollution, Water Pollution, Light Pollution, Radioactive Pollution; Radioecology: What is radioecology, Radioactivity, Units of radioactivity and dose, What is the source of radioactivity? Natural sources of radiation, Why is radon gas a problem? Synthetic radioactivity and, its use for a variety of purposes, Effects of radiation on the ecosystem components.

**FİZ340 Some Applications of Physics in Medical Science 2+0 3.0**

Electromagnetic Spectrum; Interaction Between Light and Matter; X-Rays, Production and Properties of X-Rays; Medical Techniques Based on X-Rays; Physical Fundamentals of Rontgen Technique; Physical Principles of Computer-Based Tomography Technique; Radiation; Units of Radiation; Effective Dose Values Received due to Some X-Ray Based Medical Examinations; Physical Fundamentals and Advantages of Magnetic Resonance Imaging; Sound and Properties of Sound Waves in Ultrasonography; Physical Fundamentals of Ultrasonography and Advantages; Other Applications of Physics in Medical Techniques.

**FİZ341 Metrology I 2+0 3.0**

Metrological Concepts; Institutions and Organizations Related to Metrology; Calibration and Indetermination; SI Units Concerned with Length (Length, Angle); Measurement Standards and Methods for Dimensional Measuring; Standards and Methods for Measuring Time and Frequency; SI Units of Electricity and Magnetism (Current, Voltage, Resistance, Inductance Capacitance, Electric Field and Magnetic Field and Their Flux Densities, Electrical Charge, Electrical Power and Energy, RF Power).

**FİZ342 Metrology II 2+0 3.0**

Definition of SI Units Used in Mass Measuring, Formation, Distribution, Measurement Standards and Measurement Methods; Definition of SI Units for Measurement of Mass and Units Derived from Mass and Formation, Measurement Standards and Methods; Definition of SI Units Used in Measuring Temperature and Moisture, Their Measurement, Measurement Standards; Methods for Photometric and Radiometric Measuring (Light Intensity, Light Flux, Brightness

Level, Optical Power); Definition of SI Units Used in Measuring Acoustic, Ultrasonic and Vibration (Sound Pressure, Ultrasonic Power and Acceleration), Their Measurement Standards and Methods.

**FİZ343 (Eng) Machine Learning for Physicists 2+0 3.0**

Introduction; History; The Importance and Application Areas of Machine Learning; Supervised Learning: Classification and linear regression; Supervised Learning: Simple linear regression; Unsupervised Learning; Image Preprocessing Techniques; Unbalanced Classification and Prevention Methods; Kernel Methods; Support Vector Machine Algorithm; Current Successful Algorithms; Clustering; Feature Selection and Sorting; Classification Application.

**FİZ344 Geophysics and Earthquake 2+0 3.0**

Promotion of earth sciences, earth internal structure. the world's general properties of the universe, formation, motion and tectonic plates that make up the earth. Introduction to geophysical methods. Measuring the size of an earthquake. Earthquake waves and propagation properties. Seismic wave velocities and soil effects. Hazard analysis and risk assesment. Strong ground motion and ground response analysis. Measurement of seismic wave velocities and site effect.

**FİZ346 Quantum Physics Laboratory 0+2 2.0**

Basic Informations About Quantum Physics Laboratory: Laboratory rules, Preliminary studies for experiments, Rules to be followed during the experiments, Preparation of experiment reports, Laboratory safety; Single Slit Diffraction and Heisenberg Uncertainty Principle; Determination of e/m Ratio; Millikan Oil Drop Experiment; Frank-Hertz Experiment; Balmer Series of Hydrogen; Emission and Absorption Spectra; Electron Diffraction; X-Rays; Single Electron Spectrum; The Zeeman Effect

**FİZ348 Electromagnetic Theory 5+1 6.0**

Vector Analysis and Algebra; Coulomb's Law and Electric Field: Electric flux density, Electric field of charge distributions, Gauss's law, Divergence theorem; Energy and Potential; Conductors, Dielectrics and Capacitance; Stable Magnetic Fields: Biot-Savart law, Ampere's law, Stokes' theorem, Magnetic flux density, Magnetic potentials; Magnetic Force and Magnetic Materials: Magnetization and permeability, Magnetic boundary conditions, Magnetic circuit, Potential energy and force in magnetic materials, Inductance; Time-Changing Fields and Maxwell's Equations: Faraday's law, Displacement current; Uniform Plane Wave: Wave motion, Poynting vector, Electromagnetic waves.

**FİZ349 Classic Mechanics 5+1 6.0**

Coordinate Systems; Particle Kinematics; Newton's Laws of Motion: Work, Energy and Momentum; Frames of Reference and Relative Motion; Motion in a Central Forced Field; Rotation and Translation Coordinate Systems; Virtual Business Principle; D'Alembert Principle; Classification of Mechanical Systems: Discrete and continuous systems, holonomic and non-holonomic systems, conservative and nonconservative systems, rheonomic and scleronomic systems; Planar Motion of a Rigid Body: One-dimensional motion; Rotation of Solid Bodies: Euler angles, moments of inertia and inertia factors; Lagrangian Equations; Hamilton's Equations; Variable Mass Systems.

**FİZ351 Structure and Properties of Matter 2+0 3.0**

Matter Concept, Basic Properties and Structure; Physical Properties; Chemical Properties; Atoms, Ions and Molecules; Atom Models; Chemical Bonds; Relationships Between Solid, Liquid and Gas; Mechanical Properties of Matter, Stress, Elastic Deformation, Hardness; Magnetic Properties of Matter, Diamagnetism, Paramagnetism, Ferromagnetism; Optical Properties of Matter, Electromagnetic Waves and Interaction of Materials, Reflection, Refraction, Absorption; Electrical Properties of Matter, Electrical Conductivity, Semiconductivity.

**FİZ353 Electronics I 1+2 3.0**

Electric Current, Power and Signal Generator, Measuring Instruments, Kirchoff's Laws, Circuit Theorems, RLC Circuits in Alternating Current, Electric Conversions, Rectifiers, Trimmer, Clamper and Voltage Multiplexer, FET Transistors, Bipolar Transistors, Operational Amplifiers

**FİZ354 Electronics II 1+2 3.0**

Sayı sistemleri, Mantık geçitleri ve doğruluk tabloları, Boolean cebiri ve teoremleri. Düzensel mantık devrelerinin tasarımları ve sadeleştirilmesi, Karnaugh haritaları, Düzensel mantık devreleri (toplayıcılar, karşılaştırıcılar, kodçözücüler, kodlayıcılar, veri seçici, çoklayıcı), Ardışıl mantık devreleri (Latch'ler ve Flip-Flop'lar), Sayaçlar, Kayan yazmaçlar.

**FİZ355 Computer Programming for Physicists I 1+1 2.0**

Introduction to Programming: General structure of the programming languages, Mathematical operations in the computer programs, Comparison operations, Logical operations; General structure of C/C++ Programming Language: Data types, The parts of a C/C++ program, Data input and output commands; Loop Commands in C/C++: Loop commands and their usage in the program, Creating arrays; Comparison Commands in C/C++: Comparison commands and their usage in the program, The usage of comparison commands with loop commands, Solution of Physics Problems: Numerical solution of the equation of motion of a particle moving in two dimensions, numerical solutions of Schrödinger problems.

**FİZ356 Computer Programming for Physicists II 1+1 2.0**





Primitive cell, Simple crystal structures, Bragg's law, Reciprocal lattice; Crystal Binding; Crystal Vibrations and Thermal Properties; Free Electron Fermi Gas; Energy Bands; Semiconductors; Optical Processes; Superconductivity; Diamagnetism, Paramagnetism and Ferromagnetism; Nanostructures.

**FİZ433 Atom and Molecular Physics 4+0 5.0**

The Central Field Problem and Hydrogen Atom: The wave mechanics of hydrogen atom, Solving the Schrödinger equation in spherical coordinates, Spherical harmonics, Depending of the radius of hydrogen atom wave equations, Parity of a function and parity operator, Energy in the solving hydrogen atom central field problem, The Virial theorem, Spin and Pauli spin matrices; Some Terms of Atomic Hamiltonian: Zeeman terms, Fine structure term, Hyperfine structure term, Stark term, The coupling of angular momentum in atom physics and electric dipole selection rules, Interactions between angular momentums of two particles; Molecular Structure: Binding energy of molecules, Ionic bond, Covalent bond, Van der Waals bond, Metallic bond.

**FİZ439 Observational Data Analysis in Astrophysic 2+0 3.0**

Projection Definitions on Spherical Astronomy; Coordinate Systems; Constellations and Star Maps; Earth Based Data Acquisition Platforms; Orbital Base Data Acquisition Platforms; Principles of High Energy Data Acquisition; Principles of Optic Wavelength Data Acquisition; Principles of Radio Wavelength Data Acquisition; Telescope Types of Data Acquisition; CCD Cameras. Spectrographs; Data Types used on Astrophysical Data Analysis; Software of Astrophysical Data Analysis; Methods of Astrophysical Data Analysis on Different Wavelength.

**FİZ440 Structural Analysis of Solids 2+0 3.0**

Electromagnetic Spectrum; X-rays: Production of x-rays, Continuous spectrum, Characteristic spectrum; Crystal Structures: Crystal lattices, Bravais lattices, Crystal planes and directions, Miller indices; Determination of the Crystal Structure: Laue method, Rotating crystal method, Powder method; X-ray diffraction: Bragg's law, Same applications for the determination of the crystal structure.

**FİZ443 Characterization Methods 2+0 3.0**

X-Ray Diffraction (XRD): Properties of x-rays, Occurrence of x-rays, Bragg's law; Diffraction Methods; X-Ray Fluorescence (XRF): Wavelength dispersive x-ray fluorescence WDXRF, Energy dispersive x-ray fluorescence, EDXRF; Immersion Calorimetry: Calorimeter, Heat of immersion, Enthalpy of immersion, Himm, The factors affecting the occurrence of immersion heat; Thermal Analysis Methods: Thermogravimetric Analysis (TGA-DTG); Differential Thermal Analysis (DTA); Differential Scanning Calorimetric Analysis (DSC).

**FİZ444 Satellite Data Analysis Techniques 2+0 3.0**

Principles of Positional Modelling; Data Types; Topologic Data Analysis; Electromagnetic Spectrum; Doppler Effect; Global Positioning Systems; Solid Surface Sensing on Visual, Thermal, Near Infrared Fields; Mechanisms of Electromagnetic Wave-surface Interactions; Active and Passive Image Sensing Systems and Analysis; Satellites and Satellite Data Types; Image Bonification, Extraction, Merging, Rectification, Classification and Mapping Techniques.

**FİZ446 Applied Heat Theory 0+2 3.0**

Heat and Temperature: Heat and temperature concepts, Temperature and thermal equilibrium, Thermal expansion, Heat capacity and specific heat, Calculations related to heat energy, Experimental determination of the specific heat of copper, lead and glass; Heat Transfer Mechanisms: Thermal conductivity, Conduction, Convection, Radiation and absorption, The experimental determination of the thermal conductivity for various materials; Thermal Insulation: Thermal comfort, Measurement of thermal comfort, Reducing heat loss from buildings, Thermal insulation materials and their properties, Energy efficient building design.

**FİZ449 Structural and Vibrational Theory of Molecules 2+0 3.0**

Classical and Quantum Mechanics Theory of Molecular Structure; Notions of Stereochemistry; Intermolecular Interactions: Dipole-Dipole interaction, The polarity of the molecules and the dipole moment, Hydrogen bond, Interactions between particles; Introduction to Vibrational Spectroscopy: Classical and quantum mechanical theory of molecular vibrations, Theory of vibrational spectroscopy, Infrared spectroscopy, Raman spectroscopy; Vibration Spectroscopy Depends on the Molecular Structure; Matrix Isolation Technique.

**FİZ451 Numerical Methods in Physics 2+0 3.0**

Introduction to Numerical Methods; Solving Systems of Linear Equations: Gauss elimination method, LU decomposition method; Solving Systems of Nonlinear Equations: Newton-Raphson method, Secant method; Interpolation: Linear interpolation, Newton interpolation; Curve Fitting: Linear curve fitting, Polynomial curve fitting; Numerical Integration: Trapezoidal rule, Simpson's rules; Numerical Differentiation: Taylor series expansion, Numerical differentiation with interpolation method; Numerical Solutions to Ordinary Differential Equations: Runge-Kutta methods; Numerical Solutions to Partial Differential Equations: Finite difference methods; Applications with Matlab.

**FİZ453 Career Development 2+0 2.0**

General Ethical Principles and Application Areas; Scientific Research Ethics: Basic principles of research ethics, Ethical evaluations in scientific research; Career: Concept of career, Stages and features of career planning process; Communication: Basic communication skills, Diction and body language; Preparing CV and Letter of Intent that can be

used in various job applications; Interview techniques; Time Management; Entrepreneurship; Fields of Study: Recognition of fields of study; Exchange Programs: National and International exchange programs.

**FİZ457 Physics Games 2+0 3.0**

In physics undergraduate courses, in the use of visual materials, mechanics, electricity, electronics, temperature, pressure, magnetic, optics, etc. Determining the physical properties of materials, determining and designing visual material experimental setups, transferring the experiments to the computer environment, setting up and presenting the experimental setups.

**FİZ459 Graduation Project I 2+4 5.0**

Ethics of Science: Different dimensions of science and ethics, Science research ethics, Publication ethics; Determining a Special Topic in Physics; Searching for Studies on the Determined Subject: Physics abstracts scanning, Scanning periodicals and patents, Textbooks and Internet browsing, Searching various international scientific indexes; Evaluation of Information Obtained; Preparing the Work Program of the Specified Subject.

**FİZ460 Graduation Project II 2+4 5.0**

Science Ethics: Education, Universities and professional ethics of scientists; Precautions to be taken against ethical violations and ethical education, Ethical rules; Conducting Experimental or Theoretical Study According to the Specified Study Subject, Evaluation, analysis and interpretation of the experimental data or theoretical study results; Writing the work done in accordance with the spelling rules, the presentation of the project.

**FİZ462 Characterization Methods 1+2 3.5**

Material Characterization Methods; Microscopic Analysis Technique Scanning Electron Microscopy (SEM) and Working Principle; Diffraction Analysis: X-Ray Diffraction (XRD), X-Ray Fluorescence analysis (XRF), X-Ray Photoelectron Spectroscopy (XPS) working principles and application areas, Determination of Light Absorption and Scattering Properties for Different Molecules by IR and Raman Spectra; UV-Vis Spectrometer and Working Principle; Structure Determination: Investigation of organic structures by Nuclear Magnetic Resonance Spectroscopy (NMR).

**FİZ464 Web Designing 1+1 3.0**

Web Tasarıma Giriş, Web tasarımı ile ilgili temel kavramlar, Web teknolojilerinin gelişimi; Genel Tasarım İlkeleri, Bütünlük, Farklılık, Vurgu, Denge, Alan, Zıtlık, Ritim, Oran-Orantı; Çoklu Ortam Tasarım İlkeleri, Tutarlılık ilkesi, Dikkat çekme ilkesi, Gereksizlik ilkesi, Zamansal-Konumsal yakınlık ilkesi, Parçalara bölme ilkesi, Ön alıştırma ilkesi, Biçim ilkesi, Çoklu ortam ilkesi, Kişiselleştirme ilkesi, Ses ilkesi, Resim ilkesi; Web Temelli Öğrenme, Bilişsel yük, İkili kodlama kuramı; Web Sayfası Temel Elemanları, Sayfa yerleşimi, Çerçeveler, Tablo, Liste vb.; Web Tasarımı: Planlama, Geliştirme, Değerlendirme ve İyileştirme.

**FİZ466 Magnetic Materials 2+0 3.0**

Concept of Magnetism, Experimental methods of magnetic properties of materials, Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism, Ferrimagnetism, Magnetic anisotropy, Magnetic properties of nano-particles and thin films, soft and hard magnetic materials, Use of magnetic materials in technology, Current magnetic material research.

**FİZ468 Particle Physics 2+0 3.0**

Relativistic Kinematics: Four-vectors, Collisions; Lifetimes and Cross Sections; Quantum Electrodynamics: Dirac equation, Bilinear covariants, Feynman rules; Structure of Hadrons: Quark-parton model, Björken scaling, Quark distribution functions; Quantum Chromodynamics: Feynman rules, Asymptotic freedom; Weak Interactions and Electroweak Unification; Physics of Massive Neutrinos.

**FİZSJ401 Internship 0+2 5.0**

Determining Business Life in Private Sector and Public Institutions within the Physics Department; Determination of Internship Place; Working Principles of Internship Institution: Rules and legal regulations regarding working conditions, discipline and job security; Practicing in the Field of Physics and Putting the Knowledge of the Field into Practice; Student Internship Report: Regularly processing the work done during the internship on the Student Internship Report Pages.

**FRA175 (Fra) French I 3+0 3.0**

Greeting and Introducing yourself; Saying the day and hour; Presenting somebody; Talking about occupations; Discovering the environment; Talking about the weather report; Informing oneself about health issues; Locating and Settling; Expressing one's opinion; Suggesting an activity; Expressing one's feelings; Reserving a train ticket; Communicating on the telephone; Talking about work; Expressing one's interest; The progress of an Action; Obtaining information about the press.

**FRA176 (Fra) French II 3+0 3.0**

Greeting and Introducing yourself; Saying the day and hour; Presenting somebody; Talking about occupations; Discovering the environment; Talking about the weather report; Informing oneself about health issues; Locating and Settling; Expressing one's opinion; Suggesting an activity; Expressing one's feelings; Reserving a train ticket; Communicating on the telephone; Talking about work; Expressing one's interest; The progress of an Action; Obtaining information about the press.

**iKT107 Introduction to Economics I 4+0 6.0**

Basic Concepts: Economic activity, Scope of economic science, Methods; Production Process; Production Factors; Productivity Laws; Business firms Types; Introduction to Price Theory: Value and utility, Behavior of the optimal consumer; Demand functions: Demand elasticity; Supply; Cost and Revenue Functions; Supply Curve: Supply and demand, Equilibrium price and its functions; Price Policy and Market Types: Equilibrium in perfect competition and price determination, Monopoly equilibrium; Price determination in imperfect competition; Rent; Wage; Interest; Entrepreneurial Income. Basic Concepts: Economic activity, Scope of economic science, Methods; Production Process; Production Factors; Productivity Laws; Business firms Types; Introduction to Price Theory: Value and utility, Behavior of the optimal consumer; Demand functions: Demand elasticity; Supply; Cost and Revenue Functions; Supply Curve: Supply and demand, Equilibrium price and its functions; Price Policy and Market Types: Equilibrium in perfect competition and price determination, Monopoly equilibrium; Price determination in imperfect competition; Rent; Wage; Interest; Entrepreneurial Income.

**iKT108 Introduction to Economics II 4+0 6.0**

National Income Accounting and National Income: Economic equilibrium, Macroeconomic relations, Nominal national income and real income; Introduction to Monetary Theory: Value of money theories, Purchasing power, Loss of money value (inflation); International Economic Equilibrium (exchange rates); Basic Tools in Monetary Policy: Factors determining business cycles and national income; Introduction to Business Cycle Theories; Consumption Expenditures; Investment Expenditures; Employment; International Economic Relations; International Goods and Services; International Factor Movement; Economic Growth and Development. National Income Accounting and National Income: Economic equilibrium, Macroeconomic relations, Nominal national income and real income; Introduction to Monetary Theory: Value of money theories, Purchasing power, Loss of money value (inflation); International Economic Equilibrium (exchange rates); Basic Tools in Monetary Policy: Factors determining business cycles and national income; Introduction to Business Cycle Theories; Consumption Expenditures; Investment Expenditures; Employment; International Economic Relations; International Goods and Services; International Factor Movement; Economic Growth and Development.

**iKT151 Economics 3+0 3.0**

Basic Economic Concepts; Production Process; Optimal Consumer Behavior; Demand; Supply; Equilibrium Price; Market Types; Determination of Factor Prices; National Product; Nominal and Real National Income; Introduction to Monetary Theory; Factors Determining Fluctuation and National Income: Consumption expenditures, Investment expenditures, Employment; International Economic Relations: International mobility of goods and services, International mobility of factors of production; Economic Growth and Development. Basic Economic Concepts; Production Process; Optimal Consumer Behavior; Demand; Supply; Equilibrium Price; Market Types; Determination of Factor Prices; National Product; Nominal and Real National Income; Introduction to Monetary Theory; Factors Determining Fluctuation and National Income: Consumption expenditures, Investment expenditures, Employment; International Economic Relations: International mobility of goods and services, International mobility of factors of production; Economic Growth and Development.

**iKT151 (Eng) Economics 3+0 3.0**

Basic Economic Concepts; Production Process; Optimal Consumer Behavior; Demand; Supply; Equilibrium Price; Market Types; Determination of Factor Prices; National Product; Nominal and Real National Income; Introduction to Monetary Theory; Factors Determining Fluctuation and National Income: Consumption expenditures, Investment expenditures, Employment; International Economic Relations: International mobility of goods and services, International mobility of factors of production; Economic Growth and Development. Basic Economic Concepts; Production Process; Optimal Consumer Behavior; Demand; Supply; Equilibrium Price; Market Types; Determination of Factor Prices; National Product; Nominal and Real National Income; Introduction to Monetary Theory; Factors Determining Fluctuation and National Income: Consumption expenditures, Investment expenditures, Employment; International Economic Relations: International mobility of goods and services, International mobility of factors of production; Economic Growth and Development.

**iKT213 Mathematical Economics 3+0 4.5**

Nature of Mathematical Economics: Economic models and analysis, Equilibrium analysis in economics; Comparative-Static Analysis of Equilibrium; Restricted and Unrestricted Optimization Problems: A special variety of equilibrium analysis, Dynamic analysis; Financial Mathematics; Compound Interest Rates and Installment Payment Nature of Mathematical Economics: Economic models and analysis, Equilibrium analysis in economics; Comparative-Static Analysis of Equilibrium; Restricted and Unrestricted Optimization Problems: A special variety of equilibrium analysis, Dynamic analysis; Financial Mathematics; Compound Interest Rates and Installment Payment

**iKT309 Monetary Theory 3+0 5.0**

Definition and Functions of Money; Interest Rates; Calculation of Interest Rates; Theories of Interest Rates; Loanable Funds Theory; Liquidity Preference Theory; Risk and Term Structure of Interest Rates: Yield curves and interpretation, Expectations hypothesis, Liquidity premium hypothesis, Segmented markets hypothesis; Theories of Demand for money: Classical quantity theory, Developments in Keynesian theory, Post Keynes; Transmission of money; General Equilibrium

and Effectiveness of Monetary Policy. Definition and Functions of Money; Interest Rates; Calculation of Interest Rates; Theories of Interest Rates; Loanable Funds Theory; Liquidity Preference Theory; Risk and Term Structure of Interest Rates; Yield curves and interpretation, Expectations hypothesis, Liquidity premium hypothesis, Segmented markets hypothesis; Theories of Demand for money: Classical quantity theory, Developments in Keynesian theory, Post Keynes; Transmission of money; General Equilibrium and Effectiveness of Monetary Policy.

**iKT310 Monetary Policy 3+0 5.0**

Balance Sheet Analysis in Banking: Asset, Liquidity, Liability and capital management; Deposit Creation in Banking; Money Stock Determination: Monetary base, Money multiplier, Changes in money stock; Central Banking and Analysis of Central Bank balance sheet; Tools of Monetary Policy; Conduct of Monetary Policy: Choice of targets, Indicators of monetary policy; Monetary Policy Theory: Expectations and monetary policy, Activist and non-activist policy debate, Monetary policy rules and discretionary monetary policy; Monetary Policy Games. Balance Sheet Analysis in Banking: Asset, Liquidity, Liability and capital management; Deposit Creation in Banking; Money Stock Determination: Monetary base, Money multiplier, Changes in money stock; Central Banking and Analysis of Central Bank balance sheet; Tools of Monetary Policy; Conduct of Monetary Policy: Choice of targets, Indicators of monetary policy; Monetary Policy Theory: Expectations and monetary policy, Activist and non-activist policy debate, Monetary policy rules and discretionary monetary policy; Monetary Policy Games.

**iKT322 International Economics 2+0 5.0**

Globalization in World Economy; International Economic Integration; European Economic Community; North America Free Trade Areas; Association of Southeast Asian Nations; United Nations Conference on Trade and Development; International Economic Policies; Trade Restrictions; Dumping; Export Subsidies; Foreign Exchange Markets; Balance of Payments; International Monetary Systems; International Credit Markets; Third World Countries; International Monetary Fund and Turkey; International Investment Analysis.

**iKT324 Financial Institutions and Banking 2+0 3.0**

Definition and Functions of Financial Markets; Comprehensiveness and Elements of Financial Instruments; Structure and Functions of the Central Bank in Turkey and in the World; Commercial Banking Theory; Basic Functions of Commercial Banking in the World and Turkish Economy; Structure and Functions of Investment and Development Banking in Turkey; Stock exchange in the World and in Turkish Economy; Brokerage Houses in Turkey; Mutual Funds and Investment Corporations in Turkey; Islamic Banking in Turkey.

**iKT382 Econometrics I 4+0 6.0**

Definition and Scope of Econometrics; Econometric Research Method; Data and Variable Types in Econometric Analysis; Interpretation of Regression Model: Tests, Criteria, Variable selection, Transformations; Measurement of Elasticity; Functional Forms of Regression Models: Regression through the origin, Log-linear model, Semilog models, Reciprocal models; Heteroscedasticity: Tests for heteroscedasticity, Generalized least squares; Autocorrelation: Tests for autocorrelation; Non-Normality; Test for Non-normality: Tests and estimators; Model Specification Errors.

**iKT382 (Eng) Econometrics I 4+0 6.0**

Definition and Scope of Econometrics; Econometric Research Method; Data and Variable Types in Econometric Analysis; Interpretation of Regression Model: Tests, Criteria, Variable selection, Transformations; Measurement of Elasticity; Functional Forms of Regression Models: Regression through the origin, Log-linear model, Semilog models, Reciprocal models; Heteroscedasticity: Tests for heteroscedasticity, Generalized least squares; Autocorrelation: Tests for autocorrelation; Non-Normality; Test for Non-normality: Tests and estimators; Model Specification Errors.

**iKT417 Financial Economics I 2+0 3.0**

Significance of Financial Markets in Economy; Financial Flow Table of an Economy and its Relation to Real Economic Variables; Fund Management; Demand and Supply of Securities; Security Markets and their Efficiency; Effective Market Hypothesis; Introduction to Determination of Security Prices; Options and Option Pricing; Future Contracts; Future Markets and Future Pricing; Swap Transactions and Swap Pricing. Significance of Financial Markets in Economy; Financial Flow Table of an Economy and its Relation to Real Economic Variables; Fund Management; Demand and Supply of Securities; Security Markets and their Efficiency; Effective Market Hypothesis; Introduction to Determination of Security Prices; Options and Option Pricing; Future Contracts; Future Markets and Future Pricing; Swap Transactions and Swap Pricing.

**iKT418 Financial Economics II 2+0 3.0**

Capital Markets; Institutions and Instruments on Capital Markets; Analysis of Bond Markets: Determination of bond quality, Bond valuation, Relationship between term and yield of bonds, Duration approach to bond valuation, Management of bond portfolios; Fundamental Analysis Approach to Stock Valuation; Technical Analysis of Stock Market: Dow Theory, Price-Quantity indicators, Approaches to price analysis; Portfolio Management; Evaluation of Portfolio Performance; Market Indicators and Data Sources. Capital Markets; Institutions and Instruments on Capital Markets; Analysis of Bond Markets: Determination of bond quality, Bond valuation, Relationship between term and yield of bonds, Duration approach to bond valuation, Management of bond portfolios; Fundamental Analysis Approach to Stock Valuation; Technical Analysis of

Stock Market: Dow Theory, Price-Quantity indicators, Approaches to price analysis; Portfolio Management; Evaluation of Portfolio Performance; Market Indicators and Data Sources.

**iKT421 Economy of Turkey 2+0 3.0**

The Place of Turkish Economy in World Economy; National Income and Income Distribution in Turkey; Developments of Public Finance in Turkey; Government Debt in Turkey; Sectoral Developments in Turkey: Agriculture, Industry, Energy, Service; Inflation in Turkey; Structural Stability Policies in Turkish Economy; A General Evaluation of International Trade Policies; Relations with EU; Policies Concerning Foreign Capital.

**iKT460 Financial Econometrics 3+0 4.5**

Fundamental concepts of financial econometrics; Introduction to theory of statistics and linear regression analysis; Single and multifactor index models; Capital Asset Pricing Model (CAPM); Arbitrage Pricing Model (APM); Modeling and estimation of financial time series; Predicting stock returns; autoregressive conditional heteroscedasticity models (ARCH); Financial risk models; Value at Risk (VaR); Portfolio theory.

