Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4123	**2**	**0**	**0**	**2**	**4**	**S**	**TR**	**4/FALL**
Course Name (Turkish**)**	**Endüstriyel Ayırma Yöntemleri**							
Course Name (English**)**	**Industrial Separation Methods**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	Teaching separation, chemical and physical processing methods in the Chemical Industry, Selecting the type of separation process based on the concepts of mass and heat transfer principles and phase balances, determining the operating parameters with the help of mass-energy conservation equations and phase balances, evaluating the effects of different operating conditions on separation efficiency and separation unit design parameters, Understanding the importance of cooperation and solidarity of Chemical Engineers and Chemists while performing their duties for the business.
Course Outline	Importance and Development of Separation Methods in Chemical Industry, Principles on which separation processes are based and the concept of phase equilibrium. Types of separation processes; Distillation, Liquid-liquid extraction, Solid-liquid extraction, Humidification and Drying processes. Mass conservation equations, phase curves and separation unit design equations according to different operating types for each of the separation processes. Fundamentals of Chemical Substance Production, Chemical and Physical Basic Operations, Separation Methods, Duties of Chemists and Chemical Engineers.
Textbook/ Material / Resources	**1.** Geankoplis, C.J., 2009.Transport Processes and Separation Process Principles, 4th ed., Prentice-Hall. **2.** Treybal, R.E., 1980. Mass-Transfer Operations, 3rd ed., Mc Graw-Hill Kogakusha Ltd., Tokyo. **3.** McCabe, W. L., Smith J.C., Harriott P. 2004, Unit Operations of Chemical Engineering,7th ed. Prentice Hall, New York. **4.** Coulson, J.M., Richardson, J.F., Backhurst J.R., 1996. Chemical Engineering: Particle Technology and Separation, Vol 4, Butterworth & Heinemann. **5.** Hines, A.L., Maddox, R.N., 1995. Mass Transfer, Fundamentals and Applications, Prentice-Hall Inc., New Jersey. **6.** Dutta, B.K.,2009. Principles of Mass Transfer and Seperation Processes, PHI Learning, New Delhi. **7.** Wankat, P.C., 2012. Seperation Process Engineering, 3rd ed., Prentice Hall, New York. **8.** Uysal, B.Z., 2003. Kütle Transferi Esasları ve Uygulamaları, 2. Baskı, Gazi Üniversitesi, Ankara. **9.** Alpay E., 2011. Kütle Aktarımı ve Kütle Aktarım İşlemleri, Ege Üniversitesi Yayınları No:50, İzmir. **10.**Foust, A. S., Wenzel, L. A., Clump, C. W., Maus, L., Andersen, L. B., 1980. Principles of Unit Operations, 2nd ed., John WileyδSons. **11.**Çataltaş,A.İ, Kimyasal Proses Endüstrileri 1.2,1985 **12.**Erdik,E ve Arkadaşları,Denel Organik Kimya, 2001 Balchen,G.J, Kimya Mühendisliğine Giriş, 1986
Internship Status	No

Course Precedents				
University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**

Ankara University	Chemical Engineering	Separation Procedures	**2-2-0; 3**	essential
Marmara University	Chemical Engineering	Separation Procedures	**3-0-0; 5**	essential

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Prof. Dr. Memet ŞEKERCİ	
Instructors who can teach the course (Title, Name and Surname)	*Signature*
Prof. Dr. Sinan SAYDAM, Prof. Dr. Ayşegül YAZICI, Doç. Dr. Kenan KORAN	

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

Since it is one of the most important courses in the basic and especially applied fields of chemistry, it is a necessity for knowledge in education and further academic education.

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

The course will be continued theoretically in a classroom environment with relevant visual and presentation explanations.

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)

Stakeholder Name	**Opinion** (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution

Week	Theory	Application/Laboratory
1	Importance and Development of Separation Methods in Chemical Industry	
2	Importance and Development of Separation Methods in Chemical Industry	
3	Principles of Chemical Substance Production	
4	Principles of Chemical Substance Production	
5	Principles of Chemical Substance Production	
6	Chemical and Physical Basic Operations	
7	Chemical and Physical Basic Operations	
8	Separation Methods	
9	Midterm Exam	

10	Separation Methods	
11	Separation Methods	
12	Distillation, Liquid-liquid extraction,	
13	Solid-liquid extraction, Humidification and Drying processes.	
14	Duties of Chemists and Chemical Engineers	
15	Final	
16		

Assessment			
Evaluation Criteria	**Activity**	**Custom**	**Contribution to Success Grade (%)**
	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60
		Sum:	100
Remarks			

Content Design and Subject Weight (%)	Mathematics and Basic Sciences	70
	Engineering Sciences	*30*
	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application	*1*	*2*	*2*
Self-Study (including pre-class and exam preparation)	*2*	*10*	*20*
Make-up Exam	*1*	*2*	*2*
Experiment and Observation			
Class Participation (Theory)	*14*	*2*	*28*
Homework			
Final Exam Practice	*1*	*2*	*2*
Laboratory			
Article Review			
Writing an Article			
Reading			
Case Study			
Performance			

Problem Solution	*14*	*2*	*28*
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument	*14*	*1*	*14*
Application/Practice			
Other			
TOTAL WORKLOAD:			**96**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**4**