**iKT460 (Eng) Financial Econometrics 3+0 4.5**

Fundamental concepts of financial econometrics; Introduction to theory of statistics and linear regression analysis; Single and multifactor index models; Capital Asset Pricing Model (CAPM); Arbitrage Pricing Model (APM); Modeling and estimation of financial time series; Predicting stock returns; autoregressive conditional heteroscedasticity models (ARCH); Financial risk models; Value at Risk (VaR); Portfolio theory.

**iKT482 Econometrics II 4+0 6.0**

Introduction to Econometrics; Dummy Variables; Regression with Dummy Independent Variables; Comparing Two Regression Models: Dummy variable approach, Chow test; Regression with Dummy Dependent Variable: Linear probability model, Logit model; Probit model; Dynamic Econometric Models; Reasons for Lags; Autoregressive models; Distributed-Lag Models; Panel Data; Econometric Models for Panel Data; Applications.

**iLT201 Interpersonal Communication 3+0 4.5**

Verbal Communication; Speaking Skills As Dimension of Interpersonal Communication; Listening Capabilities As Dimension of Interpersonal Communication; Non-Verbal Communication; Signs And Meanings; Stress And Stress Management; Group; Group Dynamics; Small Group Characteristics; Persuasion; Speaking And Listening; Time And Time Management; Interpersonal Communication; History of Communication Research. Verbal Communication; Speaking Skills As Dimension of Interpersonal Communication; Listening Capabilities As Dimension of Interpersonal Communication; Non-Verbal Communication; Signs And Meanings; Stress And Stress Management; Group; Group Dynamics; Small Group Characteristics; Persuasion; Speaking And Listening; Time And Time Management; Interpersonal Communication; History of Communication Research.

**iLT408 Effective and Pleasant Speaking Techniques 2+0 2.5**

Introduction to Voice: Basic breath control and tone production to develop strength, Control, Flexibility, Awareness; Speech Techniques; Pronunciation, Tonality, Intonation, Emotion; Dictation; Exercises on Monologues, Poems; Body Language Exercises.

**iNG187 (Eng) English I 3+0 3.0**

Using Personal Pronouns and Possessive Adjectives; Using to be in Present Tense; Using Singular and Plural Nouns; Using Basic Language Related to Food and Drink; Using "There is-there are" in sentences; Using "have got"; Asking "yes-no" Questions and Giving Short Answers to Them; Talking about Daily and Weekly Routines; Talking about Likes and Dislikes; Talking about Sports and Hobbies; Talking about Abilities by Using "can", "can't"; Using Adjectives that Describe People; Talking about Appearance, Personality and Feelings of People; Talking about Clothes and Colours; Talking about Shopping and Prices; Using Present Continuous Tense.

**iNG188 (Eng) English II 3+0 3.0**

Using Simple Present Tense; Comparing Simple Present and Present Continuous Tenses; Using Prepositions of Time and Place; Giving Directions, Making Reservations; Using "to be" in Past Tense; Using Regular and Irregular Verbs in Simple Past Tense; Using Comparative and Superlative Form of Adjectives; Using Modals to Give Advice; Suggestions and Obligations; Using Future Tense: Making Sentences Using "going to" and "will"; Using If Clauses Type 0 and 1.

**iNG225 (Eng) Academic English I 3+0 3.0**

Reading Skills for Academic Study: Understanding key vocabulary, Getting the gist of the text, Skimming and scanning, Understanding text organization, Developing basic vocabulary knowledge; Listening Skills for Academic Study: Listening for main idea, Listening for detailed information, Listening to short daily conversations, Listening for key ideas; Speaking Skills for Academic Study: Introducing oneself, Maintaining everyday conversations, Giving descriptions of events, Asking

and answering questions; Writing Skills for Academic Study: Writing simple sentences, Writing notes, Writing basic descriptions of events, Writing informal letters.

**iNG226 (Eng) Academic English II 3+0 3.0**

Reading Skills for Academic Study: Exposure to simple academic texts, Developing reading fluency, Identifying text type, Improving academic vocabulary knowledge, Distinguishing key ideas from supporting details; Listening Skills for Academic Study: Distinguishing main idea from the detailed information, Listening to short texts on different topics, Noticing intonation; Speaking Skills for Academic Study: Asking for information, Giving detailed information on relevant topics, Asking for and giving directions; Writing Skills for Academic Study: Writing simple and compound sentences, Writing simple biographies, Writing brief reports, Writing short paragraphs.

**iNG325 (Eng) Academic English III 3+0 3.0**

Reading Skills for Academic Study: Developing reading fluency, Adapting reading style to different text types, Practicing critical reading skills; Listening Skills for Academic Study: Listening to longer texts, Listening to short authentic texts, Recognizing stress and intonation; Speaking Skills for Academic Study: Asking for clarification, Asking for confirmation, Giving reasons and explanations, Giving short presentations on familiar topics; Writing Skills for Academic Study: Identifying different styles of paragraphs, Paraphrasing ideas in short texts, writing academic paragraphs, Writing formal and informal academic texts, Writing summaries.

**iNG326 (Eng) Academic English IV 3+0 3.0**

Reading Skills for Academic Study: Adjusting speed and reading style to different genres and tasks, Reviewing and analyzing material, Focusing on critical reading skills, Recognizing biases in written works; Listening skills for academic study: Listening to longer authentic texts, Taking notes, Distinguishing facts from opinions, Drawing inferences; Speaking Skills for Academic Study: Participating in group discussions, Expanding opinions, Giving longer presentations on familiar topics; Writing skills for academic study: Expressing opinions in well-organized academic essays, paraphrasing ideas in texts, writing summaries of longer texts.

**iNG361 (Eng) English for Specific Purposes I 2+0 4.0**

Length; International System of Measurement; Cycles in Environment; Function of Stomata; Green Algae; Proteins; Air Pollution; Cytoplasmic Organelles: Mitochondri, Endoplasmic reticulum, Ribosomes, Golgi apparatus, Vocoules, Lysosomes, Microfilaments, Microtubules; Symbiotic Relationships: Symbiosis, Mutualism, Commensalism, Parasitism; Nucleic Acids; The Structure of DNA; The Cell Theory; What is Mitosis?; What are Viruses?; Amoeba: A simple protozoan; Mutations; Acid Rain.Length; International System of Measurement; Cycles in Environment; Function of Stomata; Green Algae; Proteins; Air Pollution; Cytoplasmic Organelles: Mitochondri, Endoplasmic reticulum, Ribosomes, Golgi apparatus, Vocoules, Lysosomes, Microfilaments, Microtubules; Symbiotic Relationships: Symbiosis, Mutualism, Commensalisms, Parasitism; Nucleic Acids; The Structure of DNA; The Cell Theory; What is Mitosis?; What are Viruses?; Amoeba: A simple protozoan; Mutations; Acid Rain.

**iNG362 (Eng) English for Specific Purposes II 2+0 4.0**

Cell chemistry; Comparisons of the Prokaryotic and Eucaryotic Cells; Microbial Nutrition: Culture media; Microbial Growth; Laboratory Culture of Microorganisms; Sterilization and Aseptic Techniques: Heat sterilization, Radiation sterilization, Filter sterilization, Chemical growth control, Antibiotics, Antibiotic resistance; Procedures for Isolating Microorganisms from Nature; Metabolic Diversity Among Microorganisms; Microbial Ecology.

**iNG425 (Eng) Academic English V 3+0 3.0**

Reading Skills for Academic Study: Analyzing texts, Drawing conclusions and identifying implied meaning, Developing the vocabulary in the field of study; Listening Skills for Academic Study: Drawing inferences from the theme, Taking notes during a lecture, Interpreting what is heard, Following lectures on familiar topics; Speaking Skills for Academic Study: Participating in discussions, Summarizing, Interviewing, Applying turn-taking rules, Giving presentations on a variety of topics, Commenting on classmates presentations; Writing Skills for Academic Study: Writing various forms of academic writing, Building effective arguments using evidence.

**iNG426 (Eng) Academic English VI 3+0 3.0**

Reading Skills for Academic Study: Drawing conclusions based on the information in the text, Comparing and contrasting main ideas, Summarizing extracts from various sources, Evaluating information; Listening Skills for Academic Study: Following lectures, Synthesizing, Evaluating and transferring what was heard; Speaking Skills for Academic Study: Participating in discussions, Justifying point of view, Using strategies to achieve comprehension, Carrying out interviews, Summarizing discussions, Giving longer presentations on academic topics; Writing Skills for Academic Study: Writing well-researched essays and reports, Writing commentaries.

**iSG401 Occupational Health and Safety I 2+0 2.0**

Overview of Occupational Health and Safety: Scope, Importance, Related concepts; Workplace Accidents and Occupational Diseases: Reasons, Precautions, Costs; Occupational Health and Safety: Responsible institutions, Problems in applications,

Legal basis for occupational safety, Legislation, Regulations for employers; Legal Responsibility of Employers for Workplace Accidents and Occupational Diseases: Liability concept, Regulations for employer responsibility.

**iSG402 Occupational Health and Safety II 2+0 2.0**

Compensation Claims for Occupational Health and Safety: Compensation types; Legislation for Employers not Abide by Occupational Health and Safety Instructions: Administrative sanctions, Criminal sanctions, Investigations for workplace accidents; Organization in Workplace for Occupational Health and Safety: Employee representative, Obligation for constituting board for occupational health and safety, Workplace health and safety board; International Legislation for Occupational Health and Safety: International legislation, European legislation, Comparison of national and international legislation.

**iSN409 Organizational Communication 3+0 4.5**

Communication and Models; The Functions of Communication; Perception and Persuasive Communication; Conformity and Obedience; The Goals and Functions of Communication in Organizations; Communication Forms in Organization; The Importance of Communication in Organization; Preventative Factors Related to Effective Communications in Organization and Conflict; Effective Speaking and Listening; Public Relations as a Form of Organizational Communication; The Techniques of Writing Reports.

**iST109 Document Preparation in Computer 3+0 3.5**

Word Processing Application: File operations, Text operations, Formatting operations, Page layout and printing, Table operations, Drawing tools and objects; Electronic Spreadsheet Application: File operations, Working with cells, Formatting operations, Worksheet settings and printing options, Adding operations, Formulas; Presentation Application: File operations, Text operations, Object operations, Slide format and printing options, Slide design, Adding animations. Word Processing Application: File operations, Text operations, Formatting operations, Page layout and printing, Table operations, Drawing tools and objects; Electronic Spreadsheet Application: File operations, Working with cells, Formatting operations, Worksheet settings and printing options, Adding operations, Formulas; Presentation Application: File operations, Text operations, Object operations, Slide format and printing options, Slide design, Adding animations.

**iST109 (Eng) Document Preparation in Computer 3+0 3.5**

Word Processing Application: File operations, Text operations, Formatting operations, Page layout and printing, Table operations, Drawing tools and objects; Electronic Spreadsheet Application: File operations, Working with cells, Formatting operations, Worksheet settings and printing options, Adding operations, Formulas; Presentation Application: File operations, Text operations, Object operations, Slide format and printing options, Slide design, Adding animations. Word Processing Application: File operations, Text operations, Formatting operations, Page layout and printing, Table operations, Drawing tools and objects; Electronic Spreadsheet Application: File operations, Working with cells, Formatting operations, Worksheet settings and printing options, Adding operations, Formulas; Presentation Application: File operations, Text operations, Object operations, Slide format and printing options, Slide design, Adding animations.

**iST126 Probability II 4+0 6.0**

Some Continuous Distributions: Uniform, Exponential, Gamma, Beta, Normal, Log-normal, Cauchy, Laplace and Weibull distributions; Families of Distributions: Location-scale families; Distribution of Function of Random Variable; Random Vectors: Distributions of random vectors, Joint probability function and joint probability density function; Marginal and Conditional Distributions; Covariance and Correlation Coefficient; Independent Random Variables; The Law of Large Numbers; The Central Limit Theorem. Some Continuous Distributions: Uniform, Exponential, Gamma, Beta, Normal, Log-normal, Cauchy, Laplace and Weibull distributions; Families of Distributions: Location-scale families; Distribution of Function of Random Variable; Random Vectors: Distributions of random vectors, Joint probability function and joint probability density function; Marginal and Conditional Distributions; Covariance and Correlation Coefficient; Independent Random Variables; The Law of Large Numbers; The Central Limit Theorem.

**iST126 (Eng) Probability II 4+0 6.0**

Some Continuous Distributions: Uniform, Exponential, Gamma, Beta, Normal, Log-normal, Cauchy, Laplace and Weibull distributions; Families of Distributions: Location-scale families; Distribution of Function of Random Variable; Random Vectors: Distributions of random vectors, Joint probability function and joint probability density function; Marginal and Conditional Distributions; Covariance and Correlation Coefficient; Independent Random Variables; The Law of Large Numbers; The Central Limit Theorem. Some Continuous Distributions: Uniform, Exponential, Gamma, Beta, Normal, Log-normal, Cauchy, Laplace and Weibull distributions; Families of Distributions: Location-scale families; Distribution of Function of Random Variable; Random Vectors: Distributions of random vectors, Joint probability function and joint probability density function; Marginal and Conditional Distributions; Covariance and Correlation Coefficient; Independent Random Variables; The Law of Large Numbers; The Central Limit Theorem.

**iST129 Statistics I 4+0 6.0**

Anakütle, örneklem, veri seti, deney birimi, değişken, ölçme düzeyleri; Verilerinin Grafiklerle Gösterimi: Sütun, Pasta, Dal-yaprak grafikleri, Histogram; Konum ölçüleri: Ortalama, medyan, mod; Yayılm ölçüleri: Değişim Aralığı; Varyans,

Standart sapma; Yüzdeler, Çeyreklikler, Kutu grafiği; Rassel Dene, Örnekleme Uzay, Olay, Olasılık ölçüsü ve özellikleri, Koşullu olasılık, Bağımsız olaylar; Rassel Değişken; Kesikli rassel değişkenler ve dağılımları: Binom ve Poisson dağılımları; Sürekli rassel değişkenler ve dağılımları: Normal dağılım ve özellikleri, Normal Dağılıma Sahip Bir Rassel Değişken için Olasılık Hesabı, Binom Dağılımına Normal Dağılım Yaklaşımı.

**İST129 (Eng) Statistics I 4+0 6.0**

Population, sample, data set, experimental unit, variable, scales of measurement; Displaying Data with Graphs: Bar, Pie, Stem-leaf plots, Histogram; Measures of location: Mean, median, mode; Measures for Dispersion: Range, Variance, Standard deviation; Percentiles, Quartiles, Box Plot; Basic Probability: Random experiment, Sample Space, Event, Probability measure, Conditional probability, Independent event; Random Variable; Discrete Random Variables, Binomial and Poisson Distributions; Continuous Random Variables; Normal distribution and its properties; Probability Calculation for a Normal Random Variable, Normal Approximation to Binomial Distribution.

**İST130 Statistics II 4+0 6.0**

Örnekleme kavramı, Örnekleme dağılımı ve özellikleri;  $\bar{X}$ 'nin Örnekleme Dağılımı ve Merkezi Limit Teoremi; Bir anakütle ortalaması, varyansı ve oranı için aralık tahmini; Hipotez testleri: Hata olasılıkları, testin gücü, p-değeri; Anakütle ortalaması, varyansı ve oranı için hipotez testleri; İki örnekleme dayalı olarak güven aralığı oluşturma ve hipotez testi: İki anakütle ortalamasını karşılaştırma (bağımsız ve bağımlı örneklemler), iki anakütle varyansını karşılaştırma, iki anakütle oranını karşılaştırma, Bir-Yönlü ANOVA, Basit doğrusal regresyon: EKK tahmini, güven aralıkları ve hipotez testi; Belirlilik Katsayısı; Korelasyon katsayısı.

**İST130 (Eng) Statistics II 4+0 6.0**

Sampling, sampling distribution and its properties; Sampling distribution of  $\bar{X}$  and Central Limit Theorem, Interval Estimation for population mean, variance and proportion; Hypothesis Testing: Error probabilities, power of the test, p-value; Hypothesis tests for population mean, variance and proportion; Confidence intervals and hypothesis testing based on two samples: comparing two population means (independent and dependent samples), comparing two population variances, comparing two population proportions; One-way ANOVA; Simple Linear Regression: LS Estimation; confidence intervals, hypothesis testing; Coefficient of Determination, Correlation Coefficient.

**İST209 Biostatistics 3+0 3.0**

Biostatistical Sciences and Statistical Relations; Importance of Statistics in Health Sciences; Basic Terminology of Statistics; Techniques for Data Collection; Preparation and Presentation of Data; Sampling: Sampling distributions; Point and interval estimations for population parameters; Distributions: Chi-square distribution; Hypothesis tests; Z distribution; T distribution; Calculation of Correlation and Regression Coefficients and Their Interpretations; Nonparametric Tests.

**İST213 Probability 3+0 3.0**

Permutation, Combination; Binomial Theorem; Definitions of Probability, Axiomatic Probability; Conditional Probability and Independent Events; Bayes' Theorem; Concept of Random Variable; Univariate Probability Distributions; Expected Value and Variance; Conditional Probability Distributions; Transformation; Probability Generating Function, Characteristic Function, Moment Generating Function; Some Special Discrete and Continuous Probability Distributions; Bivariate Probability Distributions. Permutation, Combination; Binomial Theorem; Definitions of Probability, Axiomatic Probability; Conditional Probability and Independent Events; Bayes' Theorem; Concept of Random Variable; Univariate Probability Distributions; Expected Value and Variance; Conditional Probability Distributions; Transformation; Probability Generating Function, Characteristic Function, Moment Generating Function; Some Special Discrete and Continuous Probability Distributions; Bivariate Probability Distributions.

**İST228 Advanced Operation Research 3+0 4.5**

Fundamental Concepts and Properties of Nonlinear Programming; Convexity and Concavity; Analytical and Numerical Solutions for Non-linear Models with Single and Multiple Variables; Kuhn-Tucker Conditions; Integer Programming; Capital Budgeting; Loading Problem; Warehouse Selection Problem; Distribution Problem; Traveling Salesman Problem; Use of Integer Variable in Model Development; Solution Approaches in Integer Programming: Branch and bound technique; Solution of 0-1 Linear-Integer Model; Dynamic Programming; Multi-level Decision Problems; Finite Level Number Problems; Decision-making under Risk and Uncertainty; Game theories; Decision-making under conflict.

**İST235 Linear Algebra I 4+0 5.0**

Systems of linear equations and its matrix representation; Row equivalent systems, echelon and reduced echelon forms of matrix, Gaussian and Gauss-Jordan eliminations; Matrix algebra and algebraic rules; Elementary matrices, its property; Gauss-Jordan method for computing inverse matrix; LU factorization of matrix; Determinants and its properties; The adjoint of a matrix; Cramer's rule; Vector spaces: Definition and examples; Subspaces, the null space of a matrix, span; Basis and dimension of vector space, change of basis; Row space and column space of matrix, the rank of a matrix; Consistency



theorem for linear systems; Eigen values and eigenvectors, characteristic equation, eigen space; Diagonalization; Symmetric, skew-symmetric, orthogonal matrices, its eigen values and eigenvectors; Quadratic forms, positive definite matrices; Principal axes theorem.

**iST236 Linear Algebra II 4+0 5.0**

Linear transformations and its matrix representations, properties; Similarity transformations; Orthogonality, orthogonal subspaces; Least squares problems; Inner product spaces and its properties; Orthonormal sets; The Gram-Schmidt orthogonalization process; QR factorization; Hermitian and Unitary matrices, Schur's theorem; The SVD decomposition of matrix; Lu decomposition; Orthogonal transformations: Householder transformations; Rotations and reflections, Givens transformations; Reduction to Hessenberg form, the power method; QR algorithm and some applications.

**iST239 Probability I 4+0 6.0**

Sets and Classes; Sigma Algebra, Borel Algebra; Random experiment, sample space and event; Probability Measures and Probability Spaces; Conditional Probability, Bayes theorem and independent events; Random variables and distribution functions; Discrete random variables and continuous random variables; Expected values: Mean, variance, moments, moment generating functions; Mode, median, skewness and kurtosis coefficients; Inequalities: Chebyshev, Cauchy-Schwarz and Jensen inequalities; Some discrete distributions: Uniform, Bernoulli, binomial, multinomial, geometric, negative binomial, hypergeometric and Poisson distributions. Sets and Classes; Sigma Algebra, Borel Algebra; Random experiment, sample space and event; Probability Measures and Probability Spaces; Conditional Probability, Bayes theorem and independent events; Random variables and distribution functions; Discrete random variables and continuous random variables; Expected values: Mean, variance, moments, moment generating functions; Mode, median, skewness and kurtosis coefficients; Inequalities: Chebyshev, Cauchy-Schwarz and Jensen inequalities; Some discrete distributions: Uniform, Bernoulli, binomial, multinomial, geometric, negative binomial, hypergeometric and Poisson distributions.

**iST239 (Eng) Probability I 4+0 6.0**

Sets and Classes; Sigma Algebra, Borel Algebra; Random experiment, sample space and event; Probability Measures and Probability Spaces; Conditional Probability, Bayes theorem and independent events; Random variables and distribution functions; Discrete random variables and continuous random variables; Expected values: Mean, variance, moments, moment generating functions; Mode, median, skewness and kurtosis coefficients; Inequalities: Chebyshev, Cauchy-Schwarz and Jensen inequalities; Some discrete distributions: Uniform, Bernoulli, binomial, multinomial, geometric, negative binomial, hypergeometric and Poisson distributions. Sets and Classes; Sigma Algebra, Borel Algebra; Random experiment, sample space and event; Probability Measures and Probability Spaces; Conditional Probability, Bayes theorem and independent events; Random variables and distribution functions; Discrete random variables and continuous random variables; Expected values: Mean, variance, moments, moment generating functions; Mode, median, skewness and kurtosis coefficients; Inequalities: Chebyshev, Cauchy-Schwarz and Jensen inequalities; Some discrete distributions: Uniform, Bernoulli, binomial, multinomial, geometric, negative binomial, hypergeometric and Poisson distributions.

**iST243 Exploratory Data Analysis 2+0 3.0**

Basic Concepts: Statistics, Data, Collecting and Summarizing Data, Exploratory Data Analysis; Graphic Displays: Dot Diagram, Stem-and-Leaf Display, Bar Graph, Histogram and Bihistogram, Box-and-Whisker Plot, Q-Q Plot, Mean and Standard Deviation Plots, Matrix Drawing, Star Plots, Chernoff Faces, Andrews Chart and Other Graphical Techniques; Measures of Central Tendency and Dispersion; Median Polish: Introduction, Case, Graphical Display. Basic Concepts: Statistics, Data, Collecting and Summarizing Data, Exploratory Data Analysis; Graphic Displays: Dot Diagram, Stem-and-Leaf Display, Bar Graph, Histogram and Bihistogram, Box-and-Whisker Plot, Q-Q Plot, Mean and Standard Deviation Plots, Matrix Drawing, Star Plots, Chernoff Faces, Andrews Chart and Other Graphical Techniques; Measures of Central Tendency and Dispersion; Median Polish: Introduction, Case, Graphical Display.

**iST243 (Eng) Exploratory Data Analysis 2+0 3.0**

Basic Concepts: Statistics, Data, Collecting and Summarizing Data, Exploratory Data Analysis; Graphic Displays: Dot Diagram, Stem-and-Leaf Display, Bar Graph, Histogram and Bihistogram, Box-and-Whisker Plot, Q-Q Plot, Mean and Standard Deviation Plots, Matrix Drawing, Star Plots, Chernoff Faces, Andrews Chart and Other Graphical Techniques; Measures of Central Tendency and Dispersion; Median Polish: Introduction, Case, Graphical Display. Basic Concepts: Statistics, Data, Collecting and Summarizing Data, Exploratory Data Analysis; Graphic Displays: Dot Diagram, Stem-and-Leaf Display, Bar Graph, Histogram and Bihistogram, Box-and-Whisker Plot, Q-Q Plot, Mean and Standard Deviation Plots, Matrix Drawing, Star Plots, Chernoff Faces, Andrews Chart and Other Graphical Techniques; Measures of Central Tendency and Dispersion; Median Polish: Introduction, Case, Graphical Display.

**iST247 Mathematical Statistics I 4+0 7.0**

Vector of Random Variables and Distributions of Random Vectors: Marginal and conditional distributions, Conditional expected value and variance; Bivariate Normal Distribution and Properties; Distributions of Functions of Random Variables: Distribution function technique, Transformation technique, Moment generating technique; Chi-Square, Student t and F Distributions; Concepts of Population, Parameter and Estimator; Sampling Distributions; Convergences: Convergence in probability, Convergence in distribution (Central limit theorem), Convergence almost surely; Order Statistics and Some Related Sample Statistics. Vector of Random Variables and Distributions of Random Vectors: Marginal and conditional

distributions, Conditional expected value and variance; Bivariate Normal Distribution and Properties; Distributions of Functions of Random Variables: Distribution function technique, Transformation technique, Moment generating technique; Chi-Square, Student t and F Distributions; Concepts of Population, Parameter and Estimator; Sampling Distributions; Convergences: Convergence in probability, Convergence in distribution (Central limit theorem), Convergence almost surely; Order Statistics and Some Related Sample Statistics.

**iST247 (Eng) Mathematical Statistics I 4+0 7.0**

Vector of Random Variables and Distributions of Random Vectors: Marginal and conditional distributions, Conditional expected value and variance; Bivariate Normal Distribution and Properties; Distributions of Functions of Random Variables: Distribution function technique, Transformation technique, Moment generating technique; Chi-Square, Student t and F Distributions; Concepts of Population, Parameter and Estimator; Sampling Distributions; Convergences: Convergence in probability, Convergence in distribution (Central limit theorem), Convergence almost surely; Order Statistics and Some Related Sample Statistics. Vector of Random Variables and Distributions of Random Vectors: Marginal and conditional distributions, Conditional expected value and variance; Bivariate Normal Distribution and Properties; Distributions of Functions of Random Variables: Distribution function technique, Transformation technique, Moment generating technique; Chi-Square, Student t and F Distributions; Concepts of Population, Parameter and Estimator; Sampling Distributions; Convergences: Convergence in probability, Convergence in distribution (Central limit theorem), Convergence almost surely; Order Statistics and Some Related Sample Statistics.

**iST248 Mathematical Statistics II 4+0 7.0**

Introduction to Parameter Estimation; Properties of Estimators: Unbiasedness, Sufficiency, Consistency, Efficiency and Completeness; Methods of Finding Estimators: Moment estimators, Maximum likelihood estimators, Least squares estimators; Minimum-Variance Unbiased Estimators: Cramer-Rao inequality, Rao-Blackwell theorem, Lehmann-Scheffe uniqueness theorem; Introduction to Hypothesis Testing: Simple and composite hypothesis; Test Function, Error Probabilities and Power Function; Most Powerful Tests: Neyman-Pearson lemma, Karlin-Rubin theorem; Likelihood Ratio Tests; Interval Estimators. Introduction to Parameter Estimation; Properties of Estimators: Unbiasedness, Sufficiency, Consistency, Efficiency and Completeness; Methods of Finding Estimators: Moment estimators, Maximum likelihood estimators, Least squares estimators; Minimum-Variance Unbiased Estimators: Cramer-Rao inequality, Rao-Blackwell theorem, Lehmann-Scheffe uniqueness theorem; Introduction to Hypothesis Testing: Simple and composite hypothesis; Test Function, Error Probabilities and Power Function; Most Powerful Tests: Neyman-Pearson lemma, Karlin-Rubin theorem; Likelihood Ratio Tests; Interval Estimators.

**iST248 (Eng) Mathematical Statistics II 4+0 7.0**

Introduction to Parameter Estimation; Properties of Estimators: Unbiasedness, Sufficiency, Consistency, Efficiency and Completeness; Methods of Finding Estimators: Moment estimators, Maximum likelihood estimators, Least squares estimators; Minimum-Variance Unbiased Estimators: Cramer-Rao inequality, Rao-Blackwell theorem, Lehmann-Scheffe uniqueness theorem; Introduction to Hypothesis Testing: Simple and composite hypothesis; Test Function, Error Probabilities and Power Function; Most Powerful Tests: Neyman-Pearson lemma, Karlin-Rubin theorem; Likelihood Ratio Tests; Interval Estimators. Introduction to Parameter Estimation; Properties of Estimators: Unbiasedness, Sufficiency, Consistency, Efficiency and Completeness; Methods of Finding Estimators: Moment estimators, Maximum likelihood estimators, Least squares estimators; Minimum-Variance Unbiased Estimators: Cramer-Rao inequality, Rao-Blackwell theorem, Lehmann-Scheffe uniqueness theorem; Introduction to Hypothesis Testing: Simple and composite hypothesis; Test Function, Error Probabilities and Power Function; Most Powerful Tests: Neyman-Pearson lemma, Karlin-Rubin theorem; Likelihood Ratio Tests; Interval Estimators.