	Learning Outcomes (LO) *(Course Outcomes)*	**Program Outcomes (PO)** *1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Knows separation methods.	**4**	**2**	**-**	**-**	**-**	**3**	**-**	**2**	**5**	**3**	**-**
2	Knows which separation methods can be used.	**4**	**2**	**-**	**-**	**-**	**3**	**-**	**2**	**5**	**3**	**-**
3	Knows which physical and chemical separation methods can be used.	**4**	**2**	**-**	**-**	**-**	**3**	**-**	**2**	**5**	**3**	**-**
4	Knows the importance of separation methods.	**4**	**2**	**-**	**-**	**-**	**3**	**-**	**2**	**5**	**3**	**-**
5	Knows the contribution of separation methods to production methods.	**4**	**2**	**-**	**-**	**-**	**3**	**-**	**2**	**5**	**3**	**-**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4143	**2**	**0**	**0**	**2**	**4**	**S**	**TR**	**4/FALL**
Course Name (Turkish**)**	**Plastik Teknolojisi**							
Course Name (English**)**	**Plastic Technology**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	Teaching polymer types, plastic synthesis and production processes according to their sources
Course Outline	Historical Development of Polymers and General Concepts, Classification of Polymers, Smart Polymers, Thermoplastics, Overview of Plastic Materials Industry, Injection Technology, Extrusion Technology, Rotational Molding, Thermoforming, Casting, Foaming, Blowing, Additives Added to Plastic Materials, Biopolymers, Most Used Polymers
Textbook/ Material / Resources	Plastik İşleme Teknolojisi, Prof. Dr. Münir Taşdemir, Seçkin Yayıncılık Plastik Malzeme Teknolojisi, Prof. Dr. Hüsnü Gerengi, Doç. Dr. Haydar Göksu, Seçkin Yayıncılık Lif ve Elyaf Kimyası, Mehmet Saçak, Gazi Kitapevi
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Ankara University	Faculty of Engineering	Plastic and Man-Made Fiber Technology	**3-0-0-3; 4**	elective
Sakarya University of Applied Sciences	Faculty of Engineering	Plastic Technology	**3-0-0-3; 5**	elective

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Instructors who can teach the course (Title, Name and Surname)	*Signature*

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)	
Stakeholder Name	**Opinion** (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution

Week	Theory	Application/Laboratory
1	Historical Development of Polymers and General Concepts	
2	Classification of Polymers	
3	Smart Polymers	
4	Thermoplastics	
5	A Look at the Plastic Materials Industry	
6	Injection Technology	
7	Extrusion Technology	
8	Rotational Molding	
9	Midterm Exam	
10	Thermal Forming	
11	Casting, Foaming, Blowing	
12	Additives Added to Plastic Materials	
13	Biopolymers	
14	Most Commonly Used Polymers	
15	Final	
16		

Assessment

	Activity	Custom	Contribution to Success Grade (%)
Evaluation Criteria	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60
		Sum:	100
Remarks			

Content Design and Subject Weight (%)	Mathematics and Basic Sciences	100
	Engineering Sciences	
	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork	*1*	*3*	*1*
Midterm Exam Application			
Self-Study (including pre-class and exam preparation)	*1*	*10*	*10*
Make-up Exam			
Experiment and Observation	*14*	*2*	*28*
Class Participation (Theory)			
Homework	*1*	*1*	*1*
Final Exam Practice			
Laboratory			
Article Review			
Writing an Article	*10*	*2*	*20*
Reading			
Case Study			
Performance			
Problem Solution			
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work	*9*	*3*	*27*
Argument			
Application/Practice			
Other	*2*	*5*	*10*
TOTAL WORKLOAD:			**97**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**4**

	Program Outcomes (PO) / **Learning Outcomes (LO)** *(Course Outcomes)*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Learn about polymer types and raw material sources.	**5**	**3**	**4**	**1**	**3**	**3**	**4**	**2**	**5**	**5**	**2**
2	Learn about polymer syntheses.	**5**	**3**	**4**	**1**	**3**	**3**	**4**	**2**	**5**	**5**	**2**
3	Learn about plastics.	**5**	**3**	**4**	**1**	**3**	**3**	**4**	**2**	**5**	**5**	**2**
4	Learn about plastic material production methods.	**5**	**3**	**4**	**1**	**3**	**3**	**4**	**2**	**5**	**5**	**2**
5	Learn about polymer design according to	**5**	**4**	**5**	**2**	**4**	**3**	**3**	**3**	**5**	**4**	**3**

	feature.											