**iST249 Programing with Matlab 4+0 5.0**

Introduction to MATLAB Programming: Variables, Data types; Data Processing, Reading and Writing in MATLAB; Fundamental MATLAB Operations and Functions; Program Control Commands: Conditional control, Loop control; Matrix and Vector Operations with MATLAB; Function Operations; Function Definition and Using with M-Files; Symbolic Programming: Limit, Derivative, Integral; Drawing of Two and Three Dimensional Graphics with MATLAB; Program Examples with MATLAB for Statistical Applications.

**iST249 (Eng) Programing with Matlab 4+0 5.0**

Introduction to MATLAB Programming: Variables, Data types; Data Processing, Reading and Writing in MATLAB; Fundamental MATLAB Operations and Functions; Program Control Commands: Conditional control, Loop control; Matrix and Vector Operations with MATLAB; Function Operations; Function Definition and Using with M-Files; Symbolic Programming: Limit, Derivative, Integral; Drawing of Two and Three Dimensional Graphics with MATLAB; Program Examples with MATLAB for Statistical Applications.

**iST256 (Eng) Introduction to R Programming 3+0 4.5**

Basic Data Structures; Data Import and Export: Data inspection and manipulation; Comparisons of Observed Group Means: T-tests; Add-on Packages: How to find, install, and work; How/where to obtain; Basic Programming Structures: Loops, If-else statements; Built-in Functions; Apply Family; R Graphics and Visualization: Base graphic system; Trellis graphics; Grid Graphics: One variable and two variables; Normal Distribution and Its Applications; Reporting.

**iST257 (Eng) Introduction to Data Science 2+0 3.0**

Linear Programming: Introduction, Linear programming model, Assumptions of linear programming; Simplex Method; Transportation and Assignment Problems; Network Analysis: Shortest-path problem, Minimum spanning tree problem, Maximum flow problem; Pert Analysis; Dynamic Programming; Integer Programming; Nonlinear Programming; Queuing Theory; Inventory Theory: Deterministic models, Stochastic models; Decision Analysis.

**iST305 Operational Research 3+0 6.0**

Linear Programming: Introduction, Linear programming model, Assumptions of linear programming; Simplex Method; Transportation and Assignment Problems; Network Analysis: Shortest-path problem, Minimum spanning tree problem, Maximum flow problem; Pert Analysis; Dynamic Programming; Integer Programming; Nonlinear Programming; Queuing Theory; Inventory Theory: Deterministic models, Stochastic models; Decision Analysis.

**iST309 Experimental Design I 3+0 6.0**

Comparing Two Sample Means: Paired comparison of two dependent sample means, Unpaired comparison of two independent sample means, F distribution, Logic of analysis of variance, One-way classification analysis of variance, Randomized block design; Randomized Complete Block Design; Two-way Analysis of Variance; Incomplete Designs; Latin Square Design: Greco-Latin square design, Yauden square design.

**iST309 (Eng) Experimental Design I 3+0 6.0**

Comparing Two Sample Means: Paired comparison of two dependent sample means, Unpaired comparison of two independent sample means, F distribution, Logic of analysis of variance, One-way classification analysis of variance, Randomized block design; Randomized Complete Block Design; Two-way Analysis of Variance; Incomplete Designs; Latin Square Design: Greco-Latin square design, Yauden square design.

**iST311 Non-Parametric Statistical Methods 3+0 5.5**

Stages of a Statistical Test; Non-Parametric Methods For One sample: Binomial test, Kolmogorov-Smirnov test, Wilcoxon mark test, Series test; Independent Two Sample Tests: Chi-square, Median, Mann-Whitney, Kolmogorov-Smirnov tests; Paired Two Sample Test: Sign, Wilcoxon, McNemar tests; Tests for More Than Two Samples: Kruskal Wallis k sample test, Two-way variance analysis of Friedman; Cochran Q Test; Non-Parametric Correlation Coefficients: Chi-square and correlation coefficient.

**iST311 (Eng) Non-Parametric Statistical Methods 3+0 5.5**

Stages of a Statistical Test; Non-Parametric Methods For One sample: Binomial test, Kolmogorov-Smirnov test, Wilcoxon mark test, Series test; Independent Two Sample Tests: Chi-square, Median, Mann-Whitney, Kolmogorov-Smirnov tests; Paired Two Sample Test: Sign, Wilcoxon, McNemar tests; Tests for More Than Two Samples: Kruskal Wallis k sample test, Two-way variance analysis of Friedman; Cochran Q Test; Non-Parametric Correlation Coefficients: Chi-square and correlation coefficient.

**iST331 Theoretical Hypothesis Testing 3+0 4.5**

Elementary and Joint Hypothesis; Tests; 1st and 2nd Type Errors; Power Functions; Neyman-Pearson Theorem; Mean Testing of Normal Distribution; Variance Testing of Normal Distribution; Behrens- Fisher Problems; Likelihood Ratio Test ; Sequential Likelihood Ratio Test; Goodness of Fit Chi-Square Test; Kolmogorov- Shirnov Test; Non-Parametric Tests.

**iST331 (Eng) Theoretical Hypothesis Testing 3+0 4.5**

Elementary and Joint Hypothesis; Tests; 1st and 2nd Type Errors; Power Functions; Neyman-Pearson Theorem; Mean Testing of Normal Distribution; Variance Testing of Normal Distribution; Behrens- Fisher Problems; Likelihood Ratio Test ; Sequential Likelihood Ratio Test; Goodness of Fit Chi-Square Test; Kolmogorov- Shirnov Test; Non-Parametric Tests.

**iST332 Decision Theory 2+0 3.0**

Probability Distributions: Random experiment, Classic and relative frequency definitions of probability; Bayes Theorem; Decision Making: Alternative strategies, Events, Uncertainty, Decision Making under Uncertainty, Laplace, Pessimistic, Minimax, Optimistic, Hurwicz methods; Decision Making under Partial Uncertainty: Expected value of correct information, Prior analysis, Gain-loss functions, Normal prior distributions.

**iST332 (Eng) Decision Making Theory 2+0 3.0**

Probability Distributions: Random experiment, Classic and relative frequency definitions of probability; Bayes Theorem; Decision Making: Alternative strategies, Events, Uncertainty, Decision Making under Uncertainty, Laplace, Pessimistic, Minimax, Optimistic, Hurwicz methods; Decision Making under Partial Uncertainty: Expected value of correct information, Prior analysis, Gain-loss functions, Normal prior distributions.

**iST333 Regression Analysis 4+0 6.5**

Conditional expectation and regression concept; Simple linear regression model and ordinary least squares (OLS) estimators of parameters; Assumptions of linear regression; Properties of OLS estimators: Gauss-Markov theorem; Hypothesis testing and confidence intervals in simple linear regression; Coefficient of determination; Multiple linear regression model in Matrix notation and OLS estimators of parameters; Hypothesis testing and confidence intervals in multiple linear regression; Indicator (dummy) variable; Checking the assumptions (residual analysis); Multicollinearity; Variable selection; Heteroscedasticity; Autocorrelation. Conditional expectation and regression concept; Simple linear regression model and ordinary least squares (OLS) estimators of parameters; Assumptions of linear regression; Properties of OLS estimators: Gauss-Markov theorem; Hypothesis testing and confidence intervals in simple linear regression; Coefficient of determination; Multiple linear regression model in Matrix notation and OLS estimators of parameters; Hypothesis testing and confidence intervals in multiple linear regression; Indicator (dummy) variable; Checking the assumptions (residual analysis); Multicollinearity; Variable selection; Heteroscedasticity; Autocorrelation.

**iST333 (Eng) Regression Analysis 4+0 6.5**

Conditional expectation and regression concept; Simple linear regression model and ordinary least squares (OLS) estimators of parameters; Assumptions of linear regression; Properties of OLS estimators: Gauss-Markov theorem; Hypothesis testing and confidence intervals in simple linear regression; Coefficient of determination; Multiple linear regression model in Matrix notation and OLS estimators of parameters; Hypothesis testing and confidence intervals in multiple linear regression; Indicator (dummy) variable; Checking the assumptions (residual analysis); Multicollinearity; Variable selection; Heteroscedasticity; Autocorrelation. Conditional expectation and regression concept; Simple linear regression model and ordinary least squares (OLS) estimators of parameters; Assumptions of linear regression; Properties of OLS estimators: Gauss-Markov theorem; Hypothesis testing and confidence intervals in simple linear regression; Coefficient of determination; Multiple linear regression model in Matrix notation and OLS estimators of parameters; Hypothesis testing and confidence intervals in multiple linear regression; Indicator (dummy) variable; Checking the assumptions (residual analysis); Multicollinearity; Variable selection; Heteroscedasticity; Autocorrelation.

**iST334 Experimental Design II 4+0 6.0**

Comparison of Regression Analysis And Analysis of Variance: Advantages and disadvantages of the two techniques; Multifactor Experiments; 2<sup>2</sup> Factorial Designs; Two or More Repeated Designs; 3<sup>2</sup> Factorial Designs; Split-Plot Design; Analysis of Covariance; Fractional Replication; Post-Hoc Tests: Tukey, Scheffe, Dunnett, Duncan Tests.

**iST334 (Eng) Experimental Design II 4+0 6.0**

Comparison of Regression Analysis And Analysis of Variance: Advantages and disadvantages of the two techniques; Multifactor Experiments; 2<sup>2</sup> Factorial Designs; Two or More Repeated Designs; 3<sup>2</sup> Factorial Designs; Split-Plot Design; Analysis of Covariance; Fractional Replication; Post-Hoc Tests: Tukey, Scheffe, Dunnett, Duncan Tests.

**iST335 Sampling 4+0 6.5**

Principal Concepts and Descriptions; Simple Random Sampling: Choosing sample process, Estimation of parameters, Variances of estimators, Confidence intervals; Estimation of Sample Size: Estimation of sample size in simple random sampling, Cost factor in determining sample size; Stratified Sampling: Stratified random sampling, Optimum allocation to strata of sample size; Ratio Estimations: Ratio estimations in simple random sampling, Ratio estimations in stratified random sampling; Systematic Sampling: Choosing sample process, Estimation of parameters, Variances of estimators, Stratified systematic sampling; Cluster Sampling: Cluster sampling method for equal cluster sizes, Cluster sampling method for different cluster sizes.

**iST337 Multivariate Time Series 3+0 4.0**

Probability Space and Random Variable; Vector Time series; Stationary vector time series; Auto covariance and Autocorrelation matrix and their properties; Model Selection in Vector Time series; Vector Moving Average Series; Vector Autoregressive Series; Canonical Forms of Vector Time series; Non-stationary vector time series; Examples; The concept of Co-integration; Co-integration matrix and its properties; Estimation Methods of Co-integration Vector; Engle-Granger Method; Johansen Method

**iST347 Spreadsheets and Databases 3+0 3.5**

Introduction to Spreadsheets; Data Types and Data Entry; Data Import, Export; Data Binding from Multiple Workbooks; Adding Graphics and Editing; Using Macros in Spreadsheets and Programming; Introduction to Databases; Table, Form, Query, Reporting; Setting Up the Database Connection with Other Software. Introduction to Spreadsheets; Data Types and Data Entry; Data Import, Export; Data Binding from Multiple Workbooks; Adding Graphics and Editing; Using Macros in Spreadsheets and Programming; Introduction to Databases; Table, Form, Query, Reporting; Setting Up the Database Connection with Other Software.

**iST347 (Eng) Spreadsheets and Databases 3+0 3.5**

Introduction to Spreadsheets; Data Types and Data Entry; Data Import, Export; Data Binding from Multiple Workbooks; Adding Graphics and Editing; Using Macros in Spreadsheets and Programming; Introduction to Databases; Table, Form, Query, Reporting; Setting Up the Database Connection with Other Software. Introduction to Spreadsheets; Data Types and

Data Entry; Data Import, Export; Data Binding from Multiple Workbooks; Adding Graphics and Editing; Using Macros in Spreadsheets and Programming; Introduction to Databases; Table, Form, Query, Reporting; Setting Up the Database Connection with Other Software.

**iST349 (Eng) Statistical Modelling Techniques 3+0 5.0**

Introduction to Minitab: Installing and starting the program; Minitab Main Menus: File and Edit menus, Data and Calc menus, Editor and Tools menus; Data Entry and Data Processing: Splitting and merging of data files, Line-column operations; Random Data Generation; Matrix Entry and Operations; Graph Menu and Plotting Graphics; Plotting Time Series Graphics; Stat Menu: Calculation of descriptive statistics, Frequency Series and creation of cross-tables, z and Student-t tests, Assessing the assumption of normality, One-way analysis of variance.

**iST351 Statistical Packages I 2+0 3.0**

Introduction to Minitab: Installing and starting the program; Minitab Main Menus: File and Edit menus, Data and Calc menus, Editor and Tools menus; Data Entry and Data Processing: Splitting and merging of data files, Line-column operations; Random Data Generation; Matrix Entry and Operations; Graph Menu and Plotting Graphics; Plotting Time Series Graphics; Stat Menu: Calculation of descriptive statistics, Frequency Series and creation of cross-tables, z and Student-t tests, Assessing the assumption of normality, One-way analysis of variance.

**iST352 Statistical Packages II 2+0 3.0**

Introduction to SPSS: Installing and starting the program; SPSS Main Menus: File, Edit and View menus, Data and Transform menus, Utilities, Add-ons, Window and Help menus; Data Entry and Variable Definitions; Selecting and Weighting of Cases According to Specific Criteria; Data Processing: Unit and variable operations, Splitting, merging and saving data files; Input of Survey Data; Graph Menu and Plotting Graphics; Stat Menu: Calculation of descriptive statistics, Frequency series and creation of cross-tables; Parametric Tests: z and Student-t tests, Assessing the assumption of normality, One-way analysis of variance.

**iST353 Case Studies in Data Science 3+0 5.0**

Vaka Analizi çalışmaları: Problemin tanımlanması; Literatür taraması; Keşifçi veri analizi; Makine öğrenmesi modellerinin eğitilmesi: Uygun model grubunun seçilmesi; Model performansının analizi; En iyi performansı gösteren modelin seçimi; Model davranışının araştırılması: Gözlem düzeyinde model davranışının açıklanması; Veriseti düzeyinde model davranışının açıklanması; Değişkenlerin önemliliğinin araştırılması; Değişkenlerin modelin ortalama tahminine olan katkısının araştırılması, Sonuçların raporlanması: Model performansı ve davranışının raporlanması; Raporun sunulması.

**iST356 Programming with Python 4+0 5.0**

Introduction to Python Programming and Basic Concepts: Variables, Data types, Operators; Lists, Tuples, Sets and Dictionaries in Python; Data Entry and Exit Operations: Processors, Operators; Logical Control and Comparison Operations; Loops; Basic Functions; Operations in Modules; Error Handling in Python; Function Definition and Using Module; Graphing and Visualization in Python; Statistics Applications with Python

**iST356 (Eng) Programming with Python 4+0 5.0**

Introduction to Python Programming and Basic Concepts: Variables, Data types, Operators; Lists, Tuples, Sets and Dictionaries in Python; Data Entry and Exit Operations: Processors, Operators; Logical Control and Comparison Operations; Loops; Basic Functions; Operations in Modules; Error Handling in Python; Function Definition and Using Module; Graphing and Visualization in Python; Statistics Applications with Python

**iST358 (Eng) Database and Management 3+0 4.5**

Basic Concepts of Database Management Systems; Design of Relational Database; Normalization Operation in Database; Introduction to Structured Query Language; Structured Query Language Data Types; Basic Operations of Structured Query Language: Select, Where; Data Control Language in Structured Query Language; Query Operations in Structured Query Language; Arithmetic Operators in Structured Query Language; Operational Functions in Structured Query Language; Subqueries in Structured Query Language; Applications in Structured Query Language.

**iST411 Time Series Analysis 4+0 5.0**

Definition and Properties of Time Series; Purposes of Time Series Analysis; Classification of Time Series: Stationary and non-stationary time series, seasonal and non-seasonal series; Forecasting in Time Series Analysis by Using One Variable Technique: Trend analysis, Moving averages, Exponential smoothing; Linear Stationary Stochastic Models: AR and MA models; Non-Stationary Linear Stochastic Models: ARIMA models, Seasonal models.

**iST412 Fuzzy Logic 2+0 3.0**

Fuzzy logic and vagueness; Relation between Fuzzy Logic and Statistics; Fuzzy Set theory: Fuzzy sets, Crisp sets, Fuzzy Set Operations; Fuzzy logic membership functions: Triangular membership function, Trapezoid membership function, Gaussian membership function, Generalized membership function; Fuzzy logic inference systems: Mamdani fuzzy model, Sugeno fuzzy model, Tsukamoto fuzzy model; Matlab applications and sample applications.

**iST413 Introduction to Artificial Neural Networks 3+0 5.0**

Introduction to Artificial Neural Networks; Biological Neural Networks; Activation Functions; Architectures of Artificial Neural Network; Mc Culloch-Pitts Neurons; Simple Artificial Neural Networks for Pattern Classification; Linear Separability; Hebb Learning Algorithm; Perceptron; Architecture and Learning Algorithm of Perceptron; Multilayer Feed Forward Neural Networks; Backpropagation Algorithms.

**iST415 Reliability Analysis 3+0 5.0**

Fundamental Concepts of Reliability: Failure rate function, Cumulative failure rate function and bathtub curve, Conditional reliability and mean time to failure; Constant Failure Rate Model: Two-parameter exponential distribution; Time-dependent Failure Models: Weibull distribution, Normal distribution and Lognormal distribution; Reliability of Systems: Series systems, Parallel systems, Series-parallel systems; Implementation of Survival Analysis in Reliability; Exponential and Weibull Models in Survival Analysis; Kaplan-Meier Method and Cox Regression Analysis.

**iST420 Demography 2+0 3.0**

Population; Population Theories; Population Census; Population Politics; Analysis of Population according to Sex; Dividing Population into Standard Types; Determining Age; Determining Population according to Age; Errors Related to Determining Age; Age Pyramid; Distribution of Age; Births: Factors on births, Birth rates; Deaths: Factors on deaths, Death rates; Marriages and Divorces: Changes in marriage rates, Changes in divorce rates.

**iST430 Stochastic Processes 4+0 5.0**

Definition of a Probabilistic Process: Independently increased process, Stationary process, Markov chain; Discrete Markov chain: Transition probabilities, Probability vector and probability matrix, Relation between initial probability and n-step probability vector; 2 State Markov Chain; Classification of States and Limit Theorem: Generating functions, Limit theorems; Closed Cluster: Nonrecurring Markov chain; Eigen values and Eigen vectors of Transition Matrix; Recurrent Markov Chain.; Birth and Death processes.

**iST432 Simulation 4+0 4.5**

Simulation modeling concept and discrete event simulation, Random number generation and testing; Generating random varieties; Simulation software, Building simulation models, Selection of probability distributions for model inputs, Validation and verification of simulation models; Output analysis, Comparison of alternative systems, Applications of computer simulations. Simulation modeling concept and discrete event simulation, Random number generation and testing; Generating random varieties; Simulation software, Building simulation models, Selection of probability distributions for model inputs, Validation and verification of simulation models; Output analysis, Comparison of alternative systems, Applications of computer simulations.

**iST432 (Eng) Simulation 4+0 4.5**

Simulation modeling concept and discrete event simulation, Random number generation and testing; Generating random varieties; Simulation software, Building simulation models, Selection of probability distributions for model inputs, Validation and verification of simulation models; Output analysis, Comparison of alternative systems, Applications of computer simulations. Simulation modeling concept and discrete event simulation, Random number generation and testing; Generating random varieties; Simulation software, Building simulation models, Selection of probability distributions for model inputs, Validation and verification of simulation models; Output analysis, Comparison of alternative systems, Applications of computer simulations.

**iST438 (Eng) Machine Learning Methods and Applications 3+0 4.5**

Introduction to Machine Learning; Basics of Machine Learning; Linear Regression: Simple linear regression, Multiple linear regression; Variable Selection and Regularization; Subsample Selection; Resampling and Model Evaluation: Train-test-validation sets, Cross-validation, Bootstrapping; Bias-Variance Tradeoff; Comparison of The Models; Supervised Learning; Logistic Regression; K-Nearest Neighbors; Ensemble Learning: Bagging, Boosting; Unsupervised Learning; K-means algorithm.

**iST439 Graduation Project I 0+4 4.5**

Araştırmanın Konusunun Belirlenmesi: Uygulanacak araştırmanın konusunun ve amaçlarının saptanması, Araştırma konusuna ilişkin verilerin belirlenmesi, Birincil ve ikincil kaynaktan verilerin elde edilmesi, Konuya ilişkin kütüphane taramasının yapılması veya gerekli alan çalışmasının yapılması, Araştırmanın planının yapılması, Örneklem veya tamsayım tekniklerinden birisinin seçilmesi, Seçilen tekniğe uygun analiz ve uygulamanın yapılması.

**iST439 (Eng)      Graduation Project I      0+4   4.5**

Determining the Subject of the Research: Determining the subject and objectives of the research to be applied, Determining the data related to the research subject, Obtaining data from primary and secondary sources, Making a library search on the subject or conducting the necessary field study, Making the research plan, Choosing one of the sampling or enumeration techniques, Analysis and application of the chosen technique.

**iST440      Graduation Project II      0+4   4.5**

Belirlenen Araştırma Konusuna İlişkin Uygulama ve Analizin Gerçekleştirilmesi: Analizde kullanılacak istatistiksel tekniğin veya tekniklerin belirlenmesi, Çeşitli istatistik paket programları yardımı ile istatistiksel tekniklerin uygulanması, Sonuçların dökümünün elde edilmesi, Bulunan sonuçların rapor halinde yazılması, Araştırma konusunun tanımından analizine kadar yürütülen süreç içerisindeki aşamaların tez raporu olarak sunulması.

**iST440 (Eng)      Graduation Project II      0+4   4.5**

Implementation and Analysis of the Research Subject: Determination of the statistical technique or techniques to be used in the analysis, Application of statistical techniques with the help of various statistical package programs, Obtaining the results, Writing the results as a report, Presenting the stages in the process from the definition of the research subject to its analysis as a thesis report.

**iST451      Multivariate Statistics I      4+0   6.0**

Introduction: The organization of the data, descriptive statistics, graphical techniques; Distance: Euclidean distance, graphical representation; Matrix algebra and random vectors: eigenvectors-eigenvalues, quadratic forms; Mean vectors and covariance matrices: linear combinations of random variables; Random samples and the expected values of the sample mean and covariance matrix; Partitioning the covariance matrix; The multivariate normal distribution: properties, bivariate normal distribution; Sampling from multivariate normal distribution maximum likelihood estimation; Inferences about mean vector: Hotelling' s T<sub>2</sub>; Comparison of several multivariate means: MANOVA; Principal component analysis; Factor analysis; Factor rotation and factor scores: Application of PCA and FA. Introduction: The organization of the data, descriptive statistics, graphical techniques; Distance: Euclidean distance, graphical representation; Matrix algebra and random vectors: eigenvectors-eigenvalues, quadratic forms; Mean vectors and covariance matrices: linear combinations of random variables; Random samples and the expected values of the sample mean and covariance matrix; Partitioning the covariance matrix; The multivariate normal distribution: properties, bivariate normal distribution; Sampling from multivariate normal distribution maximum likelihood estimation; Inferences about mean vector: Hotelling' s T<sub>2</sub>; Comparison of several multivariate means: MANOVA; Principal component analysis; Factor analysis; Factor rotation and factor scores: Application of PCA and FA.

**iST451 (Eng)      Multivariate Statistics I      4+0   6.0**

Introduction: The organization of the data, descriptive statistics, graphical techniques; Distance: Euclidean distance, graphical representation; Matrix algebra and random vectors: eigenvectors-eigenvalues, quadratic forms; Mean vectors and covariance matrices: linear combinations of random variables; Random samples and the expected values of the sample mean and covariance matrix; Partitioning the covariance matrix; The multivariate normal distribution: properties, bivariate normal distribution; Sampling from multivariate normal distribution maximum likelihood estimation; Inferences about mean vector: Hotelling' s T<sub>2</sub>; Comparison of several multivariate means: MANOVA; Principal component analysis; Factor analysis; Factor rotation and factor scores: Application of PCA and FA. Introduction: The organization of the data, descriptive statistics, graphical techniques; Distance: Euclidean distance, graphical representation; Matrix algebra and random vectors: eigenvectors-eigenvalues, quadratic forms; Mean vectors and covariance matrices: linear combinations of random variables; Random samples and the expected values of the sample mean and covariance matrix; Partitioning the covariance matrix; The multivariate normal distribution: properties, bivariate normal distribution; Sampling from multivariate normal distribution maximum likelihood estimation; Inferences about mean vector: Hotelling' s T<sub>2</sub>; Comparison of several multivariate means: MANOVA; Principal component analysis; Factor analysis; Factor rotation and factor scores: Application of PCA and FA.

**iST452      Multivariate Statistics II      4+0   6.0**

Introduction: Classical linear regression model, Geometry of least squares; Multivariate Multiple Regression; Predictions of several variables and partial correlation coefficient; Canonical correlation analysis: Introduction, objective of canonical correlation analysis; The sample canonical correlation variates and sample canonical correlations; Discrimination and Classification: Introduction; Classification with two multivariate normal population; Fisher's approach to classification; Logistic regression and classification: Introduction, the logit model; Logistic regression with binomial responses; Clustering analysis: Introduction, similarity measures; Hierarchical clustering methods: Single linkage, complete linkage, average linkage; Nonhierarchical clustering methods: k-means method; Correspondence analysis. Introduction: Classical linear regression model, Geometry of least squares; Multivariate Multiple Regression; Predictions of several variables and partial correlation coefficient; Canonical correlation analysis: Introduction, objective of canonical correlation analysis; The sample canonical correlation variates and sample canonical correlations; Discrimination and Classification: Introduction; Classification with two multivariate normal population; Fisher's approach to classification; Logistic regression and





Management Techniques: First generation, Second generation, Third generation; New Approaches; Time Using Matrix, Stages in Effective Time Management; Importance of Communication; Personal Development; Case Studies. Time and Time Management: Concept of time, Time management; Historical Development of Time Management; Time Traps; Authority Transfer; Ability to Say No; Supplementary Techniques in Time Management; Classical Time Management Techniques: First generation, Second generation, Third generation; New Approaches; Time Using Matrix, Stages in Effective Time Management; Importance of Communication; Personal Development; Case Studies

**işL301 Human Resources Management 3+0 4.0**

Human Resources Management: Development, Goals and Principles; Functions of Human Resources Management: Human resources planning; Recruitment, Performance Appraisal, Training, Orientation and Development; Wage and Salary Administration; Career Management; International Human Resources Management; Technology in Human Resources Management. Human Resources Management: Development, Goals and Principles; Functions of Human Resources Management: Human resources planning; Recruitment, Performance Appraisal, Training, Orientation and Development; Wage and Salary Administration; Career Management; International Human Resources Management; Technology in Human Resources Management.

**işL421 Entrepreneurship 2+0 3.0**

Importance and Evolution of Entrepreneurship: Entrepreneurship within the framework of Manager, Concepts of Entrepreneur, Employer, Boss and Investor; Leadership in Entrepreneurship and Importance of Management Characteristics; Characteristics of Entrepreneurship; Changing Views of Entrepreneurship; General Evaluation of Entrepreneurship in Turkey: Change and Entrepreneurship; Entrepreneurship before and after the Republic; Female Entrepreneurs.

**işL459 (Eng) Project Management 2+0 5.0**

Basic Project management concepts, scope management, time management, CPM, PERT, Gantt graphics, cost management, quality management, human resources management, communication management, risk management, procurement management, Project management with MS Project software. Basic Project management concepts, scope management, time management, CPM, PERT, Gantt graphics, cost management, quality management, human resources management, communication management, risk management, procurement management, Project management with MS Project software.

**işL475 Techno-Entrepreneurship 3+0 4.0**

Techno-Entrepreneurship: Definitions, Concepts, History; Creativity and Innovation: Concepts, Innovation types, Situation in Turkey and world; Idea to Market: Emergence and commercialization process of business idea, road maps; Entrepreneurial Marketing: Concepts, strategy and implementation; Managerial Issues: Performance, Team work, Strategic orientations; Legal Issues: Patents, Copyrights, Law and regulations; Financial Issues: Sources of funding, Sponsorships; Characteristics of Techno-Entrepreneur: Background, Education, Personality; Sustainability and Innovator's Dilemma: Concepts, Reasons of failure; Future of Techno-Entrepreneurship: Trends.

**JEO101 General Geology 2+0 2.0**

Introduction to Geology; The Solar System and The Universe; General Properties of the Earth's Crust; Composition of The Earth: Minerals and Rocks; General Properties of Layered Rocks: Layer, Layering, Surface structures of layers; Determination of Age in Geology; Origin and Evolution of Life; Basis for Theory of Evolution; Evolution of Living Creatures; Tectonic Deformations: Magma, Volcanism, Plutonism; Metamorphism; Plate Tectonics; Weathering and Origin of Soil; Ground Water.