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4151	**0**	**2**	**0**	**1**	**2**	**Z**	**TR**	**4/FALL**
Course Name (Turkish**)**	**Polimer Kimyası Laboratuvarı**							
Course Name (English**)**	**Polymer Chemistry Laboratory**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	By strengthening the theoretical background in basic polymer chemistry and polymerization techniques, important experimental techniques and skills in the field of polymer chemistry will be acquired and the discussion and reporting of experimental results will be learned through device-based characterization studies.
Course Outline	Polimer kimyasına giriş, Polimerlerde molekül ağırlığı kavramı, Polimerlerin Fraksiyonları, Polimerlerde Camsı Geçiş Sıcaklığı, Polimerizasyon Reaksiyonları, Kopolimerizasyon ve Polimerizasyon sistemleri
Textbook/ Material / Resources	1. Kondolot Solak, Ebru; Taşkın Çakıcı, Gülşen, Polimer Kimyası Laboratuvarı Deney Kitabı, Nobel Akademik Yayıncılık, 2023. 2.Saçak M., Polimer Kimyası (2. Baskı), Gazi Kitabevi
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Hacettepe University	Chemical	**Polymer Chemistry Laboratory**	**0-6-0-; 4**	essential

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Prof.Dr.Kadir DEMİRELLİ	
Instructors who can teach the course (Title, Name and Surname)	*Signature*
Prof.Dr.Kadir DEMİRELLİ	
Prof. Dr. ZÜlfiye İLTER	
Doç. Dr. Mehmet Murşit Temüz	
Doç. Dr. Fatih BİRYAN	

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

Putting the basic knowledge of polymer chemistry into practice, providing the ability to conduct experiments, converting the experiments into reports and comprehending the discussion.

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

Face-to-face oral presentation, in exceptional cases it will be switched to online

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)

Stakeholder Name	**Opinion** (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/Laboratory**
1		Polymer Chemistry laboratory introduction and laboratory safety
2		Synthesis of polystyrene by free radical solution polymerization
3		Synthesis of halogen-terminated polymethylmethacrylate by atom transfer radical polymerization
4		Synthesis of Maleic Anhydride-Styrene Copolymer
5		Synthesis of Nylon6,1o by interfacial polymerization
6		Copolymer synthesis and determination of monomer reactivity
7		Synthesis of conductive polymer
8		Suspension polymerization
9		Condensation Polymerization and Synthesis of Phenol-Formaldehyde Resin with Base Catalyst
10		MIDTERM
11		Adsorption of dyes by polymeric microspheres
12		Determination of viscosity average molar mass of polymers
13		Polymer degradation experiment (Investigation of Thermal Degradation of PVC)
14		Continue to polymer degradation/Excuse
15		FINAL
16		

Assessment			
Evaluation Criteria	**Activity**	**Custom**	**Contribution to Success Grade (%)**
	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60
		Sum:	100
Remarks			

Content Design and Subject Weight	Mathematics and Basic Sciences	100

(%)	Engineering Sciences	
	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application	*1*	*2*	*2*
Self-Study (including pre-class and exam preparation)	*2*	*12*	*24*
Make-up Exam	*1*	*2*	*2*
Experiment and Observation			
Class Participation (Theory)			
Homework			
Final Exam Practice	*1*	*2*	*2*
Laboratory	*14*	*2*	*28*
Article Review			
Writing an Article			
Reading			
Case Study			
Performance			
Problem Solution			
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument			
Application/Practice			
Other			
TOTAL WORKLOAD:			**58**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**2**

	Learning Outcomes (LO) *(Course Outcomes)*	**Program Outcomes (PO)** *1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Gaining Polymer Chemistry laboratory experience	**5**	**3**	**3**	**4**	**0**	**4**	**4**	**4**	**3**	**4**	**0**
2	Determining the difference between monomer and polymer concepts and making polymer synthesis methods understandable	**5**	**3**	**3**	**3**	**1**	**3**	**5**	**4**	**3**	**3**	**0**
3	Highlighting the importance of polymer matrix in applications	**5**	**4**	**4**	**5**	**0**	**4**	**3**	**3**	**4**	**4**	**1**
4	Determining the behavior of polymers against	**5**	**3**	**3**	**3**	**1**	**4**	**3**	**3**	**5**	**4**	**0**

	some external factors											

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4153	**2**	**0**	**0**	**2**	**2**	**Z**	**TR**	**4/FALL**
Course Name (Turkish)	**Kuantum Kimyası**							
Course Name (English)	**Quantum Chemistry**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	Explaining atomic and molecular structures with the quantum chemistry approach
Course Outline	Events that make up quantum theory, wave and electromagnetic wave, particles and wave properties, Assumptions in quantum theory, Solution of the particle in the box with quantum mechanics, Explanation of the structure of the hydrogen atom with quantum theory, Wave functions of atomic orbitals, angular momentum
Textbook/ Material / Resources	Inorganik Kimya, Garly L.Miessler, Donald A.Tarr, Çevirmen : Çeviri Editörleri : Nurcan Karacan,Perihan Gürkan, Palme Yayınları, 2009, Ankara Quantum Chemistry; D. A. McQuarrie, University Science Books, 2007, USA.
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Ankara University	Chemical	**Quantum Chemistry**	**2-1-2-0-3**	essential
Gazi University	Chemical	**Quantum Chemistry**	**2-2-4-0-3**	essential
Hacettepe University	Chemical	**Quantum Chemistry**	**2-0-3-0-3**	essential

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Prof. Dr. Sinan SAYDAM	
Instructors who can teach the course (Title, Name and Surname)	*Signature*
Prof. Dr. Sinan SAYDAM, Prof. Dr. Ayşegül YAZICI, Prof. Dr Memet ŞEKERCİ, Doç. Dr. Kenan KORAN	

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)

Stakeholder Name	Opinion (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution

Week	Theory	Application/Laboratory
1	Events leading to quantum theory	
2	Electromagnetic waves and their properties	
3	Black body radiation	
4	Atomic spectrum and its properties	
5	Bohr Atom model and spectroscopy	
6	Wave and particle properties	
7	Heisenberg Uncertainty Principle	
8	Midterm Exam	
9	Schrödinger Wave Equation	
10	Time-independent Schrödinger Wave Equation	
11	Time-dependent Schrödinger Wave Equation	
12	One-dimensional box model	
13	Schrödinger Wave Equation and Hydrogen atom	
14	Radial and angular wave functions, multi-electron atoms	
15	Final Exam	
16		

Assessment

	Activity	Custom	Contribution to Success Grade (%)
Evaluation Criteria	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60
		Sum:	100
Remarks			

Content Design and Subject Weight (%)	Mathematics and Basic Sciences	100
	Engineering Sciences	

	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application	*1*	*2*	*2*
Self-Study (including pre-class and exam preparation)	*3*	*10*	*30*
Make-up Exam	*1*	*2*	*2*
Experiment and Observation			
Class Participation (Theory)	*14*	*2*	*28*
Homework			
Final Exam Practice	*1*	*2*	*2*
Laboratory			
Article Review			
Writing an Article			
Reading	*10*	*1*	*10*
Case Study			
Performance			
Problem Solution			
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument	*7*	*1*	*7*
Application/Practice			
Other			
TOTAL WORKLOAD:			**81**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**3**

	Program Outcomes (PO) / **Learning Outcomes (LO)** *(Course Outcomes)*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Knows the structure of the atom and its basic principles.	**5**	**4**	**4**	**4**	**3**	**4**	**4**	**3**	**3**	**3**	**1**
2	Knows the electronic structure of the atom and its relationship with electromagnetic radiation.	**5**	**5**	**4**	**3**	**4**	**3**	**3**	**2**	**3**	**3**	**1**
3	Knows the differences between classical mechanics and quantum mechanics	**3**	**3**	**2**	**2**	**1**	**2**	**5**	**4**	**2**	**2**	**1**
4	Knows the meaning of the Schrödinger wave equation and can solve 1, 2 and 3 dimensional Schrödinger wave equations	**3**	**2**	**2**	**2**	**2**	**3**	**1**	**2**	**4**	**3**	**1**
5	Has knowledge about the relationship between the atom and spectroscopy.	**5**	**5**	**5**	**4**	**4**	**4**	**3**	**4**	**4**	**4**	**1**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4159	**2**	**0**	**0**	**2**	**4**	**S**	**TR**	**4/FALL**
Course Name (Turkish**)**	**Petrokimya**							
Course Name (English**)**	**Petrochemistry**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	To provide information about petroleum and its products including chemical production processes.
Course Outline	Petroleum definition and production, processes and products developed for the use of fossil energy resources.
Textbook/ Material / Resources	-Beşergil, B. Petrol, Petrol Kimyası. Gazi Kitabevi 2009. - Petrol Ve Petrokimya TMMOB Enerji Raporu.
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Mersin University	Chemical	Petrochemical Technology	**2-0-0-2-3**	Elective
Ankara University	Chemical	Petroleum Products Chemistry	**4-0-0-3-4**	essential

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Prof. Dr. Mustafa KARATEPE	
Instructors who can teach the course (Title, Name and Surname)	*Signature*
Prof. Dr. Fikret KARATAŞ	

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

To provide information about oil and its products used in the production of energy, which is a basic need of humanity.

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

The course is aimed at gaining theoretical knowledge.

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)

Stakeholder Name	**Opinion** (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/Laboratory**
1	What is Petroleum? Word Origin and Composition	
2	Oil Production	
3	Saturated Hydrocarbons	
4	Unsaturated Hydrocarbons	
5	Physical Properties of Crude Oil	
6	Processes Applied in Oil Refineries	
7	Distillation of Crude Oil	
8	Product Development	
9	Midterm Exam	
10	Transformation Processes	
11	Blending and Other Processes	
12	Petrochemicals 1	
13	Petrochemicals 2	
14	Other Chemicals	
15	Final	
16		

Assessment			
Evaluation Criteria	**Activity**	**Custom**	**Contribution to Success Grade (%)**
	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60
		Sum:	100
Remarks			

Content Design and Subject Weight (%)	Mathematics and Basic Sciences	80
	Engineering Sciences	*20*
	Social Sciences	

	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application	*1*	*1*	*1*
Self-Study (including pre-class and exam preparation)	*4*	*10*	*40*
Make-up Exam	*1*	*2*	*2*
Experiment and Observation			
Class Participation (Theory)	*10*	*2*	*20*
Homework			
Final Exam Practice	*1*	*2*	*2*
Laboratory			
Article Review			
Writing an Article			
Reading	*5*	*2*	*10*
Case Study			
Performance			
Problem Solution	*5*	*1*	*5*
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument	*10*	*1*	*10*
Application/Practice			
Other			
TOTAL WORKLOAD:			**90**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**4**