**KBRN301 Biological Security and Defense 2+0 3.0**

Overview of biological warfare; Historical development of biological warfare; Basic terms in biological safety; Diversity of biological warfare agents and their scientific classification, Morphological/cytological structures, Physiological properties, Ways of entry into the body and diffusion methods, Active and passive defense and general defense methods; Crime scene management in CBRN defense

**KBRN302 CBRN National and International Legislation in Defense 2+0 3.0**

Historical Development of Weapons of Mass Destruction (WMD) Regulations, Cyprus Defense Regulations and Implementation Principles in National and International Law, Concept of Crime, Precautionary Approach, CBRN control mechanisms, Nuclear security agreements, Biological and Toxin Weapons Convention, Peace treaties, Public awareness, Global situation, Agreement approaches by country, Terror, War, Anarchism approaches

**KBRN303 CBRN Defense Approaches and Components 2+0 3.0**

Risk, CBRN Risk, Defense, Principles of Defense, Defense Components, CBRN threats, Protection, Protective measures, Biosensors, Rapid detection systems, Early warning systems, Decontamination Systems, Smart Technologies, Neutralization, Disposal methods, Risk, Risk perception, Risk standardization, Risk identification, Biosafety, bioselectivity,

Biorisk, Epidemiology, Propagation characterization, Case studies, Scenarios, Active and Passive Defense, Reactive approach, Crime Scene Management, Hot areas, Cold areas, Warm areas, Decontamination, Disinfection, Hygiene, Sanitation

**KBRN304 Detection, Diagnosis and Interdisciplinary Laboratory Studies of CBRN War Agents 2+1 5.0**

Detection of CBRN War Agents, Requirements of Measurement Systems, Detection, Diagnosis and Monitoring of CBRN War Agents, Preventive strategies, locating, personification, transportation, work monitoring, protective strategies, masks, clothing, protective equipment, bunkers, Mitigation strategies, decontamination techniques, disinfection techniques, Anal decontamination with asepsis and antiseptics, Practice setups

**KBRN305 Nuclear Radiation and Its Threats 3+0 4.0**

Basic Radiation Physics, Dosimeter Principles, Radiation Quantities and Units, Radiation Dosimeter, Radiation Monitoring Devices, Individual Monitoring, External Radiotherapy Treatment Machines, External Photon Beam, Photon-Multiplier Tube Calibration, Radiation Warning Signs, Radiation Protection Methods, Effects of Radiation on Human Health, Nuclear Weapons, Nuclear War, Nuclear Wars in History, Consequences of Nuclear Wars, Prevention Methods in Nuclear War

**KBRN306 Approach and Crime Scene Management in CBRN Cases 2+0 3.0**

CBRN events (terror, war, industrial, etc.), Disaster and emergencies, Disaster management, Emergency management, Protection, Protective product technical conditions, Preparation of technical documents, First aid, First response, Identification, Approach control, Support personnel, Responsible Personnel, Process control, Quality Management, Records, Documents, Instructions and Procedures, International approach, and preparation processes

**KBRN307 Chemical Threats 2+0 3.0**

Identification of chemical threats, History and classification of chemical threats; Domestic Chemicals: Identification and classification of household chemicals, Correct use of household chemicals and ways to avoid accidents; Occupational Risks and Ways of Protection: Occupational groups where chemical threats are intense, Prevention methods and treatment; Toxic Industrial Chemicals: Industries using toxic industrial chemicals, Prevention and treatment from accidents; Chemical Warfare Agents and Classification; CBRN Units; Fast and Effective Decontamination Methods in CBRN Accidents

**KBRN308 Ecological Risk Analysis 2+0 3.0**

Subject and Scope of Ecology; Resource Competition and World Policy in the 21st Century; Ecology, Economy and War; Ecological Reflections of War Policies, Chemical and Biological Warfare from an Ecological Perspective; Ecological Effects of War Preparations; Case Study: Semey (Kazakhstan) Nuclear Weapons Test Site; Case Study: Using Puerto Rico Coral Reef Area as Practice Area; Ecological, Social and Economic Effects of the War Period; Case Study: Mine Destroyed Area (Croatia); Biodiversity Conservation and War; Effects of Migration in the War Period; Environmental Effects and Cost of War; Post-War Reconstruction

**KBRN309 Biological Threats 2+0 3.0**

Biological agents and their classification; Identification and assessment of biological risks; Reducing biological risks; Reasons for using arthropods as biological weapons and entomoterrorism agents; Groups of arthropods that are used as biological weapons and have the potential to be used; Examples of the use of arthropods as agents during the war period; Genetically modified arthropods and their uses; poisonous plants; Effects of biological threats on biodiversity; Case studies in herbal poisonings; The status of plants as a biological threat, Plants that pose a threat in public places and in our homes

**KBRN310 Cellular and Genetic Toxicity from CBRN Threats 2+0 3.0**

What are the CBRN Threats; Effects of chemical agents on cells and DNA, Cytological and genomic effects of infectious agents (viral, bacterial etc.), Cytotoxic and genomic effects of radiological and nuclear exposures, Exposure to CBRN-induced threats. Definition of Cytotoxicity; Types of cellular toxicity, methods for determining cytotoxicity after CBRN exposure. Definition of Genotoxicity; Mutations and DNA lesions due to CBRN exposure, methods of determination of DNA damage

**KBRN312 Food Safety and Sanitation 2+0 3.0**

Definitions and Regulations Related to Sanitation; Relationship of Biosecurity to Sanitation; Relationship of microorganisms to sanitation: Microbial growth factors, Food spoilage, Foodborne illnesses, Microbial destruction, Microbial load determination, Diagnostic tests; Relationship of allergens to sanitation; Personal Hygiene and Food Handling; Introduction to HACCP (Hazard Analysis and Critical Control Points); Cleaning compounds; Sanitizers; Sanitation equipment; Sanitation Practices for Various Foods: Low-moisture foods, Dairy, Meat and poultry, Seafood, Fruit and vegetables, Beverages; Waste Product Handling; Management and Sanitation

**KiM121 General Chemistry Laboratory I 0+3 2.0**

Knowledge and Principles in Laboratory; Conservation of Matter Identification (Description) from Physical and Chemical Properties; Determination of Densities of Solids and Liquids; Sublimation and Distillation Experiments; Determination of Boiling-point and Freezing-point; Determination of the Molecular Mass of a Metal; Thermal Decomposition of Potassium Chlorate, Determination of Copper (II) oxide in Copper (II) carbonate; Determination of Crystal Water in Copper Sulfate Penta Hydrate; Determination of Molar Volume of Gases.

**KiM121 (Eng) General Chemistry Laboratory I 0+3 2.0**

Knowledge and Principles in Laboratory; Conservation of Matter Identification (Description) from Physical and Chemical Properties; Determination of Densities of Solids and Liquids; Sublimation and Distillation Experiments; Determination of Boiling-point and Freezing-point; Determination of the Molecular Mass of a Metal; Thermal Decomposition of Potassium Chlorate, Determination of Copper (II) oxide in Copper (II) carbonate; Determination of Crystal Water in Copper Sulfate Penta Hydrate; Determination of Molar Volume of Gases.

**KiM122 General Chemistry Laboratory II 0+3 2.0**

Preparation of a Solution; Solubility of Alcohols in Water and Ether; Determination of the Solubility of Matter; Determination of the Composition of Potassium Nitrate Copper (II) Nitrate; Determination of Molecular Mass from Boiling-point Elevation and Freezing-point Depression; Acid-Base Titration; Precipitation of Barium Sulfate; Precipitation of Iron (III) Hydroxide; Investigation of Metal Activity; Effect of Concentration and Temperature on Reaction Rate; Effect of Surface Area and Catalyst on Reaction Rate; Chemical Equilibrium.

**KiM122 (Eng) General Chemistry Laboratory II 0+3 2.0**

Preparation of a Solution; Solubility of Alcohols in Water and Ether; Determination of the Solubility of Matter; Determination of the Composition of Potassium Nitrate Copper (II) Nitrate; Determination of Molecular Mass from Boiling-point Elevation and Freezing-point Depression; Acid-Base Titration; Precipitation of Barium Sulfate; Precipitation of Iron (III) Hydroxide; Investigation of Metal Activity; Effect of Concentration and Temperature on Reaction Rate; Effect of Surface Area and Catalyst on Reaction Rate; Chemical Equilibrium.

**KiM131 General Chemistry Laboratory 0+2 2.0**

Chemistry Laboratory Safety Rules; Writing a Laboratory Report; Rules Cleaning Laboratory Glassware; Identification of Substances by Physical and Chemical Properties; Law of Conservation of Mass; Density of Substances; Melting and Boiling Points; Separation and Purification Processes; Solubility; Solutions, Colloids and Suspensions; Solution Preparation; Titration Acid-Base; Reaction Rates and Equilibrium. Chemistry Laboratory Safety Rules; Writing a Laboratory Report; Rules Cleaning Laboratory Glassware; Identification of Substances by Physical and Chemical Properties; Law of Conservation of Mass; Density of Substances; Melting and Boiling Points; Separation and Purification Processes; Solubility; Solutions, Colloids and Suspensions; Solution Preparation; Titration Acid-Base; Reaction Rates and Equilibrium.

**KiM133 General Chemistry I 5+0 6.0**

Matter: The elements, Compounds, Mixtures; Measurements and the Concept Mole: Determination of chemical formulas, Chemical Reactions-Modifying Matter: Chemical equations and chemical reactions; Reaction Stoichiometry: How to use reaction stoichiometry; The Properties of Gases: The gas laws; Thermo-chemistry Energy, Heat, and Enthalpy: The enthalpy of chemical change, The heat output of reactions; Observing Atoms: Models of atoms; Chemical Bonds; Molecules-Shape, Size and Bond Strength; Liquid and Solid Materials: Liquid structure, Solid structures; Carbon-Based Materials: Hydrocarbons, Polymers. Matter: The elements, Compounds, Mixtures; Measurements and the Concept Mole: Determination of chemical formulas, Chemical Reactions-Modifying Matter: Chemical equations and chemical reactions; Reaction Stoichiometry: How to use reaction stoichiometry; The Properties of Gases: The gas laws; Thermo-chemistry Energy, Heat, and Enthalpy: The enthalpy of chemical change, The heat output of reactions; Observing Atoms: Models of atoms; Chemical Bonds; Molecules-Shape, Size and Bond Strength; Liquid and Solid Materials: Liquid structure, Solid structures; Carbon-Based Materials: Hydrocarbons, Polymers.

**KiM133 (Eng) General Chemistry I 5+0 6.0**

Matter: The elements, Compounds, Mixtures; Measurements and the Concept Mole: Determination of chemical formulas, Chemical Reactions-Modifying Matter: Chemical equations and chemical reactions; Reaction Stoichiometry: How to use reaction stoichiometry; The Properties of Gases: The gas laws; Thermo-chemistry Energy, Heat, and Enthalpy: The enthalpy of chemical change, The heat output of reactions; Observing Atoms: Models of atoms; Chemical Bonds; Molecules-Shape,

Size and Bond Strength; Liquid and Solid Materials: Liquid structure, Solid structures; Carbon-Based Materials: Hydrocarbons, Polymers. Matter: The elements, Compounds, Mixtures; Measurements and the Concept Mole: Determination of chemical formulas, Chemical Reactions-Modifying Matter: Chemical equations and chemical reactions; Reaction Stoichiometry: How to use reaction stoichiometry; The Properties of Gases: The gas laws; Thermo-chemistry Energy, Heat, and Enthalpy: The enthalpy of chemical change, The heat output of reactions; Observing Atoms: Models of atoms; Chemical Bonds; Molecules-Shape, Size and Bond Strength; Liquid and Solid Materials: Liquid structure, Solid structures; Carbon-Based Materials: Hydrocarbons, Polymers.

**KiM134 General Chemistry II 5+0 6.0**

The Properties of Solutions: Solutes and solvents; Chemical Equilibrium: Using equilibrium constant; Protons in Transition-Acids and Bases: Weak acids and bases; Salts in Water: Ions as acids and bases, Titrations, Buffer solutions; Energy in Transition-Thermodynamics: The first law of thermodynamics; Electrons in Transition-Electrochemistry: Galvanic cells, Electrolysis; Kinetics-The Rate of Reactions: Concentration and rate, Reaction mechanisms; The Main Group Elements I-The First four Families; The Main Group Elements II-The Last Four Families; The dBlock Metals in Transition; Nuclear Chemistry: Radioactivity, Nuclear energy. The Properties of Solutions: Solutes and solvents; Chemical Equilibrium: Using equilibrium constant; Protons in Transition-Acids and Bases: Weak acids and bases; Salts in Water: Ions as acids and bases, Titrations, Buffer solutions; Energy in Transition-Thermodynamics: The first law of thermodynamics; Electrons in Transition-Electrochemistry: Galvanic cells, Electrolysis; Kinetics-The Rate of Reactions: Concentration and rate, Reaction mechanisms; The Main Group Elements I-The First four Families; The Main Group Elements II-The Last Four Families; The dBlock Metals in Transition; Nuclear Chemistry: Radioactivity, Nuclear energy.

**KiM134 (Eng) General Chemistry II 5+0 6.0**

The Properties of Solutions: Solutes and solvents; Chemical Equilibrium: Using equilibrium constant; Protons in Transition-Acids and Bases: Weak acids and bases; Salts in Water: Ions as acids and bases, Titrations, Buffer solutions; Energy in Transition-Thermodynamics: The first law of thermodynamics; Electrons in Transition-Electrochemistry: Galvanic cells, Electrolysis; Kinetics-The Rate of Reactions: Concentration and rate, Reaction mechanisms; The Main Group Elements I-The First four Families; The Main Group Elements II-The Last Four Families; The dBlock Metals in Transition; Nuclear Chemistry: Radioactivity, Nuclear energy. The Properties of Solutions: Solutes and solvents; Chemical Equilibrium: Using equilibrium constant; Protons in Transition-Acids and Bases: Weak acids and bases; Salts in Water: Ions as acids and bases, Titrations, Buffer solutions; Energy in Transition-Thermodynamics: The first law of thermodynamics; Electrons in Transition-Electrochemistry: Galvanic cells, Electrolysis; Kinetics-The Rate of Reactions: Concentration and rate, Reaction mechanisms; The Main Group Elements I-The First four Families; The Main Group Elements II-The Last Four Families; The dBlock Metals in Transition; Nuclear Chemistry: Radioactivity, Nuclear energy.

**KiM208 Organic Chemistry 3+0 4.0**

Structure, Reactivity and Mechanism; Mechanisms of Electrophilic and Nucleophilic Substitution Reactions; Chemical Bonds; Alkanes; Alkenes; Alkynes; Nomenclature of Organic Compounds; Alcohols; Alkyl Halides; Ethers; Geometric and Stereo chemical Isomers; Aldehydes and Ketones; Carboxylic Acids; Esters; Acyl Halides; Amids; Concept of Aromaticity; Aromatic Substitutions; Aromatic Nitro Compounds; Phenols; Aromatic Aldehydes and Ketones; Aromatic Acids; Aromatic Amines. Structure, Reactivity and Mechanism; Mechanisms of Electrophilic and Nucleophilic Substitution Reactions; Chemical Bonds; Alkanes; Alkenes; Alkynes; Nomenclature of Organic Compounds; Alcohols; Alkyl Halides; Ethers; Geometric and Stereo chemical Isomers; Aldehydes and Ketones; Carboxylic Acids; Esters; Acyl Halides; Amids; Concept of Aromaticity; Aromatic Substitutions; Aromatic Nitro Compounds; Phenols; Aromatic Aldehydes and Ketones; Aromatic Acids; Aromatic Amines.

**KiM209 Mathematical Methods for Chemistry 2+0 3.0**

Significant Figures: Significant figure, Numbers and measurements, Arithmetic operations; Use of Logarithms, Matrices and Determinants in Chemistry Problems; Plotting Graphs of Experimental Data: Finding the equation of a straight line from a graph, Least squares and linear regression; Interpolation and Extrapolation; Errors and Treatment of Experimental Data: Experimental errors, Random error, Standard deviation, Student's t.

**KiM215 Environnant Problems 2+0 3.0**

Environnemental Pollution: General topics, Environmental legislation; Waters Pollution: Water pollution sources, Pollutants effects, Rivers and lakes pollution, Properties of wastewater and environmental effects, Chemical analysis in the control of water pollution; Air Pollution: Pollutant components and effects, Control methods, Chemical analysis in the control of air pollution; Soil Pollution: Soil pollution sources, Pollutants movement through the soil; Solid Wastes: Solid waste sources, properties, Disposal methods; Other Environmental Problems: Noise, Odour, Radioactive pollution.

**KiM217 Basics About Safe Working Techniques in Chemistry Laboratories 2+0 3.0**

Safe Handling of Basic Laboratory Equipments; Eye and Safety Precautions for Eye Protection; Labeling of Chemicals to Indicate Their Basic Properties; Safe Transport and Storage of Chemicals; Basic Principles of Safe Working with Chemicals; Carcinogenic, Teratogenic, Mutagenic Chemicals and Basics About Safe Working with These Chemicals; Precautions and Causes of Fire and Explosion in Laboratories; Electricity Safety in Laboratories; Microbiological Safety In Laboratories.

- KiM218 Radiation in Daily Life 2+0 3.0**  
 Fundamental Principles of Radiation; Classification of Radiation: Nonionizing radiation (Electromagnetic Radiation), ionizing radiation (Nuclear Radiation); Interaction of Electromagnetic Radiation with the living; Nuclear Radiation: Units of ionizing radiation and safety limits, Effect of ionizing radiation, Radioactive wastes and environmental problems; Applications of Electromagnetic Radiation: Biomedical applications of electromagnetic waves, Industrial applications of micro waves, Applications of nuclear energy; Protection of people from nonionizing radiation, Protection of people from ionizing radiation.
- KiM221 Analytical Chemistry Laboratory I 0+6 3.0**  
 Separations in Groups of Cations with the Hydrogen Sulfide Method; Characteristic Reactions of First and Second Group Cations and their Separations; Characteristic Reactions of Third, Fourth and Fifth Group Cations and their Separations; Characteristic Reactions of First and Second Group Anions and their Separations; Characteristic Reactions of Third, Fourth and Fifth Group Anions and their Separations; Systematic Analysis of Cations and Anions in an Unknown Sample; Quantitative Determination of Sulfate by Gravimetry; Quantitative Determination of Iron by Gravimetry; Quantitative Determination of Nickel by Gravimetry.
- KiM221 (Eng) Analytical Chemistry Laboratory I 0+6 3.0**  
 Separations in Groups of Cations with the Hydrogen Sulfide Method; Characteristic Reactions of First and Second Group Cations and their Separations; Characteristic Reactions of Third, Fourth and Fifth Group Cations and their Separations; Characteristic Reactions of First and Second Group Anions and their Separations; Characteristic Reactions of Third, Fourth and Fifth Group Anions and their Separations; Systematic Analysis of Cations and Anions in an Unknown Sample; Quantitative Determination of Sulfate by Gravimetry; Quantitative Determination of Iron by Gravimetry; Quantitative Determination of Nickel by Gravimetry.
- KiM222 Analytical Chemistry Laboratory II 0+6 3.0**  
 Quantitative Determination of Hydrochloric Acid by means of Volumetric Analysis; Quantitative Determination of Mixture of Sodium Carbonate-Sodium Hydrogencarbonate with Acid-Base Titration; Quantitative Determination of Borax by Acid-Base Titration; Quantitative Determination of Chloride via Precipitation Titration; The Determination of Iron via Oxidation-Reduction Titration Method; The Determination of Copper by means of Iodometric Titration Method; Determination of Water Hardness and the Determination of Zinc in Brass by Titration with EDTA; The Fusion Experiments in the Various Samples; Semi-quantitative Analyses in an Unknown Sample.
- KiM222 (Eng) Analytical Chemistry Laboratory II 0+6 3.0**  
 Quantitative Determination of Hydrochloric Acid by means of Volumetric Analysis; Quantitative Determination of Mixture of Sodium Carbonate-Sodium Hydrogencarbonate with Acid-Base Titration; Quantitative Determination of Borax by Acid-Base Titration; Quantitative Determination of Chloride via Precipitation Titration; The Determination of Iron via Oxidation-Reduction Titration Method; The Determination of Copper by means of Iodometric Titration Method; Determination of Water Hardness and the Determination of Zinc in Brass by Titration with EDTA; The Fusion Experiments in the Various Samples; Semi-quantitative Analyses in an Unknown Sample.
- KiM240 Instrumental Analysis I 3+0 4.0**  
 Characterization of Electromagnetic Radiation; Interaction of Electromagnetic Radiation and Electromagnetic Spectrum; Basic Principles of Spectroscopic Techniques; General Information on Components of Spectroscopic Instruments; The Factors that Influence the Band Width in Spectral Transition; Basic Principles of Atomic Spectroscopy; Emission and Molecular Spectroscopy; Florimetric Methods; Intensity of Spectral Transition; Basic Principles of ICP; Basic Principles of X-Ray.
- KiM257 Inorganic Chemistry I 4+0 5.0**  
 SI Units; The structure of atom: Atom, The hydrogen atom and Bohr theory, Particle-wave character of electron, Heisenberg's uncertainty principle, Quantum model and Schrödinger wave equation, Atoms with poly electrons, Pauli principle, Slater and Hund rule, Aufbau principle, Energy levels in atom; Periodic Properties of Elements: Size of atom and ion, Ionization energy, Electron affinity, Electro negativity; Introduction to Bonding in Chemistry: Ionic, Covalent bonds: Lewis formulas, Resonance; Metallic Bond: Covalent bond: Lewis theory, VBT, Hybridization, MOT and Combination of atomic orbital; Molecular geometry. SI Units; The structure of atom: Atom, The hydrogen atom and Bohr theory, Particle-wave character of electron, Heisenberg's uncertainty principle, Quantum model and Schrödinger wave equation, Atoms with poly electrons, Pauli principle, Slater and Hund rule, Aufbau principle, Energy levels in atom; Periodic Properties of Elements: Size of atom and ion, Ionization energy, Electron affinity, Electro negativity; Introduction to Bonding in Chemistry: Ionic, Covalent bonds: Lewis formulas, Resonance; Metallic Bond: Covalent bond: Lewis theory, VBT, Hybridization, MOT and Combination of atomic orbital; Molecular geometry.
- KiM257 (Eng) Inorganic Chemistry I 4+0 5.0**  
 SI Units; The structure of atom: Atom, The hydrogen atom and Bohr theory, Particle-wave character of electron, Heisenberg's uncertainty principle, Quantum model and Schrödinger wave equation, Atoms with poly electrons, Pauli

principle, Slater and Hund rule, Aufbau principle, Energy levels in atom; Periodic Properties of Elements: Size of atom and ion, Ionization energy, Electron affinity, Electro negativity; Introduction to Bonding in Chemistry: Ionic, Covalent bonds: Lewis formulas, Resonance; Metallic Bond: Covalent bond: Lewis theory, VBT, Hybridization, MOT and Combination of atomic orbital; Molecular geometry. SI Units; The structure of atom: Atom, The hydrogen atom and Bohr theory, Particle-wave character of electron, Heisenberg's uncertainty principle, Quantum model and Schrödinger wave equation, Atoms with poly electrons, Pauli principle, Slater and Hund rule, Aufbau principle, Energy levels in atom; Periodic Properties of Elements: Size of atom and ion, Ionization energy, Electron affinity, Electro negativity; Introduction to Bonding in Chemistry: Ionic, Covalent bonds: Lewis formulas, Resonance; Metallic Bond: Covalent bond: Lewis theory, VBT, Hybridization, MOT and Combination of atomic orbital; Molecular geometry.

**KİM259 History of Chemistry 2+0 3.0**

The evolution Stages of Science, Historical Writting of Chemistry, Chemistry Practicality B.C. and First Written Sources Regarding Chemistry, Chemistry rules B.C., Alchemy age, Before and After Lavoiser; The First Developments in Organic, Inorganic and Physicochemistry, Peryodic Table, Latest Developments in Atomism and Nuclear Chemistry, Arise of Chemistry Industry and Development of Chemistry Industry, Arise of Chemistry Industry and Development of Chemistry Industry in Turkey, Importance of Basic Sciences and Role in The development of Applied Sciences, Chemistry Industry and Freedom of Opinon of Science-Scientist, Nobel Prizes in Chemistry.

**KİM275 Analytical Chemistry I 4+0 5.0**

Basic Concepts in Analytical Chemistry; Errors in Chemical Analysis: Random errors in analysis; Statistical Evaluation of Analytical Data; Gravimetric Methods of Analysis: Properties of precipitates and precipitating reagents; Titrimetric Methods of Analysis: Properties of volumetric titrimetry; Aqueous-Solution Chemistry; Chemical Equilibrium; The Effect of Electrolytes on Ionic Equilibrium; Thermodynamic and Concentration Equilibrium Constants; Application of Multiple-Equilibrium of Equilibrium Calculations. Basic Concepts in Analytical Chemistry; Errors in Chemical Analysis: Random errors in analysis; Statistical Evaluation of Analytical Data; Gravimetric Methods of Analysis: Properties of precipitates and precipitating reagents; Titrimetric Methods of Analysis: Properties of volumetric titrimetry; Aqueous-Solution Chemistry; Chemical Equilibrium; The Effect of Electrolytes on Ionic Equilibrium; Thermodynamic and Concentration Equilibrium Constants; Application of Multiple-Equilibrium of Equilibrium Calculations.

**KİM275 (Eng) Analytical Chemistry I 4+0 5.0**

Basic Concepts in Analytical Chemistry; Errors in Chemical Analysis: Random errors in analysis; Statistical Evaluation of Analytical Data; Gravimetric Methods of Analysis: Properties of precipitates and precipitating reagents; Titrimetric Methods of Analysis: Properties of volumetric titrimetry; Aqueous-Solution Chemistry; Chemical Equilibrium; The Effect of Electrolytes on Ionic Equilibrium; Thermodynamic and Concentration Equilibrium Constants; Application of Multiple-Equilibrium of Equilibrium Calculations. Basic Concepts in Analytical Chemistry; Errors in Chemical Analysis: Random errors in analysis; Statistical Evaluation of Analytical Data; Gravimetric Methods of Analysis: Properties of precipitates and precipitating reagents; Titrimetric Methods of Analysis: Properties of volumetric titrimetry; Aqueous-Solution Chemistry; Chemical Equilibrium; The Effect of Electrolytes on Ionic Equilibrium; Thermodynamic and Concentration Equilibrium Constants; Application of Multiple-Equilibrium of Equilibrium Calculations.

**KİM276 Analytical Chemistry II 4+0 5.0**

Theory of Neutralization Titrations: Acid-base indicators; Titration Curves for Complex Acid-Base Systems: Poly-functional acids and bases; Applications of Neutralization Titrations; Precipitation Titrations; Complex Formation Titrations: Complex-Formation: Titrations with metals; An Introduction to Electrochemistry; Electrode Potentials; Applications of Standard Electrode Potentials; Oxidation-Reduction Indicators; Applications of Oxidation-Reduction Titrations. Theory of Neutralization Titrations: Acid-base indicators; Titration Curves for Complex Acid-Base Systems: Poly-functional acids and bases; Applications of Neutralization Titrations; Precipitation Titrations; Complex Formation Titrations: Complex-Formation: Titrations with metals; An Introduction to Electrochemistry; Electrode Potentials; Applications of Standard Electrode Potentials; Oxidation-Reduction Indicators; Applications of Oxidation-Reduction Titrations.

**KİM276 (Eng) Analytical Chemistry II 4+0 5.0**

Theory of Neutralization Titrations: Acid-base indicators; Titration Curves for Complex Acid-Base Systems: Poly-functional acids and bases; Applications of Neutralization Titrations; Precipitation Titrations; Complex Formation Titrations: Complex-Formation: Titrations with metals; An Introduction to Electrochemistry; Electrode Potentials; Applications of Standard Electrode Potentials; Oxidation-Reduction Indicators; Applications of Oxidation-Reduction Titrations. Theory of Neutralization Titrations: Acid-base indicators; Titration Curves for Complex Acid-Base Systems: Poly-functional acids and bases; Applications of Neutralization Titrations; Precipitation Titrations; Complex Formation Titrations: Complex-Formation: Titrations with metals; An Introduction to Electrochemistry; Electrode Potentials; Applications of Standard Electrode Potentials; Oxidation-Reduction Indicators; Applications of Oxidation-Reduction Titrations.