Learning Outcomes (LO) *(Course Outcomes)*		**Program Outcomes (PO)** *1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Ability to apply basic knowledge of Chemistry, Mathematics and Physics to Chemistry problems	**4**	**5**	**5**	**4**	**4**	**5**	**4**	**4**	**4**	**5**	**4**
2	Consciousness of constantly renewing oneself and developing research skills in order to adapt to innovations and developing technology	**4**	**5**	**3**	**4**	**4**	**4**	**4**	**4**	**2**	**5**	**4**
3	Designs theoretical and practical researches in the field by developing	**5**	**5**	**3**	**5**	**5**	**3**	**4**	**4**	**4**	**4**	**5**

	original ideas and methods											
4	Consideres social, scientific and ethical values in the stages of data collection, interpretation and announcement and in all professional activities	**5**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**3**	**2**	**5**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4155	**2**	**0**	**0**	**2**	**4**	**S**	**TR**	**4/FALL**
Course Name (Turkish**)**	**Koordinasyon Kimyası**							
Course Name (English**)**	**Coordination Chemistry**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	Teaching the basic concepts, nomenclature, bonding theories and theories in coordination chemistry, stability concepts in coordination compounds.
Course Outline	Basic concepts and nomenclature in coordination chemistry, coordination numbers and isomerism, bonding theories in coordination chemistry and stability in coordination compounds.
Textbook/ Material / Resources	İleri İnorganik Kimya Ders Notları 2. Advenced Inorganic Chemistry, F.A. Cotton. Saim Özkâr, Namık Kemal Tunalı, Anorganik Kimya Ders Kitabı, Gazi Kitabevi, 2017. Turgut Gündüz, Koordinasyon Kimyası Ders Kitabı, Gazi Kitabevi, 2005.
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Ankara University	Chemical	Coordination Chemistry	**3-0-0-3-4**	Elective
Selcuk University	Chemical	Coordination Chemistry	**3-0-0-3-4**	Elective

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Doç. Dr. Kenan KORAN	
Instructors who can teach the course (Title, Name and Surname)	*Signature*
Prof. Dr. Sinan SAYDAM, Prof. Dr. Mehmet ŞEKERCİ, Prof. Dr. Ayşegül YAZICI, Doç. Dr. Kenan KORAN	

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

Since it is one of the courses in the basic and applied fields of chemistry, knowledge is necessary in education and further academic education.

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

The course will be continued theoretically in a classroom environment with relevant visual and presentation explanations.

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)

Stakeholder Name	**Opinion** (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/Laboratory**
1	History of Coordination Chemistry	
2	Nomenclature of Coordination Compounds	
3	Reading Ligands	
4	Reading Bridged Coordination Compounds	
5	Reading Geometric Isomers	
6	Hybridization	
7	Valence Bond Theory	
8	Effective Atomic Number Theory	
9	Mid-term exam	
10	Molecular Orbital Theory, Crystal Field Theory	
11	Classification of Coordination Compounds	
12	Magnetic Properties of Coordination Compounds	
13	Coordination Number	
14	Chelate Effect	
15	Final exam	
16		

Assessment			
Evaluation Criteria	**Activity**	**Custom**	**Contribution to Success Grade (%)**
	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60
		Sum:	100
Remarks			

Content Design and Subject Weight (%)	Mathematics and Basic Sciences	100
	Engineering Sciences	
	Social Sciences	

	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application	*1*	*2*	*2*
Self-Study (including pre-class and exam preparation)	*10*	*1*	*10*
Make-up Exam	*1*	*2*	*2*
Experiment and Observation			
Class Participation (Theory)	*14*	*2*	*28*
Homework			
Final Exam Practice	*1*	*2*	*2*
Laboratory			
Article Review			
Writing an Article			
Reading			
Case Study			
Performance			
Problem Solution	*15*	*2*	*28*
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument	*14*	*2*	*28*
Application/Practice			
Other			
TOTAL WORKLOAD:			**100**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**4**

Learning Outcomes (LO) *(Course Outcomes)*		**Program Outcomes (PO)** *1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Knows coordination chemistry and its history.	**4**	**2**	**-**	**-**	**-**	**3**	**-**	**2**	**5**	**3**	**-**
2	Knows the nomenclature of coordination compounds.	**4**	**2**	**-**	**-**	**-**	**3**	**-**	**2**	**5**	**3**	**-**
3	Knows the bonding theories in coordination chemistry.	**4**	**2**	**-**	**-**	**-**	**3**	**-**	**2**	**5**	**3**	**-**
4	Knows the coordination number and chelate effect.	**4**	**2**	**-**	**-**	**-**	**3**	**-**	**2**	**5**	**3**	**-**
5	Knows the magnetic properties in coordination compounds.	**4**	**2**	**-**	**-**	**-**	**3**	**-**	**2**	**5**	**3**	**-**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4161	**4**	**0**	**0**	**4**	**4**	**Z**	**TR**	**4/FALL**
Course Name (Turkish)	**Biyokimya I**							
Course Name (English)	**Biochemistry I**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	To provide information about all the basic topics of biochemistry, especially the cell, which is the basic building block of living things
Course Outline	Cell and its structure; Biochemical importance of water and chemical bonds; pH, Buffer solutions and basic buffer systems of blood; Carbohydrates (mono, di oligo and polysaccharides); Fatty acids and Fats; Amino acids; Proteins; Enzymes; Vitamins; Coenzymes and Trace elements; Nucleic acids, DNA and RNA; Hormones; Free radicals and antioxidant systems.
Textbook/ Material / Resources	**Biyokimya** – E. Edip KEHA, Ö. İrfan KÜFREVİOĞLU, **Biyokimya** – M. Engin GÖZÜKARA, Biyokimya – Fifth edition Jeremy M. Berg, John L. Tymoczko & Lubert Stryer, **Harperin Biyokimyası** – R.K. Murray; D.K. Granner; P.A. Mayes; V.W. Rodwell
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Ege University	Chemical	**Biochemistry I**	**3-1-2-0-7**	essential
Yıldız Technical University	Chemical	**Biochemistry I**	**3-2-4-0-5**	essential
Eskişehir Osmangazi University	Chemical	**Biochemistry I**	**3-0-3-0-5**	essential