**KİM277 Organic Chemistry I 4+0 4.0**

Structure and chemical bonding in organic molecules, covalent bonding and chemical reactivity, acids and bases in organic chemistry, unstable intermediates, the main types of reaction mechanisms in organic chemistry; Nomenclature of aliphatic hydrocarbons, physical and chemical properties of alkenes, conformation of the alkenes, synthesis and reactions of alkenes; Physical and chemical properties of alkenes, elimination reactions (E1 and E2) and synthesis of alkenes, other reactions of alkenes, structural properties and reactions of conjugated dienes; Physical and chemical properties, preparation and reactions of alkynes; Stereochemistry, chiral molecules and optical activity, absolute configuration, Fischer projections, molecules incorporating several stereo-centers, stereochemistry in chemical reactions, separation of enantiomers. Structure and chemical bonding in organic molecules, covalent bonding and chemical reactivity, acids and bases in organic chemistry, unstable intermediates, the main types of reaction mechanisms in organic chemistry; Nomenclature of aliphatic hydrocarbons, physical and chemical properties of alkenes, conformation of the alkenes, synthesis and reactions of alkenes; Physical and chemical properties of alkenes, elimination reactions (E1 and E2) and synthesis of alkenes, other reactions of alkenes, structural properties and reactions of conjugated dienes; Physical and chemical properties, preparation and reactions of alkynes; Stereochemistry, chiral molecules and optical activity, absolute configuration, Fischer projections, molecules incorporating several stereo-centers, stereochemistry in chemical reactions, separation of enantiomers.

**KiM277 (Eng) Organic Chemistry I 4+0 4.0**

Structure and chemical bonding in organic molecules, covalent bonding and chemical reactivity, acids and bases in organic chemistry, unstable intermediates, the main types of reaction mechanisms in organic chemistry; Nomenclature of aliphatic hydrocarbons, physical and chemical properties of alkenes, conformation of the alkenes, synthesis and reactions of alkenes; Physical and chemical properties of alkenes, elimination reactions (E1 and E2) and synthesis of alkenes, other reactions of alkenes, structural properties and reactions of conjugated dienes; Physical and chemical properties, preparation and reactions of alkynes; Stereochemistry, chiral molecules and optical activity, absolute configuration, Fischer projections, molecules incorporating several stereo-centers, stereochemistry in chemical reactions, separation of enantiomers. Structure and chemical bonding in organic molecules, covalent bonding and chemical reactivity, acids and bases in organic chemistry, unstable intermediates, the main types of reaction mechanisms in organic chemistry; Nomenclature of aliphatic hydrocarbons, physical and chemical properties of alkenes, conformation of the alkenes, synthesis and reactions of alkenes; Physical and chemical properties of alkenes, elimination reactions (E1 and E2) and synthesis of alkenes, other reactions of alkenes, structural properties and reactions of conjugated dienes; Physical and chemical properties, preparation and reactions of alkynes; Stereochemistry, chiral molecules and optical activity, absolute configuration, Fischer projections, molecules incorporating several stereo-centers, stereochemistry in chemical reactions, separation of enantiomers.

**KiM278 Organic Chemistry II 4+0 5.0**

Aromatic compounds and their nomenclature, structure and properties of benzene; Hückel's rule and aromaticity; Electrophilic aromatic substitution reactions and synthesis of benzene derivatives; Physical and chemical properties of the alkyl halide and aryl halide compounds, nucleophilic substitution reactions (SN1 and SN2), synthesis and reactions of alkyl halides and aryl halides; Nomenclature, physical and chemical properties of alcohols and aryl alcohols, synthesis and reactions of alcohols; Structural properties, synthesis and reactions of thiols; Physical and chemical properties, nomenclature, synthesis and reactions of the ethers, epoxides and thio ethers; Physical and chemical properties, nomenclature, synthesis and reactions of the amines, nitro, nitroso, diazo and azo compounds. Aromatic compounds and their nomenclature, structure and properties of benzene; Hückel's rule and aromaticity; Electrophilic aromatic substitution reactions and synthesis of benzene derivatives; Physical and chemical properties of the alkyl halide and aryl halide compounds, nucleophilic substitution reactions (SN1 and SN2), synthesis and reactions of alkyl halides and aryl halides; Nomenclature, physical and chemical properties of alcohols and aryl alcohols, synthesis and reactions of alcohols; Structural properties, synthesis and reactions of thiols; Physical and chemical properties, nomenclature, synthesis and reactions of the ethers, epoxides and thio ethers; Physical and chemical properties, nomenclature, synthesis and reactions of the amines, nitro, nitroso, diazo and azo compounds.

**KiM278 (Eng) Organic Chemistry II 4+0 5.0**

Aromatic compounds and their nomenclature, structure and properties of benzene; Hückel's rule and aromaticity; Electrophilic aromatic substitution reactions and synthesis of benzene derivatives; Physical and chemical properties of the alkyl halide and aryl halide compounds, nucleophilic substitution reactions (SN1 and SN2), synthesis and reactions of alkyl halides and aryl halides; Nomenclature, physical and chemical properties of alcohols and aryl alcohols, synthesis and reactions of alcohols; Structural properties, synthesis and reactions of thiols; Physical and chemical properties, nomenclature, synthesis and reactions of the ethers, epoxides and thio ethers; Physical and chemical properties, nomenclature, synthesis and reactions of the amines, nitro, nitroso, diazo and azo compounds. Aromatic compounds and their nomenclature, structure and properties of benzene; Hückel's rule and aromaticity; Electrophilic aromatic substitution reactions and synthesis of benzene derivatives; Physical and chemical properties of the alkyl halide and aryl halide compounds, nucleophilic substitution reactions (SN1 and SN2), synthesis and reactions of alkyl halides and aryl halides; Nomenclature, physical and chemical properties of alcohols and aryl alcohols, synthesis and reactions of alcohols; Structural properties, synthesis and reactions of thiols; Physical and chemical properties, nomenclature, synthesis and reactions of the ethers, epoxides and thio ethers; Physical and chemical properties, nomenclature, synthesis and reactions of the amines, nitro, nitroso, diazo and azo compounds.

**KiM280 Glass Chemistry and Its Applications 2+1 3.0**

General Properties of Glass: Definition, Physical properties of glass, Chemical properties of glass, Thermal properties of glass, Optical properties of glass; Glass Types: Non-oxide and oxide, Halogen glasses, Metallic glasses; Viscosity: Definition of viscosity, Measurement of viscosity, Effect of viscosity of the compound; Structure of Glass: Introduction to the structure of glass, Oxide and other glass structures; Phases: Phase diagrams, Phase separation, Effect of components of phase diagrams; Color Formation in Glasses.

**KiM305 Water and Wastewater Analyses 2+0 3.0**

Methods of Sampling and Sample Storage; Errors in Analytical Results; Accuracy of Analytical Results; Methods of Detection Limit; Reporting for Analytical Results; The Selection and Development of Analytical Methods; Determination of General Properties of Waters: Temperature, Taste, Color, Turbidity, Salinity, Conductivity, pH, Calcium carbonate saturation, Hardness; Analyses of metals: Sample pre-treatment techniques, Metal analyses by atomic absorption spectrometry, Metal analyses by plasma emission spectroscopy, Metal analyses by anodic stripping voltammetry.

**KiM314 Textile Chemistry and Its Applications 1+2 3.0**

General Properties of Textile Fibers: Polymerization, Inter-polymer forces of attraction, Fiber morphology; Classification of Textile Fibers: Natural fibers and their properties, Cellulosic fibers, Cotton, Viscose, acetate, protein fibers and their properties, Wool, silk, synthetic fibers and their properties, Nylon, Polyester; Dyeing and Printing: Theory of dyeing and printing, Dyes; Chemical Finishing of Textiles; Dyeing Textile Fibers: Dyeing cotton, Dyeing wool, Dyeing polyester, Dyeing polyester-cotton mixtures, Wash fastness test.

**KiM315 The Chemistry of Ceramics 2+0 3.0**

Introduction to Ceramics Materials; Raw Materials: Clay, Kaolin, Feldspars and others, Structure, Chemical properties of these raw materials; Preparation of raw materials; Suspension of ceramic materials in water: Slip and glaze viscosity, Zeta potential; Shaping methods, Slip casting, Shaping in plastic state, Pressing, Extrusion and others; Drying and firing of ceramic ware; Fuels; Kilns; Glazes, Enamels and glass chemistry; Chemical properties of refractory materials.

**KiM316 Drugs 2+0 3.0**

Introduction to drug concept and history; Classification of drugs; Nomenclature: Chemical, Pharmacopeal and commercial; The principles of interaction between drugs and biopolymers; Concept of biofunctional and chemofunctional groups; The general methods on starting materials of drugs: some analgesic drugs and their properties; Penicillin group antibiotics and properties; Tranquilizer drugs and properties; Sulphanilamide chemotherapeutic and mechanism of activity; Some starting materials of drugs which can be produced in Turkey.

**KiM318 The Extraordinary Chemistry of Ordinary Things 2+0 3.0**

Atoms, Elements and Chemical Bonding; Energy, Medicine and Nuclear Calendar; The Power of Hydrocarbons; Petroleum; Acids and Bases; The Electricity of chemistry; The States of Matter; Surfactants; Chemicals, pollution and environment; Food, fats and oils; Proteins and The Chemistry of Life; Minerals, vitamins and additives; Cosmetics; Medicine and Drugs.

**KiM321 Organic Chemistry Laboratory I 0+4 4.0**

Crystallization of Benzoic Acid; Sublimation of Naphthalene; Extraction Based on Chemical Reactions; Continuous Extraction with Solvents Less Dense than Water; Continuous Extraction with Solvents Denser than water; Continuous Extraction with Soxhlet Extractor; Simple Distillation; Fractional Distillation; Vacuum Distillation; Steam Distillation; Thin Layer Chromatography; Paper Chromatography; Column Chromatography; Nucleophilic Substitution Reactions (Synthesis of N-Butyl Bromide from N-Butanol); Elimination Reactions (Synthesis of 1-Hexene from 1-Hexanol); Iodination and Trans Electrophilic Addition (Synthesis of 1,2-Dibromohexane from 1-Hexanol).

**KiM321 (Eng) Organic Chemistry Laboratory I 0+4 4.0**

Crystallization of Benzoic Acid; Sublimation of Naphthalene; Extraction Based on Chemical Reactions; Continuous Extraction with Solvents Less Dense than Water; Continuous Extraction with Solvents Denser than water; Continuous Extraction with Soxhlet Extractor; Simple Distillation; Fractional Distillation; Vacuum Distillation; Steam Distillation; Thin Layer Chromatography; Paper Chromatography; Column Chromatography; Nucleophilic Substitution Reactions (Synthesis of N-Butyl Bromide from N-Butanol); Elimination Reactions (Synthesis of 1-Hexene from 1-Hexanol); Iodination and Trans Electrophilic Addition (Synthesis of 1,2-Dibromohexane from 1-Hexanol).

**KiM322 Organic Chemistry Laboratory II 0+4 4.0**

Catalytic Hydrogenation Reactions: Synthesis of aniline from nitrobenzene; Synthesis of Diazonium Salts: Synthesis of phenol from diazonium salts, Synthesis of bromobenzene from diazonium salts, Synthesis of azo dyes from diazonium salts; Esterification Reactions: Synthesis of ethyl benzoate from benzoic acid; Cannizzaro Reactions: Synthesis of benzyl alcohol and benzoic acid from benzaldehyde; Research Experiments; Qualitative Organic Analysis; Sodium Fusion; Elementary Analysis; Solubility Tests; Functional Group Analysis.

**KiM322 (Eng) Organic Chemistry Laboratory II 0+4 4.0**



Catalytic Hydrogenation Reactions: Synthesis of aniline from nitrobenzene; Synthesis of Diazonium Salts: Synthesis of phenol from diazonium salts, Synthesis of bromobenzene from diazonium salts, Synthesis of azo dyes from diazonium salts; Esterification Reactions: Synthesis of ethyl benzoate from benzoic acid; Cannizzaro Reactions: Synthesis of benzyl alcohol and benzoic acid from benzaldehyde; Research Experiments; Qualitative Organic Analysis; Sodium Fusion; Elementary Analysis; Solubility Tests; Functional Group Analysis.

**KiM324 Physical Chemistry Laboratory I 0+3 4.0**

Gases: The PVT Behavior and equation of state for ideal gas; Thermo chemistry: Determination of the enthalpy of neutralization; Colligative Properties: Determination of molar mass; Partial Molar Quantities: Partial molar volume; Viscosity: Viscosity measurements of liquids, Determining the molecular weight of a polymer from intrinsic viscosity measurement; Interfacial Chemistry: Determination of surface tension of liquids, Adsorption of liquids at solid surfaces; Phase Equilibrium and Diagrams: Solubility diagram of two partially mixing liquids, construction of phase diagram of a three-component system, Boiling point diagram of a binary mixture, Melting point diagram of a binary mixture.

**KiM325 Inorganic Chemistry Laboratory I 0+3 4.0**

Synthesis of Some Basic Ionic Compounds, Metal Oxides, Zwitter Salts and Covalent Compounds and Determination Experiment of Specific Characteristics of them by Gravimetric, Volumetric and Conductometric Methods; Oxides: Chromium (III) oxide, Copper (I) oxide, Calcium peroxide 0,4 and 8 hydrate, di-Iodine pentoxide; Salts: Tin (II) chloride dehydrate and anhydrous, Ammonium permanganate, Potassium monochloro chromate, Sodium tiosulfate, Lead iodine, Magnesium sulfate heptahydrate; Covalent Compounds: Tin(IV) iodine, Barium bromide, Iron (II) oxalate, Copper (I) iodide, Boron acetate.

**KiM325 (Eng) Inorganic Chemistry Laboratory I 0+3 4.0**

Synthesis of Some Basic Ionic Compounds, Metal Oxides, Zwitter Salts and Covalent Compounds and Determination Experiment of Specific Characteristics of them by Gravimetric, Volumetric and Conductometric Methods; Oxides: Chromium (III) oxide, Copper (I) oxide, Calcium peroxide 0,4 and 8 hydrate, di-Iodine pentoxide; Salts: Tin (II) chloride dehydrate and anhydrous, Ammonium permanganate, Potassium monochloro chromate, Sodium tiosulfate, Lead iodine, Magnesium sulfate heptahydrate; Covalent Compounds: Tin(IV) iodine, Barium bromide, Iron (II) oxalate, Copper (I) iodide, Boron acetate.

**KiM326 Inorganic Chemistry Laboratory II 0+3 4.0**

Synthesis of Some Basic Coordination Compounds and Inorganic Acids and Determination of Specific Characteristics of them with Gravimetric, Volumetric, Conductometric, Magnetic and Spectroscopic Method; Acids: Amino ethane sulfonic acid, Iodic acid; Coordination Compounds: Tetra amine copper (II) sulfate, Hexamine cobalt (III) chloride, cis-Potassium dioxalato diaqua chromate (III), Potassium tri oxalato aluminate, Hexamine nickel (II) chloride, Barium ferrate, Potassium dioxalato dihydroxo manganate, Sodium hegzanitro cobaltite, trans-potassium dioxalato dicaqua chromate (III).

**KiM326 (Eng) Inorganic Chemistry Laboratory II 0+3 4.0**

Synthesis of Some Basic Coordination Compounds and Inorganic Acids and Determination of Specific Characteristics of them with Gravimetric, Volumetric, Conductometric, Magnetic and Spectroscopic Method; Acids: Amino ethane sulfonic acid, Iodic acid; Coordination Compounds: Tetra amine copper (II) sulfate, Hexamine cobalt (III) chloride, cis-Potassium dioxalato diaqua chromate (III), Potassium tri oxalato aluminate, Hexamine nickel (II) chloride, Barium ferrate, Potassium dioxalato dihydroxo manganate, Sodium hegzanitro cobaltite, trans-potassium dioxalato dicaqua chromate (III).

**KiM331 Analysis Methods in Atomic Absorption 1+2 3.0**

Basic principles of the atomic absorption spectroscopy; Some applications of atomic absorption spectroscopy in foods: Quantitative determination of metals in fruit juice, tea, coffee and milk. Some applications of atomic absorption spectroscopy in pharmacy: Quantitative determination of lead in cosmetics, Quantitative determination of aluminum in pharmaceuticals; Some industrial applications of atomic absorption spectroscopy: Quantitative determination of copper in textile fabrics, Quantitative determination of potassium in fertilizers; Analysis of metals in natural water by atomic absorption spectroscopy.

**KiM334 Inorganic Chemistry II 4+0 5.0**

Solids: Crystal structure and calculation of Avogadro number, Ionic solids, Radius ratio, Lattice energy, Born-Haber cycle; Metals: Physical properties, Bonding theories in metals, Conductivity; Covalent Solids; Molecular Solids: Intermolecular forces: Vander Waals, London, Repulsion forces, Hydrogen bond; Acids and Bases: Classical approach, Lewis definition, Hard-Soft Acid-Base concept; Coordination compounds: Werner Theory, Nomenclature of C.C., Isomers, EAN rule, VB, MO Theories; Magnetic properties of coordination compounds; Ligands.

**KiM334 (Eng) Inorganic Chemistry II 4+0 5.0**

Solids: Crystal structure and calculation of Avogadro number, Ionic solids, Radius ratio, Lattice energy, Born-Haber cycle; Metals: Physical properties, Bonding theories in metals, Conductivity; Covalent Solids; Molecular Solids: Intermolecular forces: Vander Waals, London, Repulsion forces, Hydrogen bond; Acids and Bases: Classical approach, Lewis definition,

Hard-Soft Acid-Base concept; Coordination compounds: Werner Theory, Nomenclature of C.C., Isomers, EAN rule, VB, MO Theories; Magnetic properties of coordination compounds; Ligands.

**KiM336 Surface and Thermal Analysis Methods 1+2 3.0**

Determination of Surface Area; Determination of Micro, Meso and Macro Pore Sizes; Determination of Particle Size; Zeta Potential; Isoelectronic Point; Atomic Force Microscope; Scanning Tunneling Microscope; Determination of Surface Properties; Thermal Analysis; Thermal gravimetric analysis, Differential thermal analysis, Differential scanning calorimetry; Thermal Stability; Thermal Properties; Thermal Decomposition.

**KiM337 Organic Chemistry III 4+0 6.0**

Physical and chemical properties of carbonyl compounds, nomenclature of aldehydes and ketones, preparation of aldehydes and ketones, nucleophilic addition to aldehydes and ketones and condensation reactions, reactions of  $\alpha,\beta$ -unsaturated aldehydes and ketones; Physical and chemical properties, preparation of carboxylic acids and derivatives, reactivity of the carboxy group and the mechanism of addition-elimination reactions, transformation of the carboxylic acids into acyl halides, anhydride, ester and amide derivatives and other reactions, preparations and reactions of carbamic acid, urea and carbamates; Structural properties and reactions of nitriles, isonitriles and cyanates; Structural properties and nomenclature of heterocyclic compounds, reactions of aromatic heterocyclic compounds; Pericyclic chemistry. Physical and chemical properties of carbonyl compounds, nomenclature of aldehydes and ketones, preparation of aldehydes and ketones, nucleophilic addition to aldehydes and ketones and condensation reactions, reactions of  $\alpha,\beta$ -unsaturated aldehydes and ketones; Physical and chemical properties, preparation of carboxylic acids and derivatives, reactivity of the carboxy group and the mechanism of addition-elimination reactions, transformation of the carboxylic acids into acyl halides, anhydride, ester and amide derivatives and other reactions, preparations and reactions of carbamic acid, urea and carbamates; Structural properties and reactions of nitriles, isonitriles and cyanates; Structural properties and nomenclature of heterocyclic compounds, reactions of aromatic heterocyclic compounds; Pericyclic chemistry.

**KiM337 (Eng) Organic Chemistry III 4+0 6.0**

Physical and chemical properties of carbonyl compounds, nomenclature of aldehydes and ketones, preparation of aldehydes and ketones, nucleophilic addition to aldehydes and ketones and condensation reactions, reactions of  $\alpha,\beta$ -unsaturated aldehydes and ketones; Physical and chemical properties, preparation of carboxylic acids and derivatives, reactivity of the carboxy group and the mechanism of addition-elimination reactions, transformation of the carboxylic acids into acyl halides, anhydride, ester and amide derivatives and other reactions, preparations and reactions of carbamic acid, urea and carbamates; Structural properties and reactions of nitriles, isonitriles and cyanates; Structural properties and nomenclature of heterocyclic compounds, reactions of aromatic heterocyclic compounds; Pericyclic chemistry. Physical and chemical properties of carbonyl compounds, nomenclature of aldehydes and ketones, preparation of aldehydes and ketones, nucleophilic addition to aldehydes and ketones and condensation reactions, reactions of  $\alpha,\beta$ -unsaturated aldehydes and ketones; Physical and chemical properties, preparation of carboxylic acids and derivatives, reactivity of the carboxy group and the mechanism of addition-elimination reactions, transformation of the carboxylic acids into acyl halides, anhydride, ester and amide derivatives and other reactions, preparations and reactions of carbamic acid, urea and carbamates; Structural properties and reactions of nitriles, isonitriles and cyanates; Structural properties and nomenclature of heterocyclic compounds, reactions of aromatic heterocyclic compounds; Pericyclic chemistry.

**KiM338 X-Ray Diffraction Analysis Techniques 1+2 3.0**

Theory of X-Ray Diffraction and Identification of Molecular Structure; Principles of Single Crystal X-Ray Diffraction and Using X-Ray Diffraction Machine; Solid State Chemistry and Types of Crystals; Transition Metal Complexes and Techniques of Metal Complex Synthesis; Techniques of Coordination Polymers Synthesis: Crystallization techniques, data collection and structure solving of sample molecules from diffractometer.

**KiM339 Inorganic Technologies 2+0 3.0**

Industrial raw materials. Preparation and separation of raw materials. Industrial wastes. Industrial gases. Synthesis methods of sulfuric acid, nitric acid, phosphoric acid and hydrochloric acid and applications. Classification of mineral fertilizers. Important compounds of boron and production. Synthesis methods of ammonia and applications. Types and production of glass. Types and characteristics of cement. Production of iron and steel. Production and usage of aluminum.

**KiM341 Green Organic Chemistry 2+0 3.0**

Introduction to Green Chemistry; Ionic Liquids: Historical background and synthesis, Physical properties, Applications as reaction media, The future of ionic liquids; Fluorous Solvents: Physical properties, Applications as reaction media, Enantioselective catalysts for fluoruous biphasic systems, Heavy fluoruous reagents, Light fluoruous compounds and fluoruous silica gel, Fluorous reactions in supercritical carbon dioxide; Supercritical Carbon Dioxide: Physical properties, Applications as reaction media, Synthesis and separation, Experimental methods.

**KiM343 Instrumental Analysis II 3+0 4.0**

UV-VIS (Ultraviolet-Visible) Spectroscopy: Absorption of ultraviolet region and electronic excitation, Types of electronic transition; Inter-intra factors affecting absorption band shifting, factors affecting band intensities, Steric and other effects; Applications of UV spectroscopy, IR Spectroscopy: Absorption on infrared region, Types of infrared bands, Vibration types,

Infrared spectrometer, Infrared absorption regions, Factors affecting infrared spectrum, Applications of IR spectroscopy; Theory of Nuclear Magnetic Resonance.

**KiM345 Physical Chemistry I 3+0 5.0**

Properties of Gases: The ideal gas, Imperfect gases, nonideal behaviour and equation of state; The kinetic Theory of Gases; The First Law of Thermodynamics: Reversible and irreversible processes, Internal energy function, Enthalpy function, Dependence of internal energy and enthalpy on pressure, volume and temperature, Isothermal and adiabatic processes; The Second Law of Thermodynamics: Entropy, Entropy change in the system, surroundings and universe, The Carnot cycle, Absolute entropies; The Third Law of Thermodynamics; Thermochemistry: Internal energy and enthalpy changes in chemical reactions, Hess law, Temperature dependence of heats of reactions.

**KiM346 Physical Chemistry II 3+0 5.0**

Free Energy and Chemical Equilibria: Gibbs and Helmholtz functions, Dependence of the free energy on pressure, Quantitative relation between standard Gibbs free energy and the equilibrium constant, Temperature dependence of the free energy and the equilibrium constant of a reaction, Fugacity; The Thermodynamic Treatment of Multicomponent Systems: The thermodynamics of mixing, The ideal and nonideal solutions, Chemical potential, Activity, Partial molar quantities, Colligative properties; Surfaces and Processes at Interfaces; Phase Equilibria and Diagrams: Phase rule, Phase diagrams for one-, two- and three-component systems.

**KiM347 Food Chemistry and Technology 2+0 3.0**

Chemical Composition of Foods: Water, Amino acids and proteins, Enzymes, Lipids, Carbohydrates, Vitamins and minerals; Aroma Compounds; Food Additives; Food Contaminations; Milk and Dairy Products; Eggs, Meat and Fish; Edible Oils: Fats and oils; Cereals and Cereal Products; Legumes; Vegetables and Vegetable Products; Fruits and Fruit Products; Sugars: Sugar alcohols and honey; Alcoholic Beverages; Coffee, Tea, Cocoa; Spices; Salt and Vinegar; Drinking Water: Mineral and table water; Analysis of Food Components, Quality and safety controls; Food Storage Techniques; International Food Laws; European, USA and Turkish Food Codex.

**KiM348 Colour Chemistry and Synthesis Methods 2+0 3.0**

Physical and Chemical Basis of The Colour; Synthesis of Azo Dyes and Pigments; Synthesis of Carbonyl Dyes and Pigments; Synthesis of Phthalocyanines; Synthesis of Textile Dyes; Synthesis of Reactive Dyes For Textile Fibres; Synthesis of Functional Dyes or Advanced Technology; Synthesis of Inorganic Pigments; Organic Pigment Synthesis; Special Pigments Synthesis; Colour and The Environment; Comparison of Synthetic and Natural Dyes Substances; Substances and colours of natural dyes; Future Colour and Dyes.

**KiM349 Structure Characterization of Organic Compounds 2+0 3.0**

Importance of Structure Characterization in Organic Compounds; Separation and Purification Processes in Organic Compounds; Determination of the Physical Properties; General Principle of Elemental Analysis, Ultraviolet (UV), Infrared (IR), Nuclear magnetic resonance (NMR) and Mass Spectroscopy methods in organic compounds; Interpretation of NMR, IR and UV Spectra; Structure Characterization of Selected Special Samples by NMR, IR, UV, Mass Spectroscopy and Element Analysis Techniques; Structure Characterization for an Unknown Sample.

**KiM350 Introduction to Stereochemistry 2+0 3.0**

Classification of Isomers; Stereoisomers; Chirality; Chirality in Molecules; Chiral Carbons; Symmetry Plane; (R), (S), Naming System; Cahn-Ingold-Prelog Rules; Characteristics of the two Enantiomers; Optical Activity; Racemic Mixtures; Racemic Product; Optical Purity; Chiral conformers; Fischer Rules; Diastereomers; Two or More Chiral Carbon; Fischer-Rosanoff Convection; Determination of D and L; Diastereomers Features; Separation of Enantiomers; Basic Concepts of Stereochemistry.

**KiM353 Laboratory Accreditation 2+0 3.0**

Basic Concepts of Accreditation; Importance of Accreditation in Quality Management Systems; International Accreditation Associations; Accreditation Programs; Targets of Accreditation; Accreditation Standards; Standards of Experiment and Calibration Laboratories Accreditation ( TS EN ISO 17025); Accreditation Period of Laboratories; Management Conditions; Technical Requirements; Target Group.

**KiM354 Food Safety and Management Systems 2+0 3.0**

Food Safety: Nutritional health, Food hygiene, Food-borne health risks; Management Systems Used in the Food Industry: ISO 22000, FSSC 22000 (ISO 22002-1), BRC, IFS; Good Manufacturing Practices and Conditions Required: GMP/GHP, HACCP, Pest control, Hazard analysis, Cleaning and disinfection in food business; Food Safety Inspection and Auditor Behavior: Control methods and standards, Food safety controls, Auditor qualifications and behavior.

**KiM355 Hazardous Materials of Chemical and Safety I 2+0 3.0**

Classification: Principles of classification, Classification of substances and mixtures, Classification of samples; Class Specific Provisions: Explosive substances and articles, Gases, Flammable liquids, Flammable solids, Self-reactive substances and solid desensitized explosive, Substances liable to spontaneous combustion, Substances which, in contact with water, emit flammable gases, Oxidizing substances, Organic peroxides, Toxic substances, Infectious substances, Radioactive material, Corrosive substances, Miscellaneous dangerous substances and articles.

**KiM356 Hazardous Materials of Chemical and Safety II 2+0 3.0**

Special Provision: Dangerous goods list, special provisions and exemptions related to limited and excepted quantities; Packing and Tank Provisions; Consignment Procedures: General provisions, Marking and labelling, Documentation; Provisions Concerning The Conditions of Carriage, Loading, Unloading and Handling: Provisions concerning carriage in packages, Provisions concerning carriage in bulk, Provisions concerning carriage in tank, Provisions concerning loading, unloading and handling; Transport Restrictions by The Competent Authorities: Tunnel restrictions.

**KiM357 Introduction to Adsorption 2+0 3.0**

Adsorption: Types of adsorption, Adsorption forces, Physical and chemical adsorption, Adsorption heats, Factors affecting adsorption; Measurement of the Amount of Adsorption; Adsorbent Properties and Types; Adsorption Isotherms: Langmuir adsorption isotherm, Freundlich adsorption isotherm, BET adsorption isotherm; Adsorption Kinetics; Adsorption Thermodynamics; Applications of Adsorption in the Industries.

**KiM358 Instrumental Analysis III 4+0 4.0**

<sup>1</sup>H-NMR Spectroscopy: Chemical Shift and Chemical Factors Affecting Splitting, Spin-Spin Interaction Types and Factors Affecting the Interactions, Current Basic Rules of a proton Interaction with different protons, Second Order Spectra; <sup>13</sup>C NMR spectroscopy: Help with <sup>13</sup>C NMR Spectroscopy NMR Spectroscopy Structural Analysis; Fundamentals of ESR spectroscopy; Mass Spectrometry: Mass spectra and peak types, molecular ion peak, isotope peaks, Part stable peaks. Chromatography: Basic principles of chromatography, gas, high performance liquid and supercritical fluid chromatography; Electrophoresis: Capillary Electrophoresis and Capillary Chromatography. <sup>1</sup>H-NMR Spectroscopy: Chemical Shift and Chemical Factors Affecting Splitting, Spin-Spin Interaction Types and Factors Affecting the Interactions, Current Basic Rules of a proton Interaction with different protons, Second Order Spectra; <sup>13</sup>C NMR spectroscopy: Help with <sup>13</sup>C NMR Spectroscopy NMR Spectroscopy Structural Analysis; Fundamentals of ESR spectroscopy; Mass Spectrometry: Mass spectra and peak types, molecular ion peak, isotope peaks, Part stable peaks. Chromatography: Basic principles of chromatography, gas, high performance liquid and supercritical fluid chromatography; Electrophoresis: Capillary Electrophoresis and Capillary Chromatography.

**KiM358 (Eng) Instrumental Analysis III 4+0 4.0**

<sup>1</sup>H-NMR Spectroscopy: Chemical Shift and Chemical Factors Affecting Splitting, Spin-Spin Interaction Types and Factors Affecting the Interactions, Current Basic Rules of a proton Interaction with different protons, Second Order Spectra; <sup>13</sup>C NMR spectroscopy: Help with <sup>13</sup>C NMR Spectroscopy NMR Spectroscopy Structural Analysis; Fundamentals of ESR spectroscopy; Mass Spectrometry: Mass spectra and peak types, molecular ion peak, isotope peaks, Part stable peaks. Chromatography: Basic principles of chromatography, gas, high performance liquid and supercritical fluid chromatography; Electrophoresis: Capillary Electrophoresis and Capillary Chromatography. <sup>1</sup>H-NMR Spectroscopy: Chemical Shift and Chemical Factors Affecting Splitting, Spin-Spin Interaction Types and Factors Affecting the Interactions, Current Basic Rules of a proton Interaction with different protons, Second Order Spectra; <sup>13</sup>C NMR spectroscopy: Help with <sup>13</sup>C NMR Spectroscopy NMR Spectroscopy Structural Analysis; Fundamentals of ESR spectroscopy; Mass Spectrometry: Mass spectra and peak types, molecular ion peak, isotope peaks, Part stable peaks. Chromatography: Basic principles of chromatography, gas, high performance liquid and supercritical fluid chromatography; Electrophoresis: Capillary Electrophoresis and Capillary Chromatography.

**KiM359 Literature Searching 1+0 1.0**

Ethic in Science: Concept of ethics, Ethical rules related to scientific research and publications; Types of Publications and Science Citation Indexes; Library Use; Using Chemical Drawing Program (ChemOffice); Use of Chemical Abstract Service (CAS) and SciFinder Program; Searching through SciFinder; Access to Publications via SciFinder; Searching through Internet Search Engines; Searching Through Web Pages of Publishers; Use of YÖK Documentation and ULAKBİM Systems; Types of Scientific Reports and Plagiarism Prevention Programs (iThenticate and Turnitin); The Main Sections in Reporting; Referencing in Reports; Referencing by EndNote Program.

**KiM360 Introduction to Polymer Chemistry 2+0 3.0**

Basic Concepts for Polymers and Polymer Chemistry; Classification of Polymers; Molecular Weight of Polymers; Methods for Molecular Weight Determination of Polymers; Stereochemistry of Polymers; Polymer Morphology and Thermal Behavior; Step-reaction Polymerization; Addition Polymerization; Copolymerization and Other Polymerization Techniques; Physical and Mechanical Properties of Polymers; Functional Polymers.

**KiM362 (Eng) Technical Writing for Chemists 2+0 3.0**

The stages of writing a review article with the number of articles selected and limited as a result of the literature research conducted by the student on a particular subject. Introduction; Types of Technical Writing in Chemistry;

Organization/Sections of Technical Writing; Citation and References in Technical Writing; Visual Expression of Results; Databases and Searching Strategies for Literature Review; Preparation of an Outline and a Draft for a Research Report; Writing of the Sections of the Research Report; Principles of Oral Presentation; Visual Aids; Presentation of the Research Report; Poster Presentation Principles.

**KiM401 Biochemistry I 3+0 3.0**  
Organization in Living Organisms; Types of Cells and Their Differences; Functions of Basic Organelles; Functions of Bioelements; Amino Acids, Structures and Main Reactions; Main Natural Peptides and Functions; Classification of Proteins; Natural Defense Proteins; Enzymes and Cofactors; Nucleotides; Nucleic Acids; Structure and Types of RNA; Primary, Secondary, Tertiary Structure and Functions of DNA; Recombinant DNA Technology; Carbohydrates, Derivatives and Basic Reactions.

**KiM401 (Eng) Biochemistry I 3+0 3.0**  
Organization in Living Organisms; Types of Cells and Their Differences; Functions of Basic Organelles; Functions of Bioelements; Amino Acids, Structures and Main Reactions; Main Natural Peptides and Functions; Classification of Proteins; Natural Defense Proteins; Enzymes and Cofactors; Nucleotides; Nucleic Acids; Structure and Types of RNA; Primary, Secondary, Tertiary Structure and Functions of DNA; Recombinant DNA Technology; Carbohydrates, Derivatives and Basic Reactions.

**KiM402 Biochemistry II 3+0 3.0**  
Fatty Acids and General Properties; Simple Lipids, Types and Functions; Compound Lipids, Types and Functions; Main Carotenoids and Functions; Main Steroids and Functions; Lipid Vitamins and Functions; Biomembranes and Their Structures; Active and Passive Transport in Biomembranes and Membrane Receptors; Energy Yielding and Requiring Processes in Living Organisms and High-Energy Biomolecules; Carbohydrate Metabolism; Citric Acid Cycle; Oxidative Phosphorylation; Anabolic and Catabolic Reactions of Fatty Acids; Protein Synthesis and Role of DNA and RNA in this Synthesis.

**KiM402 (Eng) Biochemistry II 3+0 3.0**  
Fatty Acids and General Properties; Simple Lipids, Types and Functions; Compound Lipids, Types and Functions; Main Carotenoids and Functions; Main Steroids and Functions; Lipid Vitamins and Functions; Biomembranes and Their Structures; Active and Passive Transport in Biomembranes and Membrane Receptors; Energy Yielding and Requiring Processes in Living Organisms and High-Energy Biomolecules; Carbohydrate Metabolism; Citric Acid Cycle; Oxidative Phosphorylation; Anabolic and Catabolic Reactions of Fatty Acids; Protein Synthesis and Role of DNA and RNA in this Synthesis.

**KiM408 Atom and Molecular Chemistry 2+0 2.0**  
The Structure of Atom: The Charge/Mass Ratio of the Electron, Millikan's Experiment and Determination of the mass and the charge of the Electron, the Energy of a Moving Electron, the Rutherford Experiment, the atomic size, Radioactivity, the Nucleus and Its Fundamental Particles, Radioactive Decay, Formation of the Nuclei and the Transformation of the Mass and the Energy, Energy from Nuclear Reactions, Some Applications of the Radioactivity, the Theory of Quantum and Wave Mechanics, Black Body Radiation, Photoelectric Effect, the Compton Effect, The Wave and Particle Natures of Light, the Schrödinger Equation, the Time-Independent Schrödinger Equation, the Physical Meaning of  $(x,y,z)$  Function, Chemical Bonding, Atomic Orbitals and Hybridization, Molecular Orbitals.

**KiM409 Chemistry in Industry 3+0 4.0**  
Basic Chemical Introduction: Continue and Batch processes, Chemical process economy, Market evaluation, Research and development, What is mass balance and purpose of mass balance, Examples; Water Technology; Energy and Fuels; Coal Technology; Industrial Gases; Chlorine-Alkali Industries; Nitrogen Industries; Sulfur and Sulfuric acid; Hydrochloric acid and Various Inorganic Chemical Substances; Sugar and starch Industries. Energy and Energy Balances; Heat Transfer; Petroleum Refining; Petrochemical Materials and Chemical Transformations: Alkylation, Amination, Halogenation and Hydrohalogenation; Polymer Technology: Plastic, Synthetic fibres and rubbers, Liquid and solid oils: Refining and Hydrogenation; Soap and Detergents; Fermentation Industries; Agriculture Chemical Material Industries; Tasting and flavoring materials: Food additive industries; Cement Industries

**KiM412 Biochemistry Laboratory 0+3 3.0**  
Microscopic Observation of Different Cells; Observation of Some Properties of Amino Acids and Proteins; The Bradford Test for Blood Protein; Protein Electrophoresis; Some Factors Affecting The Activity of  $\alpha$ -Amylase; Determination of Catalase Activity; Qualitative and Quantitative Carbohydrate Determinations; Anaerobic Glycolysis; Determination of Glucose in Urine; Qualitative and Quantitative Lipid Determinations; Determination of Serum Calcium; Determination of Ascorbic Acid; Dna Isolation and Purification; Chromatographic Techniques: Affinity chromatography applications.

**KiM415 Introduction to Heterocyclic Chemistry 2+0 3.0**

Nomenclature, Aromatic heterocyclic compounds, Nonaromatic heterocyclic compounds, Synthesis, of Three and four membered heterocyclic compounds, Compounds with one heteroatom in a five membered ring, Compounds with one heteroatom in a six membered ring, Two or more heteroatoms in a five membered rings, Two or more heteroatoms in a six membered rings, Seven membered heterocyclic compounds.

**KiM419 Dyestuff Chemistry 2+0 3.0**

General Characteristics of Dyestuffs; Fiber Species and Its Characteristics; Natural Dyestuffs; Classification of Dyestuffs as Inorganic and Organic Dyestuffs; Chemical and Physical Characteristics of Dyestuffs; Synthesis of Inorganic Dyestuffs; Synthesis of Organic Dyestuff; Azo Dyestuff a Thion: Dyestuffs; Reactions of dyestuff with Dyeing Fiber.

**KiM423 Industrial Chemical Laboratory 0+4 3.0**

Production of Inorganic and Organic Industrial Materials: Soap; Water Analyses: Removing of water hardness by Soda-Lime and Ion exchange processes; Coal Analysis: Improving of coal qualification; Coal Tar Analysis: Distillated oil, Phenol; Petroleum Analysis, Determination of aniline point, Production of petroleum; Application of Mass-Energy balances in distillation system; Vegetable Oil Analyses; Iodine number, Determination of Free acid analysis, Saponification number; Polymer Synthesis: Aniline-formaldehyde resin; ORSAD gas analyses: CO<sub>2</sub>, O<sub>2</sub>, CO; Determination of nitrogen by Kjeldahl method.

**KiM425 Physical Chemistry Laboratory II 0+3 3.0**

Chemical Kinetics: Determination of the formation constant of a complex, Halogen exchange rate, Determination of kinetics of a reaction using extinction measurement; the Nature of Electrolytes in Solution and Conductivity: Determination of activity coefficient by conductivity measurement, Temperature and concentration dependence of conductivity; Dissociation Equilibria: Determination of equilibrium constant; Electrochemical Cells: Determination of electromotive force, the Nernst equation, Potentiometric titration; Electrolysis: Electrolysis of water, Determination of Faraday's constant.

**KiM425 (Eng) Physical Chemistry Laboratory II 0+3 3.0**

Chemical Kinetics: Determination of the formation constant of a complex, Halogen exchange rate, Determination of kinetics of a reaction using extinction measurement; the Nature of Electrolytes in Solution and Conductivity: Determination of activity coefficient by conductivity measurement, Temperature and concentration dependence of conductivity; Dissociation Equilibria: Determination of equilibrium constant; Electrochemical Cells: Determination of electromotive force, the Nernst equation, Potentiometric titration; Electrolysis: Electrolysis of water, Determination of Faraday's constant.

**KiM427 Analysis Techniques in Gas Chromatografi 1+2 3.0**

Fundamental Principles of Gas Chromatography; Injection Systems; Columns: Types of columns, Column Materials; Detectors: Flame ionization dedector, Electron capture dedector, Thermal conductivity dedector, N-P dedector, Mass spectrometer; Analysis: Selecting and preparation of samples, Method development for temperature and pressure programming, Qualitative analysis, Quantitative analysis, Structural analysis with mass spectrometer.

**KiM429 Chemistry of Main Group Elements 2+0 3.0**

The General Properties of Main Group Elements: Physical and chemical properties, Electronegativity, Ionization energy; The Chemistry of Hydrogen; The Chemistry of Alkali Metals; occurrence, physical and chemical properties, compounds of alkali metals; The Chemistry of IIA Group Elements; occurrence, physical and chemical properties, compounds of group elements; The Chemistry of IIIA, IVA, VA, VIA ve VII Group Elements; occurrence, physical and chemical properties, compounds of the group elements; The Chemistry of Halojens: occurrence, physical and chemical properties, compounds of halojens.

**KiM430 Biotechnological Methods 2+0 3.0**

Description of Biotechnology; Importance of Biotechnology; Biotechnology in Turkey and world; Politics of Biotechnology in world; Plant technology, Use of biotechnology in production of vegetables fruits and oil seeds and plants including biological active matter; Biological methods applied for food industry production; Cleanliness of industrial effluents and waste water with biological methods; Future applications of Biotechnology.

**KiM432 Organic Synthesis 2+0 3.0**

Synthesis by oxidation of organic compounds, synthesis by reduction of organic compounds, uses of organometallic compounds in organic synthesis, uses of phosphorus compound in organic synthesis, uses of boron compounds in organic synthesis, uses of silicone compounds in organic synthesis, uses of carbonium, acil cation and acil anions in organic synthesis.

**KiM433 The Seperation Techniques in Inorganic Chemistry 2+0 3.0**

Separation Techniques; TLC (Thin Layer Chromatography); Column Chromatography; Crystallization; Use of TLC Method to Follow Reactions and Determine the Product Distribution; Isolation and Purification of Products by Using Column Chromatography Methods; Crystallization of the Compounds via some Chemical Techniques; Thermal Decomposition



Concepts of Worker and Employer: History of work and worker safety, Definition of worker, employer and work, Relationship between workers and employers, Workers wages and basic principles of charging, Obligations of employers and workers; Work Safety Legislation: Introduction to work health and safety, Worker health, Laws and legislations about work health and safety, Basic rights of workers; Audit of Work Health and Safety: Audit of workplaces, work health and safety, Work health and safety audit by government.

**KiM440 Polymer Technology 2+0 3.0**

Solid State, Mechanical and Thermal Properties of Polymers; Thermoplastics; Thermosets; Compounding; Molding; Compression molding; Transfer molding; Injection molding; Blow molding; Rotational molding; Extrusion, Film extrusion, Coating, Blow molding with extrusion; Thermoforming; Casting; Calendaring; Foaming; Additives; Plasticizers, Lubricants, Fillers, Antioxidants, Colorants, Flame retardants, Stabilizers; Fibers; Spinning, Melt spinning, Wet spinning, Dry spinning; Elastomers; Vulcanization, Reinforcement; Testing.

**KiM444 Forensic Chemistry 2+0 3.0**

Fundamental of Forensic Chemistry: The role of Chemistry in Crime Incident; Instrumental Analysis Methods in Forensic Chemistry: Spectroscopic, chromatographic and electro analytical methods; Crime Scene Data and Evidence : Collection of evidence, Transportation of evidence to laboratory, Determination of suitable methods of analysis for evidence, Preparation of evidence for analysis (preparation of solution, extraction, evaporation, derived evidence , filtration, purification etc.); Analysis of Blood and Urine Samples; Analysis of Abused Substance; Analysis of Explosive Substance; Analysis of Dye Substance; Analysis of Gun Powder Residue; Analysis of Fire Residue; Analysis of Textile Materials.

**KiM445 Introduction to Archaeological Chemistry 2+0 3.0**

Archaeological Chemistry and Archeometry; Terms and Concepts with Archaeological Chemistry; History of Archaeological Chemistry; Current Status and Scope of Archaeological Chemistry; What Archaeologists Want to Know; Archaeological Materials and Their Chemical Properties; Analysis Methods of Archaeological Materials; Identification and Authentication in Archaeological Materials; Archaeological Chemistry Studies and Some Examples in Turkey and in the World.

**KiM446 Natural Polymeric Materials 2+0 3.0**

Polymer Structure: The Basic Concepts of Polymer Chemistry, Classification of Polymers, Nomenclature of Polymers; Plant Polymers: Structure of Plant Polymers, Cotton Fiber, Linen Fiber, Cannabis Fiber, Hemp Fiber, Leaf Fiber, Fruit Fiber, Wood Fiber, Chemical and Physical Properties; Animal Polymers: Structure of Animal Polymers; Wool Fiber, Silk Fiber Hair, Furs; Chemical and Physical Properties, Natural Polymeric Materials Recognition Reactions Areas of Use of Natural Polymers.

**KiM447 Instrumental Analysis Laboratory I 0+4 3.0**

Qualitative and Quantitative Analysis with UV-Visible Spectroscopy; Infrared Spectroscopy; Illumination of Unknown Organic Compounds with Nuclear Magnetic Resonance Spectroscopy; Polarimetry: Investigating the decomposition kinetics of sugar, Finding the rotating angle of maltose and lactose; Conductometri: Collapsing and acid-base titrations; Finding the Composition of Unknown Compounds with Elemental Analysis; Qualitative and Quantitative Analysis with Spectro Florimetry; Volumetric Analysis with Polarography; Practicing Structure Analysis by Using UV, IR, NMR and Basic Analytic Instruments.

**KiM448 Instrumental Analysis Laboratory II 0+4 3.0**

Finding the Composition of Known and Unknown Compounds with Gas Chromatography-Mass Spectroscopy; Atomic Absorption Spectroscopy; Anion and Cation Analysis with Ion Chromatography; Quantitative Analysis with HPLC; Finding Pore Dimension and Surface Area of Polymers by BET; Finding Thermal Decomposition of  $\text{CaC}_2\text{H}_2\text{O}_4 \cdot \text{H}_2\text{O}$  with TGA; Analyzing Unknown Compounds with TLC; Determination of Isoelectric Point with Zetameter.

**KiM450 Asymmetric Organic Synthesis Introduction 2+0 3.0**

Stereochemical terms; The purpose and importance of asymmetric synthesis; Asymmetric synthesis and rules; General methods used in asymmetric synthesis; Asymmetric synthesis using chiral auxiliary component; Chiral catalysts and use of chiral catalysts in asymmetric synthesis; Overview of asymmetric organic reactions; Carbon-carbon bond formation; Asymmetric carbon-heteroatom bond formation; Addition reactions to multiple bonds; Hydrogenation; Cyclization reactions; Reduction and oxidation reactions; Rearrangement reactions; Isomerization; Applications and industrial importance of asymmetric synthesis.

**KiM452 Bioinorganic Chemistry 2+0 3.0**

Main elements forming structure of living organisms. Carbon, hydrogen, oxygen, nitrogen and phosphorus in biomolecules. Trace elements in living organisms and their structural functions. Metalloenzymes. Effects of toxic metals on living organisms. Coordination compounds used in medicine. Inorganic compounds used in the diagnosis of diseases. Inorganic compounds used in the treatment of diseases.



- KİM453 Chemistry and Technology of Paints 2+0 3.0**  
Polymers: Basic concepts about polymers, Some properties of polymers, Polymerization mechanisms, Methods for polymer manufacturing, Date of paints; Paint Content, Supplementary Materials and General Information about Paint Manufacturing: Fasteners (resins), Pigments and dyes, Fillers, Solvents, Other additives, Paint manufacturing; Classification of Paints: Classification with respect to environment, Classification with respect to resin type, Classification with respect to polymeric film forming processes, Classification with respect to application areas; Paint Application: Surfaces used for application and preparation of surfaces, Implementation techniques; Quality Tests for Paints: Characteristics of wet paint and related tests, Application of paints and related tests, Characteristics of dry film and related tests.
- KİM454 Chemistry of Colloids 2+0 3.0**  
Basics of Colloid Chemistry: Classification of colloidal systems, Preparation and purification of colloidal systems, Kinetic Properties, Optical properties; Surface Tension and Surface Energy: Gibbs adsorption equation, Adhesion, cohesion and spreading, Surface and Interface Phenomenon in Colloidal systems: Electric double layer, Zeta potential, Stability of colloidal systems; Association Colloids and Micelle Formation; Emulsions; Foams.
- KİM455 Applied Nuclear Magnetic Resonance Spectroscopy Technics 2+0 3.0**  
Fundamental Principles of Nuclear Magnetic Resonance Spectroscopy; Main Components of Nuclear Magnetic Resonance Spectroscopy Instrument: Radio frequency transmitter, Superconducting magnet, Detector and the cooling system; Analysis: Preparing a sample for nuclear magnetic resonance spectroscopy, Nuclear magnetic resonance spectroscopy analysis of nuclei such as proton, carbon, nitrogen and phosphor; Two-Dimensional Analysis: Two-dimensional correlation and two-dimensional heteronuclear correlation analysis of samples; Interpreting Spectrum.
- KİM456 Chemistry of Cosmetics 2+0 3.0**  
The History of Cosmetics; Cosmetic Materials and Components: Hair-care products and hair shampoos, Skin-care products, Bath and shower products, Coloring materials and dyes, Make-up products, Antiperspirants and deodorants, Perfumes, Sunscreens, Soaps, Dental hygiene; Analytical Methods for Cosmetic Materials: Classical and instrumental methods, Chromatographic methods, Spectrophotometric methods; Microbiological Control of Cosmetics.
- KİM459 Graduation Project I 2+4 10.0**  
Bilimsel Araştırma ve Yayınlarla İlgili Etik Kurallar; Kimya Alanıyla İlgili Bir Problemin Danışman Öğretim Üyesi Rehberliğinde Belirlenmesi: Seçilen bu problemin çözümüne yönelik olarak teknolojiye de yararlanarak geniş çaplı kaynak taramasının gerçekleştirilmesi; Problemin Çözümüne Yönelik Olarak Hipotez Basamaklarının Belirlenmesi: Belirlenen hipotez basamaklarının sınanması için deneysel ve teorik yöntem tasarımı; Projede Takip Edilecek Basamakların Rapor Haline Getirilmesi.
- KİM459 (Eng) Graduation Project I 2+4 10.0**  
Ethical Rules for Scientific Research and Publications; Determining a Problem in the Field of Chemistry with the Guidance of a Supervisor Lecturer: Carrying out a wide-ranging literature review by making use of technology for the solution of this chosen problem; Determination of Hypothesis Levels for the Solution of the Problem: Experimental and theoretical method design for testing the determined hypothesis steps; Reporting the Steps to be Followed in the Project.
- KİM460 Graduation Project II 2+4 13.0**  
Bitirme Projesi I Dersinde Belirlenen Yöntem Doğrultusunda Gerekli Kimyasal Madde ve Deney Alt Yapısının Sağlanması; Deney Düzeninin veya Hesaplama Parametrelerinin Dizayn Edilmesi; Deneysel ve Teorik Çalışmaların İşleme Konulması ve Gerekli Analiz İle Sentez İşlemlerinin Uygulanması; Problem Çözümüne Yönelik Veri Elde Edilmesi: Elde edilen verilerin istatistiksel yöntemlerle doğrulanması ve problemin çözümü için önerinin netleştirilmesi; Sonuçların Rapor Haline Getirilmesi; Rapor Sonuçlarının Teknolojide Uygulanabilirliğinin Belirlenmesi ve Raporun Hedef Kitleye Sözlü veya Poster Halinde Sunulması.
- KİM460 (Eng) Graduation Project II 2+4 13.0**  
Providing Necessary Chemical Substance and Experimental Substructure According to the Method Determined in Graduation Project I Course; Designing the Experimental Setup or Calculation Parameters; Processing Experimental and Theoretical Studies and Application of Synthesis Processes with Necessary Analysis; Obtaining Data for Problem Solving: Verification of the obtained data by statistical methods and clarification of the proposal for the solution of the problem; Reporting the Results; Determining the Applicability of the Report Results in Technology and Presenting the Report to the Target Audience orally or as a Poster.
- KİMSJ303 Internship 0+2 5.0**  
Purpose, Scope and Subject of Internship; Information about the Internship Establishment and Sector: Name of the establishment, Number of personnel, Works carried out in the facility, Current situation of the sector; Internship Study:



theorem for multiple integration, Variable transformation for multiple integration; Curved Integral's Definition and Properties; Applications of Multiple Integrals: Green and Stokes theorems, Theorem of divergence.

**MAT213 Computer Programming I 2+2 5.0**

Structure of a Programming Language: Special symbols and words, Data types, Variables, Constants, Definition blocks and Operators; Basic Commands and Functions: I/O commands, Conditional statements, Loops; Subroutines: Functions, Procedures, Standard function and procedures; Arrays: Vector arrays, Two dimension arrays, Multiple dimension arrays; Files: File types, File implementation statements, Graphical statements and drawing methods.

**MAT214 Computer Programming II 2+2 5.0**

Visual Programming: Visual programming environment and structure, Objects, Properties, Events and methods; Components of a Visual Programming Language: Types and variables, Constants, Branches, Loops, Operators, Units; Implementation on Data Types; File Structures, Pointers, File I/O operations, Arrays, Records, Text files, Databases.

**MAT215 Differential Equations I 2+2 5.0**

Differential Equations and Their Solutions: Classification of differential equations, Solution of differential equations, Existence and uniqueness theorems; First Order Ordinary Differential Equations: Separable equations, Homogeneous differential equations, Linear differential equations, Bernoulli and Riccati differential equations, Exact differential equations, Integrating Factors; Applications of First Order Equations and Orthogonal Trajectories; Introduction to Higher Order Linear Differential Equations. Differential Equations and Their Solutions: Classification of differential equations, Solution of differential equations, Existence and uniqueness theorems; First Order Ordinary Differential Equations: Separable equations, Homogeneous differential equations, Linear differential equations, Bernoulli and Riccati differential equations, Exact differential equations, Integrating Factors; Applications of First Order Equations and Orthogonal Trajectories; Introduction to Higher Order Linear Differential Equations.

**MAT216 Differential Equations II 2+2 5.0**

Higher Order Linear Differential Equations: Homogeneous linear equations with constant coefficients and nonhomogeneous linear equations with constant coefficients, Method of undetermined coefficients, Method of variation of parameters, Cauchy-Euler equation; Series Solution: Method of power series, Solution about ordinary points, Solution about singular points, Method of Frobenius; Systems of Linear Differential Equations; Laplace Transform and Inverse Laplace Transform; Solution of Differential Equations With Constant Coefficients and Linear Systems. Higher Order Linear Differential Equations: Homogeneous linear equations with constant coefficients and nonhomogeneous linear equations with constant coefficients, Method of undetermined coefficients, Method of variation of parameters, Cauchy-Euler equation; Series Solution: Method of power series, Solution about ordinary points, Solution about singular points, Method of Frobenius; Systems of Linear Differential Equations; Laplace Transform and Inverse Laplace Transform; Solution of Differential Equations With Constant Coefficients and Linear Systems.

**MAT218 Documentation with LaTeX 3+0 5.0**

Basics of LaTeX: A Brief History of TeX and LaTeX, Components of LaTeX and Installation, LaTeX and Text Editors; Document Structure: Document Classes, The Title Page, Sectioning Commands, Numbering; Formatting Commands: Lines and Paragraphs, List Environments, Footnotes and Headings, Multicolumns, Tabular Environments, Basic Font Characteristics; Mathematical Formulas: Mathematical Environments, Theorem, Proposition, etc. Environments, Mathematical Symbols; The Layout of the Page and Customizing LaTeX: Page Settings, Page Layout, Counters, User-defined Commands; Graphics with LaTeX: Graphics with LaTeX and Graphics Packages; The Table of Contents, Bibliographies and Index Generation: The Table of Contents, Bibliography Generation and Cross-referencing, Index Generation.