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Prof. Dr. Fikret KARATAŞ	**Prof. Dr. Fikret KARATAŞ**
Instructors who can teach the course (Title, Name and Surname)	*Signature*
Prof. Dr. Fikret KARATAŞ	

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business

world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)	
Stakeholder Name	**Opinion** (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution

Week	Theory	Application/Laboratory
1	Cell and structure,	
2	pH and buffers, Water and chemical bonds,	
3	Carbohydrates	
4	Continuation of carbohydrates	
5	Lipids,	
6	Amino acids,	
7	Proteins,	
8	Enzymes	
9	Midterm	
10	Continuation of enzymes,	
11	Vitamins,	
12	Coenzymes and Trace elements	
13	Nucleic acids and Hormones	
14	Continuation of hormones and Radicals	
15	Final	
16		

Assessment

	Activity	Custom	Contribution to Success Grade (%)
Evaluation Criteria	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60
		Sum:	100
Remarks			

Content Design and Subject Weight	Mathematics and Basic Sciences	100

(%)	Engineering Sciences	
	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application	*1*	*3*	*3*
Self-Study (including pre-class and exam preparation)	*2*	*10*	*20*
Make-up Exam	*1*	*3*	*3*
Experiment and Observation			
Class Participation (Theory)	*14*	*4*	*56*
Homework			
Final Exam Practice	*1*	*3*	*3*
Laboratory			
Article Review			
Writing an Article			
Reading	*10*	*1*	*10*
Case Study			
Performance			
Problem Solution	*14*	*1*	*14*
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument	*7*	*1*	*7*
Application/Practice			
Other			
TOTAL WORKLOAD:			**109**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**4**

	Program Outcomes (PO) / **Learning Outcomes (LO)** *(Course Outcomes)*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Understanding the importance of cells, water, buffers and chemical bonds in biochemistry	**5**	**4**	**4**	**4**	**4**	**4**	**3**	**3**	**3**	**3**	**1**
2	Understanding the subjects of general biochemistry	**4**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**4**	**4**	**1**
3	Obtaining theoretical knowledge, collecting data	**3**	**3**	**3**	**4**	**4**	**2**	**5**	**4**	**4**	**3**	**1**
4	Understanding the metabolic importance of enzymes	**5**	**5**	**5**	**4**	**3**	**3**	**3**	**2**	**3**	**3**	**1**

5	Understanding the importance of three-dimensional structures of biological molecules	**4**	**5**	**3**	**2**	**4**	**4**	**4**	**3**	**4**	**2**	**1**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4101	**0**	**2**	**0**	**1**	**2**	**Z**	**TR**	**4/FALL**
Course Name (Turkish**)**	**Seminer**							
Course Name (English**)**	**Seminar**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	This course aims to develop the practical knowledge, skills and experiences of the students of the Chemistry department, to develop their skills in applying the theoretical knowledge learned during the undergraduate education in Chemistry, and to provide experience in conducting individual experimental studies on a planned research topic, interpreting the results and presenting them in a scientific report.
Course Outline	The course covers the stages of choosing a research topic in the field of Chemistry, conducting experimental studies after conducting literature research on the subject, evaluating the obtained data and presenting the results in a report.
Textbook/ Material / Resources	Chemistry Textbooks, Experimental Organic Chemistry, Laboratory handouts, Library infrastructure.
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Afyon Kocatepe University	Chemical	Graduation Thesis	**0-2-0-1; 3**	Elective
Erciyes University	Chemical	Graduation Thesis	**0-2-0-1; 3**	Elective
Bursa Uludağ University	Chemical	Graduation Thesis	**0-2-0-1; 4**	Elective

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Prof. Dr. Hülya TUNCER	
Instructors who can teach the course (Title, Name and Surname)	*Signature*

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

The graduation project study provides students with the skills to conduct literature searches on selected study topics individually and in groups, to establish the theoretical background on the subject, to determine the experimental study conditions and prepare the experimental setups for the sound conduct of the research subject, to evaluate the results obtained from the studies and to present them in the form of a scientific report/thesis.

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

Bitirme ödevi dersi, çalışma konusu ile ilgili teorik alt yapı hazırlandıktan sonra laboratuvarda uygulamalı olarak yürütülecektir.

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)

Stakeholder Name	Opinion (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/Laboratory**
1		Method to be followed: Preliminary interview on topics related to the student's skills and field of interest, Selection of topics for the seminar program to be prepared, Guidance of students; Preparation of resources, research methods and auxiliary materials used in presentation preparation to be used by students continuing their studies on the selected topic: Seminar poster, sound devices, slide machine, curtain; Presentation stages: Written text, visual materials, seminar critique and evaluation.
2		Meeting with students, explanation of the purpose and content of the course.
3		Examining research examples, preliminary research and topic selection
4		Determining the topics by limiting the determined topics, Studies on resource scanning and resource use
5		Starting written text studies, working on the table of contents of the research, defining and classifying the content, classifying reference sources
6		Creating written texts, examining the written texts created
7		Studies on using other sources such as internet, periodicals and theses in addition to books in written text studies and interviews with source persons
8		Researching visual materials that will support the research in text studies, slide presentation design in computer environment
9		Using visual materials in text studies in research, completion of seminar poster and CD cover designs
10		Continuing text creation studies, seminar poster, CD cover designs
11		Finalizing text studies, completion of slide presentation in computer environment, seminar poster and CD cover designs
12		Completion of presentations and collective screening for corrections
13		Presentations
14		Presentation of the project
15		
16		

Assessment			
Evaluation Criteria	**Activity**	**Custom**	**Contribution to Success Grade (%)**
	Midterm Exams		

	Quizzes		
	Assignments		
	Projects		
	Term Paper	1	50
	Laboratory		
	Other		
	Final Exam	1	50
		Sum:	100
Remarks			

Content Design and Subject Weight (%)	Mathematics and Basic Sciences	100
	Engineering Sciences	
	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application			
Self-Study (including pre-class and exam preparation)	*5*	*1*	*5*
Make-up Exam			
Experiment and Observation			
Class Participation (Theory)	*14*	*2*	*28*
Homework			
Final Exam Practice	*1*	*2*	*2*
Laboratory	*5*	*1*	*5*
Article Review	*5*	*1*	*5*
Writing an Article			
Reading			
Case Study			
Performance			
Problem Solution			
Project Preparation			
Project Submission			
Quiz			
Report Preparation	*1*	*2*	*2*
Submitting Reports	*1*	*2*	*2*
Role/Drama Work			
Seminar			
Oral Exam	*1*	*2*	*2*
Team/Group Work	*5*	*1*	*5*
Argument			
Application/Practice			
Other			
TOTAL WORKLOAD:			**56**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**2**

	Learning Outcomes (LO) *(Course Outcomes)*	**Program Outcomes (PO)** *1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Able to comprehend and apply the basic principles of conducting research on a specific subject.	**4**	**5**	**3**	**4**	**4**	**4**	**4**	**4**	**3**	**3**	**1**
2	Able to determine and plan the topic of the Graduation Project.	**5**	**3**	**2**	**2**	**5**	**5**	**3**	**3**	**5**	**2**	**1**
3	Able to conduct literature research in the library and on the internet regarding the Graduation Project topic, interpret and apply literature information.	**5**	**5**	**4**	**5**	**4**	**3**	**4**	**3**	**2**	**1**	**1**
4	Able to conduct independent experiments in the laboratory, and participate in group work when necessary.	**5**	**5**	**5**	**4**	**3**	**3**	**4**	**5**	**2**	**3**	**1**
5	Able to evaluate the findings obtained as a result of the research, convert them into a report in accordance with scientific ethical rules, and present them.	**4**	**4**	**4**	**4**	**3**	**4**	**4**	**2**	**2**	**4**	**1**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4125	**2**	**0**	**0**	**2**	**4**	**E**	**TR**	**4/FALL**
Course Name (Turkish**)**	**Fitoterapi ve Biyokimya**							
Course Name (English**)**	**Phytotherapy and Biochemistry**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	To provide information about the therapeutic and disease-preventive effects of plants known to have medicinal effects, or of pharmaceutical products prepared from different parts of the plant.
Course Outline	Basic knowledge of phytotherapy and its applications from the perspective of medicine and biochemistry.
Textbook/ Material / Resources	- Özata N. Fitoterapi ve Aromaterapi, İstanbul Tıp Kitabevleri, 2019. - Kalafatçılar A. Bitkiler ve Sağlık Fitoterapi. Sidas Yayıncılık
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Selcuk University	Chemistry	Phytotherapy and Biochemical Applications	**2-0-0-3-5**	Elective
Ankara University	Pharmacy	Phytotherapy	**3-0-0-3-4**	Essential
Pamukkale University	Tavas Vocational School	Phytotherapy and Aromatherapy	**2-0-0-2-3**	Essential

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Prof. Dr. Mustafa KARATEPE	
Instructors who can teach the course (Title, Name and Surname)	*Signature*

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

To provide information about plants, treatments and products that are important for the health of humanity.

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

The course is aimed at gaining theoretical knowledge.