**MAT221 Analysis I 4+2 7.0**

Sequences and Infinite Series: Sequences and convergence of a sequence, Subsequences, Accumulation points, Lower and upper limits, Infinite series and convergence of a series, Series of positive terms, Alternating series, Absolute convergence of series; Sequences and Series of Functions, Pointwise convergence, Uniform convergence, Power series, Taylor theorem, Differentiation of sequences and series of functions; Elementary Transcendental Functions: Exponential and logarithmic functions, Trigonometric and inverse trigonometric functions, Limits and continuity, Differentiation and applications of differentiation.

**MAT222 Analysis II 4+2 7.0**

Riemann Integral: Lower and upper Riemann-Darboux sums and definite integral of a function, Properties of definite integral, Fundamental theorem of calculus, Indefinite integral and properties, Mean value theorem and uniform convergence theorems; Techniques of Integration; Improper integrals, Types of improper integrals, Tests for convergence of improper integrals; Gamma Function.

**MAT226 Introduction to Graph Theory 3+0 5.0**

What is a Graph: Fundamental concepts, Graph, Vertex, Edge, Adjacency, Degree, Isomorphism, Various examples, Certain special graphs, Digraphs and multigraphs; Paths and Cycles: Walk, Trail, Cycle, Connected graphs, Eulerian trail, Eulerian



**MAT267 Mathematics with Models 2+0 3.0**

Several Models for the Proof of Pythagorean Theorem; Pantograph as an Application of Thales Theorem; The Demokrit Model for the Volume of Pyramid; The Platonic Solid Models and Their Sections; The Archimedes Model for the Volume of Sphere; Models for the Area of the Disc; Models for Binomial Expansion; Models for the Sums of Squares and Cubes; A Model for the Theorem of Spherical Triangle; Models for the Conic Sections; Hyperboloid Models; Invertor; Polygon Partitioning; Cuts of the Möbius Strip; 7 Coloured Map on Torus; Arnold Bricks. Several Models for the Proof of Pythagorean Theorem; Pantograph as an Application of Thales Theorem; The Demokrit Model for the Volume of Pyramid; The Platonic Solid Models and Their Sections; The Archimedes Model for the Volume of Sphere; Models for the Area of the Disc; Models for Binomial Expansion; Models for the Sums of Squares and Cubes; A Model for the Theorem of Spherical Triangle; Models for the Conic Sections; Hyperboloid Models; Invertor; Polygon Partitioning; Cuts of the Möbius Strip; 7 Coloured Map on Torus; Arnold Bricks.

**MAT267 (Eng) Mathematics with Models 2+0 3.0**

Several Models for the Proof of Pythagorean Theorem; Pantograph as an Application of Thales Theorem; The Demokrit Model for the Volume of Pyramid; The Platonic Solid Models and Their Sections; The Archimedes Model for the Volume of Sphere; Models for the Area of the Disc; Models for Binomial Expansion; Models for the Sums of Squares and Cubes; A Model for the Theorem of Spherical Triangle; Models for the Conic Sections; Hyperboloid Models; Invertor; Polygon Partitioning; Cuts of the Möbius Strip; 7 Coloured Map on Torus; Arnold Bricks. Several Models for the Proof of Pythagorean Theorem; Pantograph as an Application of Thales Theorem; The Demokrit Model for the Volume of Pyramid; The Platonic Solid Models and Their Sections; The Archimedes Model for the Volume of Sphere; Models for the Area of the Disc; Models for Binomial Expansion; Models for the Sums of Squares and Cubes; A Model for the Theorem of Spherical Triangle; Models for the Conic Sections; Hyperboloid Models; Invertor; Polygon Partitioning; Cuts of the Möbius Strip; 7 Coloured Map on Torus; Arnold Bricks.

**MAT273 Construction of Number Systems 3+0 5.0**

Natural Numbers: Axioms, Addition for natural numbers, Sorting of natural numbers, Multiplication of natural numbers; Fractions: Definition and equivalence, Sorting of fractions, Addition of fractions, Multiplication of fractions, Rational numbers and integers; Cuts: Definition of cuts, Sorting of cuts, Addition of cuts, Multiplication of cuts, Rational cuts and integral cuts; Real Numbers: Definition of real numbers, Sorting in real numbers, Addition of real numbers, Multiplication of real numbers, Dedekind's fundamental theorem. Natural Numbers: Axioms, Addition for natural numbers, Sorting of natural numbers, Multiplication of natural numbers; Fractions: Definition and equivalence, Sorting of fractions, Addition of fractions, Multiplication of fractions, Rational numbers and integers; Cuts: Definition of cuts, Sorting of cuts, Addition of cuts, Multiplication of cuts, Rational cuts and integral cuts; Real Numbers: Definition of real numbers, Sorting in real numbers, Addition of real numbers, Multiplication of real numbers, Dedekind's fundamental theorem.

**MAT273 (Eng) Construction of Number Systems 3+0 5.0**

Natural Numbers: Axioms, Addition for natural numbers, Sorting of natural numbers, Multiplication of natural numbers; Fractions: Definition and equivalence, Sorting of fractions, Addition of fractions, Multiplication of fractions, Rational numbers and integers; Cuts: Definition of cuts, Sorting of cuts, Addition of cuts, Multiplication of cuts, Rational cuts and integral cuts; Real Numbers: Definition of real numbers, Sorting in real numbers, Addition of real numbers, Multiplication of real numbers, Dedekind's fundamental theorem. Natural Numbers: Axioms, Addition for natural numbers, Sorting of natural numbers, Multiplication of natural numbers; Fractions: Definition and equivalence, Sorting of fractions, Addition of fractions, Multiplication of fractions, Rational numbers and integers; Cuts: Definition of cuts, Sorting of cuts, Addition of cuts, Multiplication of cuts, Rational cuts and integral cuts; Real Numbers: Definition of real numbers, Sorting in real numbers, Addition of real numbers, Multiplication of real numbers, Dedekind's fundamental theorem.

**MAT309 Advanced Programming 2+2 5.0**

Linked Lists: Single linked lists, Double linked lists; Stack: Structure and using areas of stacks; Queue: Structure and using areas of queues; Searching: Standard Searching algorithms, types and comparison; Sorting: Well-known sorting algorithms, types and advantages. Drawing Methods: Drawing algorithms for mathematical curves, Drawing algorithms for mathematical surfaces; File Processing Techniques: Files, File systems, Database structures.

**MAT310 Selected Topics on Computer 2+2 5.0**

Office Packages: Detailed information of actual office packages. Word processing programs and user tricks, Spreadsheet programs and user tricks, Presentation programs and user tricks, Database management software and using, Scheduler and desktop organizer software using; Mathematics Packages: Introducing popular mathematics packages such as Maple, MathCad, Mathematica, Matlab, etc; Image Processing Software: Foundations of popular Image Processing Software.

**MAT311 Numerical Analysis I 3+0 5.0**

Approximation Theory: Discrete Least-Squares approximation; Interpolation: Lagrange interpolation polynomial, Hermite interpolation polynomial, Cubic natural spline interpolation, Cubic clamped spline interpolation; Solutions of Equations with One Variable: Bisection Algorithm, Fixed Point Iteration, Newton-Raphson Method.

- MAT312 Numerical Analysis II 3+0 5.0**  
 Numerical Integration: Trapezoidal Rule, Simson 1/3 Rule, Simson 3/8 Rule, Romberg Integration, Composite Trapezoidal Rule, Composite Simson 1/3 Rule, Composite Simpson 3/8 Rule; Numerical Solutions of Differential Equations: Euler's Method, Higher-Order Taylor Methods, Runge-Kutta Methods; Numerical Solutions of Systems of Differential Equations; Numerical Solutions of Higher-Order Equations; Numerical Solutions of Nonlinear Systems of Equations: Fixed Point Iteration, Newton-Raphson Method.
- MAT313 Differential Geometry I 3+0 5.0**  
 Calculus on Euclidean space: Euclidean space, Tangent vectors, Tangent, Tangent space, Natural frame fields, Directional derivatives, Curves in  $\mathbb{R}^3$ , 1-Forms, Differential forms, Exterior derivative, Mappings; Frame fields: Dot Product, Cross product, Curves, Frenet frame fields, Frenet-Serret formulae, Arbitrary-speed curves, Frenet-Serret formulae for arbitrary speed curves, Covariant derivatives.
- MAT314 Differential Geometry II 3+0 5.0**  
 Euclidean Geometry: Isometries of  $\mathbb{R}^3$ , Tangent map of an isometry orientation, Congruence of curves, Calculus on a surface; Surfaces in  $\mathbb{R}^3$ , Patch computations, Differentiable functions and tangent vectors, Differential forms on a surface: Mappings of surfaces, Integration of forms, Topological properties of surfaces, Manifolds.
- MAT318 Matrix Analysis 3+0 5.0**  
 Preliminaries: Vector spaces, Matrices and determinants, Special types of matrices; Unitary Equivalence and normal matrices: Unitary equivalence, Schur's unitary triangularization theorem and some implications of Schur's theorem, Normal matrices, QR factorization and algorithm; Canonical forms: The Jordan canonical form and applications, Matrices polynomial and the minimal polynomial, Other canonical forms and factorization, Triangular factorizations; Hermitian and Symmetric matrices: Variational characterization of eigenvalues of Hermitian matrices, Some applications of the variational characterizations.
- MAT318 (Eng) Matrix Analysis 3+0 5.0**  
 Preliminaries: Vector spaces, Matrices and determinants, Special types of matrices; Unitary Equivalence and normal matrices: Unitary equivalence, Schur's unitary triangularization theorem and some implications of Schur's theorem, Normal matrices, QR factorization and algorithm; Canonical forms: The Jordan canonical form and applications, Matrices polynomial and the minimal polynomial, Other canonical forms and factorization, Triangular factorizations; Hermitian and Symmetric matrices: Variational characterization of eigenvalues of Hermitian matrices, Some applications of the variational characterizations.
- MAT319 Euclidean and Non-Euclidean Geometries 3+0 5.0**  
 Introduction: Geometries in General, Necessity of Non-Euclidean Geometry and Inadequacy of Euclidean Geometry; Elliptic Geometry: Geometry on Sphere, Analytical Expressions for Points and Lines, Elliptic Isometries and Collinations; Spherical Trigonometry: Concepts of Angle, Triangle and Polygon, Calculations of Areas and Length; Hyperbolic Geometry: Disk Model, Upper Half Plane Model, Projective Model, Concepts of Angle, Triangle and Polygon in these Models and Calculations of Areas and Length; A Short Introduction to Hyperbolic Isometries.
- MAT321 Complex Analysis I 2+2 5.0**  
 Complex Numbers: Algebraic and geometric properties, Polar form, Exponential form, Powers and roots; Topological Properties of Complex Plane; Complex Functions and Sequences: Limit and continuity, Derivatives, Cauchy-Riemann equations, Sufficient conditions, Analytic functions, Harmonic functions; Elementary Functions: Exponential function, Logarithmic function, Trigonometric functions; Complex Integrals: Contours, Contour integrals, Cauchy-Goursat theorem, Cauchy integral formula, Derivatives of analytic functions; Complex Numbers: Algebraic and geometric properties, Polar form, Exponential form, Powers and roots; Topological Properties of Complex Plane; Complex Functions and Sequences: Limit and continuity, Derivatives, Cauchy-Riemann equations, Sufficient conditions, Analytic functions, Harmonic functions; Elementary Functions: Exponential function, Logarithmic function, Trigonometric functions; Complex Integrals: Contours, Contour integrals, Cauchy-Goursat theorem, Cauchy integral formula, Derivatives of analytic functions.
- MAT322 Complex Analysis II 2+2 5.0**  
 Derivatives of Analytic Functions: Morera's theorem, Maximum moduli of functions, Liouville's theorem and fundamental theorem of algebra; Complex Series: Sequences and series of complex functions, Absolute and uniform convergence, Cauchy convergence principle, Weierstrass test, Power series and radius of convergence; Taylor and Laurent Series; Zeros, Poles and Residues of Complex Function: Residue theorem, Evaluation of complex integrals, Evaluation of real integrals, Logarithmic residues and Rouché's theorem. Derivatives of Analytic Functions: Morera's theorem, Maximum moduli of functions, Liouville's theorem and fundamental theorem of algebra; Complex Series: Sequences and series of complex functions, Absolute and uniform convergence, Cauchy convergence principle, Weierstrass test, Power series and radius of convergence; Taylor and Laurent Series; Zeros, Poles and Residues of Complex Function: Residue theorem, Evaluation of complex integrals, Evaluation of real integrals, Logarithmic residues and Rouché's theorem.
- MAT323 Abstract Algebra I 2+2 5.0**

Basic Concepts: Integers and irrational numbers, Fundamental theorem of arithmetics, Division algorithm, Euclid's algorithm, Euler function, Modular arithmetics, Fermat-Euler theorems, Linear congruences: Group Theory, Definition of a group, Direct products, Subgroups, Cyclic groups, Normal subgroups, Homomorphism, Isomorphism and their elementary properties, Symmetric groups, Finite Abelian Groups, Sylow's theorem.

**MAT324 Abstract Algebra II 2+2 5.0**

Ring Theory: Definition and examples of rings, Some special classes of rings, Subrings, Ideals, Quotient rings, Ring homomorphisms, Ring isomorphisms, Factor rings, Characteristics of an integral domain or field, Field of fractions of an integral domain, Polynomials and fields, Polynomial rings, Some properties of field, Degrees of field extensions.

**MAT325 Metric and Topological Spaces I 2+2 5.0**

Metric spaces: Motivation, Open sets in metric spaces, Equivalent metrics, Continuity; Topological Spaces: Definition of topology, Bases, Sub-bases and weak topology, Subspaces, Product spaces, Quotient spaces, Homomorphisms; Hausdorff Spaces, Separation axioms; Compact Spaces: Motivation, Definition of Compactness, Properties of compact spaces, Continuous maps on compact spaces, Compactness and constructions, Compactness and uniform continuity, Inverse function theorem. Metric spaces: Motivation, Open sets in metric spaces, Equivalent metrics, Continuity; Topological Spaces: Definition of topology, Bases, Sub-bases and weak topology, Subspaces, Product spaces, Quotient spaces, Homomorphisms; Hausdorff Spaces, Separation axioms; Compact Spaces: Motivation, Definition of Compactness, Properties of compact spaces, Continuous maps on compact spaces, Compactness and constructions, Compactness and uniform continuity, Inverse function theorem.

**MAT326 Metric and Topological Spaces II 2+2 5.0**

Connected Spaces: Connectedness and path-connectedness, Comparison of definitions, Components; Convergence in Metric Spaces: Sequential compactness, Uniform convergence, Cauchy's criterion, Uniform limits of sequences, Generalizations; Complete Metric Spaces: Definition, Fixed point theorems, Contraction mapping theorem, Cantor's and Baire's theorems; Criteria for Compactness in Metric Spaces: A general criterion, Arzelà-Ascoli theorems, Completion of metric spaces. Connected Spaces: Connectedness and path-connectedness, Comparison of definitions, Components; Convergence in Metric Spaces: Sequential compactness, Uniform convergence, Cauchy's criterion, Uniform limits of sequences, Generalizations; Complete Metric Spaces: Definition, Fixed point theorems, Contraction mapping theorem, Cantor's and Baire's theorems; Criteria for Compactness in Metric Spaces: A general criterion, Arzelà-Ascoli theorems, Completion of metric spaces.

**MAT327 Analysis III 4+2 7.0**

Finite Dimensional Spaces; Functions: Real valued functions of several variables, Vector valued functions of one variable, Vector valued functions of several variables; Limit and continuity: Limits and iterated limits, Continuous functions, The Weierstrass theorem, Uniform continuity; Derivative of Functions of Several Variables: Derivatives and partial derivatives: Directional derivatives, Higher order derivatives; The Schwarz theorem, The Taylor Theorem; Extremums: Necessary conditions, Sufficient conditions: Inverse and Implicit Functions; Lagrange multipliers and conditional extremums; Parametric problems.

**MAT328 Analysis IV 4+2 7.0**

Multiple Integrals: Double integrals, Measurable sets, Sets of measure zero, Properties of double integrals, The Fubini theorem, Multiple integrals and their properties, Coordinate transformations for triple integrals, Applications of multiple integrals, Improper Double integrals; The Gamma and Beta Functions; Curve integrals: First and second type curve integrals, Green's Theorem, Path independence of curve integrals and some applications; Surface integrals: Surfaces; Surface integrals of first and second type, Stokes' Theorem, Divergence Theorem, Some applications of surface integrals.

**MAT365 Creativity and Innovation Management 2+0 2.0**

Definition of Creativity: Definition of creativity, Concepts, Characteristics of creative people; Myths of Creativity: True known mistakes, Mixed concepts; Creativity Exercises; Methods for Improving Creativity; Innovation Definition: Innovation concepts; Mixed Concepts; Types of Innovation: Product development process, Diffusion of innovation; Innovative Organizational Culture and Innovation: Definition of organizational culture, Effect of organizational culture on creativity; Factors Determining Innovation in Enterprises: Internal and external factors; Innovation Resources and Strategies

**MAT367 History of Mathematics I 3+0 5.0**

Ancient Egyptian Numerals and Four Operations; Fraction Concept and Fraction Operations in Ancient Egyptian; Problems from Rhind and Moscow Papyrus; Geometry in Ancient Egyptian; Sumerian and Babylonian Numerals and Sexagesimal System; Examination of Some Clay Tablets Related to Mathematics; The Advent of Concept of Proof in Ancient Greeks; Thales; Perfect Numbers, Amicable Numbers, Triangle Numbers and School of Pythagoras; Eudoxus and Method of Exhaustion; Euclid's Elements Book ve Pythagorean Theorem; Archimedes and His Contributions to Mathematics; Eratosthenes, Apollonius and Diophantus.

**MAT368 History of Mathematics II 3+0 5.0**

Lou Shu and Magic Squares; The Four Operations with Sticks in Ancient Chinese, The Use of Abacus; Selection Problems from Book of Liu Hui; Vedic Mathematics; Number System in Ancient Indian and The Use of Zero; Brahmagupta's Method of Solving Pell Equation; Indian Contributions to Trigonometry; Khwarizmi and Algebra; Omar Khayyam and Method of Solving Cubic Equations; Contributions of Thabit Ibn Qurra to Mathematics; Contributions of Islamic Mathematicians to Trigonometry; Al-Kashi and The Key of Arithmetic; Mathematics in the Ottoman Empire; Examining Salih Zeki's Studies.

**MAT402 Real Analysis II 3+0 5.0**

Lebesgue Integral: Simple Functions, Lebesgue integral of a simple function, the Lebesgue integral of a nonnegative function, Monotone convergence theorem, Fato u Lemma, the Lebesgue dominated convergence theorem, Comparison of the Lebesgue and Riemann Integrals, product measure and iterated integral; Lp Spaces: Riesz-Fischer theorem.

**MAT403 Real Analysis I 3+0 5.0**

Fundamentals of Real Analysis: Sets, Countable and uncountable sets, Real numbers, Extended real numbers, Metric spaces, Topological Spaces; Measure Theory: Semi rings, Algebras, Sigma Algebras and Borel Algebras on Family of Sets. Outer measure; Outer Measure Generated by Measure, Lebesgue measure; Function Defined on Family of Sets: Measurable functions and its properties.

**MAT404 Functional Analysis II 3+0 5.0**

Metric Spaces: Sequences, Cauchy sequences, Completeness, Separable metric spaces, Homeomorphism, Equivalence and isometry, Connected sets; Normed spaces: Definition of norm, Equivalent norms, Induced metrics of a norm, Examples of normed spaces, Banach spaces, Series in Banach spaces, Bounded linear transformations, Linear homeomorphism, Linear isometry, Finite dimensional normed linear spaces.

**MAT405 Functional Analysis I 3+0 5.0**

Bounded linear transformations, Norm of a bounded linear transformation, Bounded linear functionals, Dual spaces, Hahn-Banach theorem, Existence of bounded linear functionals; Inner product spaces: Norm on an Inner Product Space, Parallelogram Law on an inner product Space; Hilbert spaces: Properties of Hilbert Spaces, Orthogonality, Orthonormal sets, Gram-Schmidt orthogonalization process, Bessel's inequality, Parseval? identity.

**MAT406 Geometric Topology 3+0 5.0**

Derived Spaces: Product Spaces and Identification Spaces; Surfaces: Triangulation, Euler-Poincare Number; Topological Groups: Groups Acting on Sets, Orbit Spaces; Fundamental Group: Category, Functor, Product of Paths and Construction of Fundamental Group, Methods of Calculations, Seifert-Van Kampen Theorem, Homotopy and Homotopy Invariance of Fundamental Group, Brauer Fixed Point Theorem, Jordan Curve Theorem, Calculation of Fundamental Groups of Surfaces.

**MAT406 (Eng) Geometric Topology 3+0 5.0**

Derived Spaces: Product Spaces and Identification Spaces; Surfaces: Triangulation, Euler-Poincare Number; Topological Groups: Groups Acting on Sets, Orbit Spaces; Fundamental Group: Category, Functor, Product of Paths and Construction of Fundamental Group, Methods of Calculations, Seifert-Van Kampen Theorem, Homotopy and Homotopy Invariance of Fundamental Group, Brauer Fixed Point Theorem, Jordan Curve Theorem, Calculation of Fundamental Groups of Surfaces.

**MAT407 Uniform Spaces 3+0 5.0**

Uniformities and Uniform Spaces: Topology Induced by a Uniformity, Methods of generating uniformities on a set, Metrizable uniform spaces, Uniform continuity, Operations on uniform spaces; Totally Bounded and Complete Uniform Spaces: Subspaces of uniform space, product of uniform spaces, Totally boundedness of uniform spaces, Complete uniform spaces, Extension theorems and completion; Uniform Para-compact Spaces and Uniform Para-Lindelöf Spaces.

**MAT407 (Eng) Uniform Spaces 3+0 5.0**

Uniformities and Uniform Spaces: Topology Induced by a Uniformity, Methods of generating uniformities on a set, Metrizable uniform spaces, Uniform continuity, Operations on uniform spaces; Totally Bounded and Complete Uniform Spaces: Subspaces of uniform space, product of uniform spaces, Totally boundedness of uniform spaces, Complete uniform spaces, Extension theorems and completion; Uniform Para-compact Spaces and Uniform Para-Lindelöf Spaces.

**MAT408 Vector Analysis 3+0 5.0**



Vector Algebra: Basic Definitions, Vector Addition and Subtraction, Vector Products, Multiplication by Scalars, Triple Products; Vector functions of a single variable: Arc Length Angular Velocity: Angular Velocity of a Rigid Body, Derivative of a Moving Vector; Functions of Position: Scalar Functions of Several Variables, Line Integrals; Green's, Stoke's Theorems, Green's and Stokes theorems in a plane, Divergence Theorem.

**MAT408 (Eng) Vector Analysis 3+0 5.0**

Vector Algebra: Basic Definitions, Vector Addition and Subtraction, Vector Products, Multiplication by Scalars, Triple Products; Vector functions of a single variable: Arc Length Angular Velocity: Angular Velocity of a Rigid Body, Derivative of a Moving Vector; Functions of Position: Scalar Functions of Several Variables, Line Integrals; Green's, Stoke's Theorems, Green's and Stokes theorems in a plane, Divergence Theorem.

**MAT409 Partial Differential Equations 3+0 5.0**

Basic Concepts: A general classification of partial differential equations, Providing partial differential equations; First Order Partial Differential Equations: First order linear equations, First order semi-linear equations (Lagrange Method), First order nonlinear equations (Charpit Method), First order nonlinear equations special types, Standard form to transform non linear equations; Higher Order Partial Differential Equations: Second order linear equations with constant coefficients, Separation of operators into reoccurring multiplier, Euler equations, Finding a special solution for non homogeneous linear equations

**MAT409 (Eng) Partial Differential Equations 3+0 5.0**

Basic Concepts: A general classification of partial differential equations, Providing partial differential equations; First Order Partial Differential Equations: First order linear equations, First order semi-linear equations (Lagrange Method), First order nonlinear equations (Charpit Method), First order nonlinear equations special types, Standard form to transform non linear equations; Higher Order Partial Differential Equations: Second order linear equations with constant coefficients, Separation of operators into reoccurring multiplier, Euler equations, Finding a special solution for non homogeneous linear equations

**MAT410 Game Theory 3+0 5.0**

Examples of Games; Game Theory Notions; Two-Person Zero-Sum Games, Mixed strategies, Minmax (von Neumann) theorem, Equilibrium strategies, Solution of (nxm) games; Two-Person Non-Zero-Sum games, Nash theorem, Equilibrium strategies, Solution methods; Cooperative games; N-Person Games, Stable Sets, Non-Cooperative Games, Shapley value; Market Games and Oligopoly, M-N Market Game, Duopoly, Cournot equilibrium, Metagames.

**MAT410 (Eng) Game Theory 3+0 5.0**

Examples of Games; Game Theory Notions; Two-Person Zero-Sum Games, Mixed strategies, Minmax (von Neumann) theorem, Equilibrium strategies, Solution of (nxm) games; Two-Person Non-Zero-Sum games, Nash theorem, Equilibrium strategies, Solution methods; Cooperative games; N-Person Games, Stable Sets, Non-Cooperative Games, Shapley value; Market Games and Oligopoly, M-N Market Game, Duopoly, Cournot equilibrium, Metagames.

**MAT412 Education of Axiomatic Geometry 3+0 5.0**

Emergence of the notion of proof, Classification and synthesis of mathematical discoveries depending on their internal structures, The first axiomatization of geometry, Consistency and sufficiency, Discovery of failures in axiom systems, Variety of axioms, Discovery of non-enclidean geometries, Modernization and finalization of the enclidean geometry, Aspects of axiomatic geometry relevant for teaching.

**MAT413 Fourier Analysis 3+0 5.0**

Fourier Series: Basic concepts, Periodic functions, Trigonometric series, Even and odd functions, Half-range expansions, Complex Fourier series, Sturm-Liouville Theorem, A Fourier Theorem, Discussion of the theorem and its corollary, Uniform convergence of Fourier series, Differentiation and integratio of Fourier series, Fourier transform.

**MAT413 (Eng) Fourier Analysis 3+0 5.0**

Fourier Series: Basic concepts, Periodic functions, Trigonometric series, Even and odd functions, Half-range expansions, Complex Fourier series, Sturm-Liouville Theorem, A Fourier Theorem, Discussion of the theorem and its corollary, Uniform convergence of Fourier series, Differentiation and integratio of Fourier series, Fourier transform.

**MAT414 Dynamical Systems 3+0 5.0**

Linear systems: One dimensional linear systems, Two and more dimensional linear systems; Nonlinear systems; Fixed points, Stability of fixed points; Linearization, Periodicity, Stability of periodic points; Poincare-Bendixon theorem; Bifurcation; Sarkovskii's theorem; Chaos; Symbolic dynamics.

**MAT414 (Eng) Dynamical Systems 3+0 5.0**

Linear systems: One dimensional linear systems, Two and more dimensional linear systems; Nonlinear systems; Fixed points, Stability of fixed points; Linearization, Periodicity, Stability of periodic points; Poincare-Bendixon theorem; Bifurcation; Sarkovskii's theorem; Chaos; Symbolic dynamics.



- MAT431 Introduction to Number Theory I 3+0 5.0**  
 Natural Numbers: Peano aksiyoms; Divisibility Theory in the Integers: The division algorithm, The Greatest Common Divisor, The Euclidean Algorithm, The Diophantine Equation ; The Theory of Congruences: Basic properties of congruence, Special divisibility tests, Linear congruences, Chinese Remainder Theorem, Fermat's Theorem, Wilson's Theorem, Euler function and Euler's Theorem; Primitive Roots and Indices: The order of an integer modulo , Primitive roots for primes, Composite numbers having primitive roots, The tory of indices.
- MAT431 (Eng) Introduction to Number Theory I 3+0 5.0**  
 Natural Numbers: Peano aksiyoms; Divisibility Theory in the Integers: The division algorithm, The Greatest Common Divisor, The Euclidean Algorithm, The Diophantine Equation ; The Theory of Congruences: Basic properties of congruence, Special divisibility tests, Linear congruences, Chinese Remainder Theorem, Fermat's Theorem, Wilson's Theorem, Euler function and Euler's Theorem; Primitive Roots and Indices: The order of an integer modulo , Primitive roots for primes, Composite numbers having primitive roots, The tory of indices.
- MAT432 Introduction to Number Theory II 3+0 5.0**  
 Quadratic residues; Euler's Criterion; The Legendre symbol and its properties; The law of Quadratic Reciprocity; The Jacobi Symbol; Quadratic Congruences; Continued Fractions; Finite continued fractions; Infinite continued fractions; Continued fractions method for the solution of Diophantine equations; Pell's equation; Transcendent Numbers; Irrationalities of Pi, Transcendentality of e
- MAT432 (Eng) Introduction to Number Theory II 3+0 5.0**  
 Quadratic residues; Euler's Criterion; The Legendre symbol and its properties; The law of Quadratic Reciprocity; The Jacobi Symbol; Quadratic Congruences; Continued Fractions; Finite continued fractions; Infinite continued fractions; Continued fractions method for the solution of Diophantine equations; Pell's equation; Transcendent Numbers; Irrationalities of Pi, Transcendentality of e
- MAT433 Fractal Geometry I 3+0 5.0**  
 Basic Concepts: Classical fractals, Self-similarity; Metric Spaces: Complete metric spaces, Contraction maps, Fixed point theorem; Hausdorff Distance; Iterated Function Systems: Finite iterated function systems (IFS), The notion of attractor, Countable iterated function systems (CIFS), Collage theorem and its applications; Graph-directed Fractals: Directed-graphs, Graph-directed iterated function systems (GIFS). Basic Concepts: Classical fractals, Self-similarity; Metric Spaces: Complete metric spaces, Contraction maps, Fixed point theorem; Hausdorff Distance; Iterated Function Systems: Finite iterated function systems (IFS), The notion of attractor, Countable iterated function systems (CIFS), Collage theorem and its applications; Graph-directed Fractals: Directed-graphs, Graph-directed iterated function systems (GIFS).
- MAT433 (Eng) Fractal Geometry I 3+0 5.0**  
 Basic Concepts: Classical fractals, Self-similarity; Metric Spaces: Complete metric spaces, Contraction maps, Fixed point theorem; Hausdorff Distance; Iterated Function Systems: Finite iterated function systems (IFS), The notion of attractor, Countable iterated function systems (CIFS), Collage theorem and its applications; Graph-directed Fractals: Directed-graphs, Graph-directed iterated function systems (GIFS). Basic Concepts: Classical fractals, Self-similarity; Metric Spaces: Complete metric spaces, Contraction maps, Fixed point theorem; Hausdorff Distance; Iterated Function Systems: Finite iterated function systems (IFS), The notion of attractor, Countable iterated function systems (CIFS), Collage theorem and its applications; Graph-directed Fractals: Directed-graphs, Graph-directed iterated function systems (GIFS).
- MAT434 Fractal Geometry II 3+0 5.0**  
 Space-Filling Curves: Peano curve, Hilbert curve; Fractal Dimension: Topological dimension, Box-counting dimension, Hausdorff measure and Hausdorff dimension; Open Set Condition for Iterated Function Systems (IFS); Iteration of Complex Functions: Parametric spaces, Mandelbrot set, Julia sets, Computation methods for Julia sets; Interpolation: Interpolation functions, Fractal interpolation functions. Space-Filling Curves: Peano curve, Hilbert curve; Fractal Dimension: Topological dimension, Box-counting dimension, Hausdorff measure and Hausdorff dimension; Open Set Condition for Iterated Function Systems (IFS); Iteration of Complex Functions: Parametric spaces, Mandelbrot set, Julia sets, Computation methods for Julia sets; Interpolation: Interpolation functions, Fractal interpolation functions.
- MAT434 (Eng) Fractal Geometry II 3+0 5.0**  
 Space-Filling Curves: Peano curve, Hilbert curve; Fractal Dimension: Topological dimension, Box-counting dimension, Hausdorff measure and Hausdorff dimension; Open Set Condition for Iterated Function Systems (IFS); Iteration of Complex Functions: Parametric spaces, Mandelbrot set, Julia sets, Computation methods for Julia sets; Interpolation: Interpolation functions, Fractal interpolation functions. Space-Filling Curves: Peano curve, Hilbert curve; Fractal Dimension: Topological dimension, Box-counting dimension, Hausdorff measure and Hausdorff dimension; Open Set Condition for Iterated Function Systems (IFS); Iteration of Complex Functions: Parametric spaces, Mandelbrot set, Julia sets, Computation methods for Julia sets; Interpolation: Interpolation functions, Fractal interpolation functions.
- MAT435 Discrete Dynamical Systems 3+0 5.0**

Concept and Examples of Discrete Dynamical System; Fixed points: Existence of fixed points, Stability of fixed points; Periodic Points: Existence of periodic points and Sharkovsky's theorem, Stability of periodic points; Chaotic Dynamical Systems: Sensitive dependence on initial conditions, Lyapunov exponent, Topological conjugacy, Examples of chaotic dynamical systems.

**MAT436 Introduction to Perturbation Methods 3+0 5.0**

Introduction: Regular problem, Singular problem, Order symbols, Fundamental theorem of perturbation theory, Asymptotic sequences; Roots of Polynomials; Singular Perturbation in Ordinary Differential Equations; Periodic solutions: Poincare method; Introduction to the two-scale method: The damped linear oscillator, Nonlinear damping; WKB approximation: WKB approximation for high frequencies, WKB approximation for non-oscillatory solutions; Transition Point Problems and Langer's Method of Uniform Approximation.

**MAT436 (Eng) Introduction to Perturbation Methods 3+0 5.0**

Introduction: Regular problem, Singular problem, Order symbols, Fundamental theorem of perturbation theory, Asymptotic sequences; Roots of Polynomials; Singular Perturbation in Ordinary Differential Equations; Periodic solutions: Poincare method; Introduction to the two-scale method: The damped linear oscillator, Nonlinear damping; WKB approximation: WKB approximation for high frequencies, WKB approximation for non-oscillatory solutions; Transition Point Problems and Langer's Method of Uniform Approximation.

**MAT439 History of Mathematics Concepts 3+0 5.0**

Examination of Infinity, Concept of Sets and Construction of Real Numbers; Some Special Curves and Historical Development of Analytic Geometry; The Advent of Sequence, Series and Limit; The Development of concepts of Derivative and Integral; Historical Development of Multivariable Functions; Historical Development of Equation Solving Methods; The advent of Modern Algebra and Concepts; Complex Numbers and Examination of Complex Functions; Study of Curvature, Torsion, Curves and Surfaces.

**MAT441 Graduation Project 0+3 6.0**

Determination of Project Topic; Literature Review on Project; Literature Review on Project; Studying the Determined Subject; Studying the Determined Subject; Studying the Determined Subject; Studying the Determined Subject; Studying the Determined Subject; Studying the Determined Subject; Studying the Determined Subject; Studying the Determined Subject; Report preparation; Report preparation; Presentation

**MAT441 (Eng) Graduation Project 0+3 6.0**

Determination of Project Topic; Literature Review on Project; Literature Review on Project; Studying the Determined Subject; Studying the Determined Subject; Studying the Determined Subject; Studying the Determined Subject; Studying the Determined Subject; Studying the Determined Subject; Studying the Determined Subject; Studying the Determined Subject; Studying the Determined Subject; Report preparation; Report preparation; Presentation

**MAT452 Applications of Partial Differential Equations 3+0 5.0**

Classification of Second Order Almost-Linear Equations, Canonical Forms of Almost-Linear Equations; Some Special Cases of Second-Order Linear Equations With Variable Coefficients; Reduction of Order in Second-Order Linear Equations; Introduction to the Wave Equation; Initial Value Problem for one Dimensional Homogeneous Wave Equation; The Vibrating String; Separation of Variables Method; Separation of Variables of the one Dimensional Wave Equation; Two Dimensional Wave Equation in the Rectangular Domain; Solution of the Two Dimensional Homogeneous Wave Equation in Polar Coordinates; Separation of Variables Solutions of the One Dimensional Heat Equation; Heat Flow in Rectangular Domain; Separation of Variables Solutions of the Laplace Equation; Solution of the Laplace Equation in Polar Coordinates. Classification of Second Order Almost-Linear Equations, Canonical Forms of Almost-Linear Equations; Some Special Cases of Second-Order Linear Equations With Variable Coefficients; Reduction of Order in Second-Order Linear Equations; Introduction to the Wave Equation; Initial Value Problem for one Dimensional Homogeneous Wave Equation; The Vibrating String; Separation of Variables Method; Separation of Variables of the one Dimensional Wave Equation; Two Dimensional Wave Equation in the Rectangular Domain; Solution of the Two Dimensional Homogeneous Wave Equation in Polar Coordinates; Separation of Variables Solutions of the One Dimensional Heat Equation; Heat Flow in Rectangular Domain; Separation of Variables Solutions of the Laplace Equation; Solution of the Laplace Equation in Polar Coordinates.

**MAT452 (Eng) Applications of Partial Differential Equations 3+0 5.0**

Classification of Second Order Almost-Linear Equations, Canonical Forms of Almost-Linear Equations; Some Special Cases of Second-Order Linear Equations With Variable Coefficients; Reduction of Order in Second-Order Linear Equations; Introduction to the Wave Equation; Initial Value Problem for one Dimensional Homogeneous Wave Equation; The Vibrating String; Separation of Variables Method; Separation of Variables of the one Dimensional Wave Equation; Two



- MATSJ301 Internship 0+2 5.0**  
Introduction of Workplaces at the Application Areas of Department of Mathematics; General Information about the Workplace; Daily Business Plans in the Institution where Internship is held; Studies in the Workplace, Applied Methods and Use of Theoretical Knowledge in the Work Environment; Professional Equipment and Software in the Working Environment; Preparing Reports Based on Observations at Internship; Submission Report.
- MEK308 Fluid Mechanics 2+0 3.0**  
Properties of Matter; Fluids; Pressure in Fluid and Density, Elasticity Modulus; Viscosity; Stress and Strain; Young Modulus; Variation of Pressure in Fluid at Rest, Viscous Fluids; Principle of Pascal's and Archimedes Principle; Measurement of Fluid Pressure; Fluid Dynamics; Equation of Continuity, Torricelli's Theorem; Bernoulli Equation; Applications of the Equations of Bernoulli and Continuity; Venturi Meter; Pitot Tube.
- MUH302 Analysis of Financial Reports 3+0 4.5**  
Fundamental Financial Statements: Balance sheet, Income statement; Comparative Statements Analysis Method: Preparation of statements, Analysis and interpretation; Percentage Analysis Method: Preparation of statements, Analysis and interpretation; Trend Analysis Method: Preparation of statements, Analysis and interpretation; Fund Cash Flow Analysis: Preparation of statements, Analysis and interpretation; Change in Net Working Capital Statement: Preparation of statements, Analysis and interpretation; Ratio Analysis: Analysis and interpretation of liquidity, financial structure activity and profitability ratios.
- MÜZ151 Short History of Music 2+0 3.0**  
Mile Stones in the History of Music; Music of the Antique Period; Music of Far East; Music of Anatolia; Music of the Middle Ages: Gregorian Chants; Music of Renaissance: Bach and Handel; Music of the Classical Age; Pianoforte in the Classical Age; Romantic Age; Nationalist Movement; Contemporary Music; Nationalism and Universality.
- MÜZ155 Turkish Folk Music 2+0 2.0**  
Folk songs from different Regions of Turkey are Taught; Aegean Region Zeybek Folk Songs: Eklemedir koca konak, Ah bir ateş ver, Çökertme, Kütahya'nın pınarları, Çemberinde gül oya; Kars Region Azerbaijani Folk Songs: Bu gala daşlı gala, Yollarına baka baka, Dağlar gızı Reyhan, Ayrılık, Dut ağacı boyunca; Central Anatolian Region Folk Songs: Seherde bir bağa girdim, Uzun ince bir yoldayım, Güzelliğin on para etmez, Mihriban ve Acem kızı; Southeastern Anatolian Region; Urfa and Diyarbakır Folk Songs: Allı turnam, Urfanın etrafı, Mardin kapısından atlayamadım, Fırat türküsü, Evlerinin önü kuyu; Blacksea Region; Trabzon, Rize, Artvin Folk Songs: Maçka yolları taşlı, Ben giderim Batuma, Dere geliyor dere.
- MÜZ157 Traditional Turkish Art Music 2+0 2.0**  
Description of Traditional Art Music: Basic concepts, Characteristics, Types, Notes, Instruments; The Mode System of Traditional Turkish Art Music; The Rhythmic Pattern of Traditional Turkish Art Music; Samples from Different Modes; Samples from Different Rhythmic Patterns.
- NÜM308 Numerical Analysis I 2+2 5.0**  
Errors and Mistakes; Numerical Methods for Solution of Nonlinear Equations: Simple iteration, Newton - Raphson, Cuts and Halfway Through Methods; Simple Iteration and Newton/Raphson Methods for System Equations; Finite Difference Equations; Interpolation: Linear, Quadratic, Lagrange's, Legendre's, Spline Interpolations; Numerical Integration: Trapezoidal Rule, Simpson's Rule, Gauss Integration Formulas.
- PZL211 (Eng) Principles of Marketing 3+0 5.0**  
Marketing: Scope, Evolution of Marketing; Marketing Environment; Marketing Research and Marketing Information Systems; Market Segmentation; Selecting Target Markets; Elements of Marketing Mix: Product, Price, Distribution channels, Promotion; Organization of Marketing Activities; International Marketing. Marketing: Scope, Evolution of Marketing; Marketing Environment; Marketing Research and Marketing Information Systems; Market Segmentation; Selecting Target Markets; Elements of Marketing Mix: Product, Price, Distribution channels, Promotion; Organization of Marketing Activities.
- PZL302 Marketing Management 3+0 4.5**  
Concept of Marketing; Evolution of Marketing; Functions of Marketing; Environmental Conditions of Marketing; Marketing Information Systems and Marketing Research; Market Concept; Market Segmentation and Target Market Selection; Customer Behavior in Industrial Markets; Product; Price; Distribution Channels and Physical Distribution; Sales Promotions; International Marketing. Concept of Marketing; Evolution of Marketing; Functions of Marketing; Environmental Conditions of Marketing; Marketing Information Systems and Marketing Research; Market Concept; Market Segmentation and Target Market Selection; Customer Behavior in Industrial Markets; Product; Price; Distribution Channels and Physical Distribution; Sales Promotions; International Marketing.

- PZL453 (Eng) Marketing Research** **3+0 4.5**  
 Marketing Problems in Businesses; Basic Classification of Marketing Research; Definition of Marketing Research; Implementation and Limitations of Marketing Research; Disciplines Relevant to Marketing Research; Categories of Marketing Research; Methodology in Marketing Research: Defining the problem, Situation Analysis, Determining Sources of Data , Data Collection Techniques; Sampling; Data Tabulation; Analysis of the Data; Interpreting the Results. Marketing Problems in Businesses; Basic Classification of Marketing Research; Definition of Marketing Research; Implementation and Limitations of Marketing Research; Disciplines Relevant to Marketing Research; Categories of Marketing Research; Methodology in Marketing Research: Defining the problem, Situation Analysis, Determining Sources of Data , Data Collection Techniques; Sampling; Data Tabulation; Analysis of the Data; Interpreting the Results.
- RTV281 Digital Literacy** **2+2 4.0**  
 Internet Technology and Uses; Abbreviations on Internet Addresses; Accessing Information over the Internet; Effective Participation on the Web; Web Literacy Reading Skills and Competencies; Terms and Concepts in New Media; Social media: Social Media Literacy Components; Social Media Security Threats and Precautions: Malware on the Web, Access to Reliable, Accurate and Updated Information in the Web Environment; Misinformation and Disinfection Concepts; Information Usage and Sharing in the Web Environment; Web Ethics: Privacy and Privacy in Social Media Use.
- SAĞ222 First Aid** **2+1 3.0**  
 Social Importance of First Aid; Aims of First Aid; Precautions to be Taken by First Aid Providers; Human Body; First Aid Materials; Strangulations and Supplying Respiration; Stopping Bleedings and Supplying Blood Circulation: External and internal bleeding signs and first aid, First aid and recognition of loss of consciousness, Causes of shock and recognition of shock due to bleeding and first aid; Degrees of Coma and First Aid; First Aid in Heart Failure; Applying Cardiopulmonary Resuscitation (CPR) and Artificial Respiration Together; Types of Injury and First Aid; Burn and Boils; Fractures; Dislocations and Spraining; Poisonings; Freezing; Hot and Electric Shocks.
- SAN155 Hall Dances** **0+2 2.0**  
 Basic concepts. The ethics of dance, Dance Nights, Dance Costumes, National International Competitions and rules/grading, Basic Definitions, Classifications of Dances: Social Dances; Salsa, Cha Cha, Samba, Mambo, Jive, Rock'n Roll, Jazz, Merenge; Flamenco, Rumba, Passa -Doble, Argentina tango, Vals, Disco, Quickstep, Foxtrot, Bolero, European Tango: Ballroom Dances; Sportive Dances; Latin American Dances; Samba, Rumba, Jive, Passa-Doble, Cha Cha, Standart Dances; European Tango, Slow vals (English), Viyana vals, Slow foxtrot, Quickstep.
- SNT155 History of Art** **2+0 2.0**  
 History of Civilization and Evolution of Art: Prehistory to Present; Concepts and Terminology in Art with Samples; Interrelation among Art-Religion and Society; Effects of Religion on Artistic Development; Reflections and Interpretations of Judaism, Christianity and Islam on Art; Renaissance: Emergence, Effects, Artists, Works of Art; Architecture and Plastic Arts; Art in the 19th and 20th Centuries: Relevance of the main historical events of the period.
- SOS155 Folkdance** **2+0 2.0**  
 Dance in Primitive Cultures; Dance in Earlier Civilizations; Dance in the Middle Age and Renaissance; Dance in the 18th and 19th Centuries; Dances of the 20th Century; Ballet; Turkish Dances; Emergence of Folkdance; Anatolian Folkdance: Classification, Accompanying instruments; Methods and Techniques of Collecting Folkdance; Problems in Collecting Folkdance; Teaching of Folkdance; Adapting Folkdance for Stage: Stage, Stage aesthetics and Choreography, Orientation and choreography.
- TAR165 Atatürk's Principles and History of Turkish Revolution I** **2+0 2.0**  
 Reform efforts of Ottoman State, General glance to the stagnation period, Reform searching in Turkey, Tanzimat Ferman and its bringing, The Era of Constitutional Monarchy in Turkey, Policy making during the era of first Constitutional Monarchy, Europe and Turkey, 1838-1914, Europe from imperialism to World War I, Turkey from Mudros to Lausanne, Carrying out of Eastern Question, Turkish Grand National Assembly and Political construction 1920-1923, Economic developments from Ottomans to Republic, The Proclamation of New Turkish State, from Lausanne to Republic.
- TAR166 Atatürk's Principles and History of Turkish Revolution II** **2+0 2.0**  
 The Restructuring Period; The Emergence of the fundamental policies in the Republic of Turkey (1923-1938 Period); Atatürk's Principles, and Studies on Language, History and Culture in the period of Atatürk; Turkish Foreign Policy and Application Principles in the period of Atatürk; Economic Developments from 1938 to 2002; 1938-2002 Period in Turkish Foreign Policy; Turkey after Atatürk's period; Social, Cultural and Artistic Changes and Developments from 1938 to Present.
- TER206 Thermodynamics** **4+0 5.0**  
 Temperature, Thermal Expansion and Ideal Gases: Temperature and the zeros law of thermodynamics, Thermometers and temperature scales, Thermal expansion of solids and liquids, Macroscopic description of an ideal gas; Heat and the First Law of Thermodynamics: Heat and thermal energy, Heat capacity and specific heat, Work and heat in thermodynamic

processes, The first law of thermodynamics, Heat transfer; The Kinetic Theory of Gases: Molecular model of pressure in an ideal gas, Molecular interpretation of temperature, Heat capacity of an ideal gas; Heat Engines, Entropy and the Second Law of Thermodynamics: Heat engines and the second law of thermodynamics, the Carnot engine, Entropy and disorder.

**TER210 Thermodynamics Laboratory 0+2 2.0**

Sıcaklık, Termal genleşme ve ideal gazlar: Sıcaklık ve termodinamiğin sıfıncı yasası; Katı ve Sıvıların Termal Genleşmesi, Isı ve termodinamiğin birinci yasası; Isı Enerjisi: Isı yalıtımı ve ısı iletimi, Isı yalıtım malzemeleri; Isı ve termal enerji, Isı kapasitesi ve özgül ısı.

**THU203 Community Services 0+2 3.0**

Various Community Projects: Helping young students during their study periods or after school study sessions, Aiding the elderly in nursing homes, helping disabled individuals with various tasks, helping social services and aiding children with their education etc., take part in the projects which raise environmental awareness, Integrating with the community and enabling use of knowledge accumulated in the courses.

**TKY302 Quality Control 3+0 4.5**

Quality Development and Quality Control: Quality development and dimensions of its concept, Probability and statistics in quality control; Quality Control in Total Quality Management; Statistical Methods Used in Quality Control: Variations and its measurement, Important batch and continuous dispersion, Sampling dispersions, Parameter estimate and hypothesis tests; Statistical Process Control (SPC): Philosophy of SPC and methods, Practice, Control charts for attributable and quantity variables, Other statistical process control methods, Process ability analysis, Acceptance (consent) sampling and sampling plans, Various quality standards. Quality Development and Quality Control: Quality development and dimensions of its concept, Probability and statistics in quality control; Quality Control in Total Quality Management; Statistical Methods Used in Quality Control: Variations and its measurement, Important batch and continuous dispersion, Sampling dispersions, Parameter estimate and hypothesis tests; Statistical Process Control (SPC): Philosophy of SPC and methods, Practice, Control charts for attributable and quantity variables, Other statistical process control methods, Process ability analysis, Acceptance (consent) sampling and sampling plans, Various quality standards.

**TKY302 (Eng) Quality Control 3+0 4.5**

Quality Development and Quality Control: Quality development and dimensions of its concept, Probability and statistics in quality control; Quality Control in Total Quality Management; Statistical Methods Used in Quality Control: Variations and its measurement, Important batch and continuous dispersion, Sampling dispersions, Parameter estimate and hypothesis tests; Statistical Process Control (SPC): Philosophy of SPC and methods, Practice, Control charts for attributable and quantity variables, Other statistical process control methods, Process ability analysis, Acceptance (consent) sampling and sampling plans, Various quality standards. Quality Development and Quality Control: Quality development and dimensions of its concept, Probability and statistics in quality control; Quality Control in Total Quality Management; Statistical Methods Used in Quality Control: Variations and its measurement, Important batch and continuous dispersion, Sampling dispersions, Parameter estimate and hypothesis tests; Statistical Process Control (SPC): Philosophy of SPC and methods, Practice, Control charts for attributable and quantity variables, Other statistical process control methods, Process ability analysis, Acceptance (consent) sampling and sampling plans, Various quality standards.

**TKY404 Quality Management System 2+0 3.0**

Quality Definition and Terms; Quality Philosophy: Principles of quality philosophy; Total Quality Management; Quality Costs; Simple Problem Solving Techniques: Brainstorming, Check sheets, Histogram, Pareto analysis, Scatter plots, Box plot; Quality Control; Statistical Quality Control: Variable control charts, Attribute control charts; Standardization and Standards; Quality Assurance Systems and ISO 9000 Standards.

**TKY409 Industrial Quality Systems 2+0 3.0**

Concept of Quality: Content of quality concept, Customer, Cost, Delivery; Laboratory Management Systems and Safety in Laboratory; Preparation of Working Instructions, Procedures, Equipment Use Training Notes; Laboratory Management: 5S; Total Perfect Management (TPM); Design of Experiments: Taguchi; Statistical Process Control: Control schemes, 6 sigma; Problem-Solving Techniques: Ishikawa diagrams, Why-why analysis, Pareto.

**TÜR120 Turkish Sign Language 3+0 3.0**

Overview of Sign Language: Characteristics of sign language; History of Sign Language in the World: Emergence of language and sign language, Verbal education and approaches to sign language; History of Turkish Sign Language: Early period, Ottoman period, Period of the Republic of Turkey; Introduction to Turkish Sign Language: Finger alphabet, Pronouns, Introducing oneself and family, Greetings, Meeting, Relationship words; Showing Basic Words: Adjectives: Adjectives of quality, Adjectives of quantity; Verbs: Present tense, Past tense, Future tense, Time adverbs, Antonyms; Healthy Living: Expression of health-related problems, Sports terms, Expressing requirements; In a Bank: Expressions required to carry out basic procedures in a bank; Vacation: Basic words about vacation.



- TÜR125 Turkish Language I 2+0 2.0**  
 Language: Characteristics of language, Relationship between language and thought and language and emotion, Theories about the origin of languages, Language types, The position of Turkish Language among world languages; Relationship Between Language and Culture; Historical Progress of the Turkish Language; Alphabets Used for Writing in Turkish; Turkish Language Studies; Turkish Language Reform; Phonetics; Morphology and Syntax; The Interaction of Turkish Language with Other Languages; Wealth of Turkish Language; Problems Facing Turkish Language; Derivation of Terms and Words; Disorders of Oral and Written Expression.
- TÜR126 Turkish Language II 2+0 2.0**  
 Composition: Written composition, Paragraph and ways of expression in paragraphs; Punctuation; Spelling Rules; Types of Written Expression and Practices I: Expository writing; Types of Written Expression and Practices II: Narrative writing; Academic Writing and Types of Correspondence; Reading and Listening: Reading, Reading comprehension strategies, Critical reading; Listening; Relationship between Listening and Reading; Oral Expression: Basic principles of effective speech; Body Language and the Role of Body Language in Oral Expression; Speech Types; Principles and Techniques of Effective Presentation; Some Articulatory Features of Oral Expression.
- YBİM302 Recommender Systems 3+0 4.5**  
 Introduction: Scope, importance and requirements; Recommender Systems: basic features and application areas; Association Rule Mining: Concept and usage; Types of Recommender Systems: Demographic filtering, knowledge-based recommendation, collaborative filtering, content-based filtering, hybrid recommendation systems; Case studies: Creating project groups and identifying project topics; Case studies: Discussion of recommendation system analysis and implementation phases; Case studies: Creation and presentation of recommendation systems applications.
- YBİM304 Mobile Programming 3+0 5.0**  
 Mobile Computing: Mobile computing platforms, Smart devices, Mobile development environments, Native and Cross-platform Development; The Xamarin Approach; Xamarin.Android, Xamarin.iOS and Xamarin.Forms approaches; XAML in Xamarin.Forms; Layout in Xamarin.Forms; Resources and Styles; Navigation Patterns in Xamarin.Forms; Data Binding in Xamarin.Forms; Using ListView in Xamarin.Forms; The Xamarin.Android Environment; Xamarin.Android - Activities & Intents; SQLite and Mobile Data; Design MVVM ViewModel in Xamarin.Forms; Preparing to Publish Your Application.
- YİST301 (Eng) Applied Econometrics 3+0 5.0**  
 Introduction to Applied Econometrics: Matrix algebra, Probability and distribution theory, Estimation and inference, Computation and optimization; Linear Regression Model and Estimation Methodology: Estimation frameworks in econometrics, Specification analysis and model selection; Time Series and Macroeconometrics: Time series data, Serial correlation, Nonstationary data; Panel Data and Microeconometrics: Panel data, Random effects and fixed effects models; Limited Dependent Variables: Censored-truncated-discrete data, Sample selection and corner solution, Hurdle models; Count and Duration Data: Zero-inflated data, Poisson regression, Survival analysis
- YİST303 Data Visualization 3+0 5.0**  
 Fundamentals of data visualization: Mapping data onto aesthetics, Coordinate systems and axes, Color scales; Visualization types: Visualizing amounts, Visualizing distributions, Visualizing proportions, Visualizing time series, Visualizing spatial data; Principles of figure design: The principle of proportional ink, Handling overlapping points, Common pitfalls of color use, Legend using, Balance the data and the context; Visualization applications: Understanding most commonly used image file formats, Choosing right visualization software, Telling a story and making a point.
- YPZL301 CRM and Customer Analytics 2+0 4.0**  
 Relationship Marketing and CRM Philosophy; CRM Concept and Features; Basic Concepts of CRM; Communication with Customers; Quality Approaches to Service, E-Service and Mobile Service; Customer Satisfaction and Loyalty; Customer Experience Management; Measuring Customer Relationships; Examples of CRM and its Measurement; Concept and Characteristics of Customer Analytics; Customer Value and Strategies; Customer Analytics and Measurement, Sample Applications of Customer Analytics.

**YPZL302 Social Media and Digital Marketing**

**3+0 5.0**

Development of Social Media and; Social Media, Web 2.0, Consumer Generated Content, Building Blocks of Social Media, Social Media Platforms; Communication Based Platforms, Cooperation Based Platforms, Multimedia and Entertainment Based Platforms, Mobile Applications, Digitalization and the Consumer; New Consumer Power, Digital Generations, E-Consumption Behavior, Social Media Campaigns; Social Media Campaign Planning, Research, Strategic Designs, Implementation and Screening, Evaluation and Measurement, Internet Advertising; Target Marketing Strategies, Search Engine Marketing and Advertising, Digital Advertising, E-mail Marketing, Affiliate Marketing, Content Marketing; Content Marketing Funnel, Storytelling, Customer Journey, Attention Getting, Content Creation and Curation, Content Delivery