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)

Stakeholder Name	**Opinion** (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/Laboratory**
1	Medicinal plants, General information about herbal medicines	
2	History of Phytotherapy and Aromatherapy	
3	Definition of Phytotherapy and explanation of its principles	
4	Use of Drugs in Different Historical Periods	
5	Forms of herbal medicine	
6	Phytotherapy in Terms of Medicine and Biochemistry	
7	Plants Used in Phytotherapy	
8	Plants Used in Phytotherapy	
9	Midterm	
10	Medicinal plants used among the people	
11	Methods of using drugs	
12	Active substances obtained from drugs	
13	Factors Affecting the Effective Compounds of Herbal Materials	
14	Approach between contemporary medicine and alternative medicine	
15	Final	
16		

Assessment			
Evaluation Criteria	**Activity**	**Custom**	**Contribution to Success Grade (%)**
	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60
		Sum:	100
Remarks			

Content Design and Subject Weight	Mathematics and Basic Sciences	60

(%)	Engineering Sciences	*40*
	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application	*1*	*1*	*1*
Self-Study (including pre-class and exam preparation)	*4*	*10*	*40*
Make-up Exam	*1*	*2*	*2*
Experiment and Observation			
Class Participation (Theory)	*10*	*2*	*20*
Homework			
Final Exam Practice	*1*	*2*	*2*
Laboratory			
Article Review			
Writing an Article			
Reading	*10*	*1*	*10*
Case Study			
Performance			
Problem Solution	*5*	*1*	*5*
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument	*10*	*2*	*20*
Application/Practice			
Other			
TOTAL WORKLOAD:			**100**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**4**

	Program Outcomes (PO) / **Learning Outcomes (LO)** *(Course Outcomes)*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Ability to apply basic knowledge of Chemistry, Mathematics and Physics to Chemistry problems	**4**	**5**	**5**	**5**	**5**	**5**	**4**	**4**	**4**	**5**	**1**
2	Consciousness of constantly renewing oneself and developing research skills in order to adapt to innovations and developing technology	**5**	**4**	**3**	**4**	**5**	**5**	**5**	**4**	**4**	**4**	**1**
3	Sensitivity to national and international effects on health, safety and the environment in	**2**	**5**	**5**	**5**	**5**	**3**	**5**	**4**	**4**	**4**	**1**

	chemical applications and in solving problems in the field of Chemistry											
4	Professional and ethical responsibility awareness	**5**	**4**	**4**	**4**	**5**	**3**	**3**	**4**	**2**	**2**	**1**
5	Quality and environmental awareness	**5**	**5**	**4**	**4**	**5**	**5**	**4**	**3**	**5**	**2**	**1**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4121	**2**	**0**	**0**	**2**	**4**	**E**	**TR**	**4/FALL**
Course Name (Turkish**)**	**Spektroskopi**							
Course Name (English**)**	**Spectroscopy**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	To teach the scientific and technological principles and application areas of many molecular spectroscopic methods that are widely used in laboratories for purposes such as substance detection, structure clarification, quantification, research, etc. in many fields such as science, industry, medicine, criminology. To provide a basis for new spectroscopic methods that are constantly developing with technology.
Course Outline	It includes the theories and application areas of spectroscopic methods widely used in quantitative and qualitative molecular analyses.
Textbook/ Material / Resources	1. Organik Kimyada Spektroskopik Yöntemler, E. Erdik, (1993)., Ankara: Gazi Büro Kitapevi. 2. Tüm Enstrümantal Analiz Kitapları ve Bilimsel Internet Siteleri 3. Nicel Kimyasal Analiz (Bölüm: 19-26), Daniel C. Harris, Çevirisi, Palme Yayıncılık, Ankara 2015
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Gazi University	Chemical	Molecular Spectroscopıc Methods	**2-0-0-1-3**	Elective

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Doç. Dr. Fatih BİRYAN	
Instructors who can teach the course (Title, Name and Surname)	*Signature*
Prof. Dr. Kadir DEMİRELLİ	

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

Face-to-face lecture, discussion, question and answer.

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)

Stakeholder Name	**Opinion** (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/Laboratory**
1	Definition and Classification of Spectroscopy	
2	Electromagnetic Rays, Wave Characteristics of Light, Particle Characteristics of Light	
3	Matter-energy interactions, electromagnetic spectrum, matter-light interactions, which form the basis of spectroscopy	
4	Relationships between the electromagnetic waves absorbed and emitted by matter and its molecular structure	
5	Absorption, emission spectra, measurements and evaluation.	
6	UV-GB absorption spectroscopy, applications and areas of use	
7	IR absorption spectroscopy, applications and areas of use	
8	Raman spectroscopy, applications and areas of use	
9	Midterm	
10	1H-NMR spectroscopy, applications and areas of use	
11	13C- NMR spectroscopy, applications and areas of use	
12	Combined Methods	
13	GC-MS Spectroscopy	
14	LC-MS Spectroscopy	
15	Final	
16		

Assessment			
	Activity	**Custom**	**Contribution to Success Grade (%)**
Evaluation Criteria	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60
		Sum:	100

Remarks	

Content Design and Subject Weight (%)		
	Mathematics and Basic Sciences	90
	Engineering Sciences	*10*
	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application	*1*	*3*	*3*
Self-Study (including pre-class and exam preparation)	*2*	*18*	*36*
Make-up Exam	*1*	*3*	*3*
Experiment and Observation			
Class Participation (Theory)	*14*	*2*	*28*
Homework			
Final Exam Practice	*1*	*3*	*3*
Laboratory			
Article Review			
Writing an Article			
Reading			
Case Study			
Performance			
Problem Solution	*5*	*2*	*10*
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument	*10*	*1*	*10*
Application/Practice			
Other			
TOTAL WORKLOAD:			**93**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**4**

	Program Outcomes (PO) / **Learning Outcomes (LO)** *(Course Outcomes)*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Learns the basic physical and chemical principles on which molecular spectroscopic analysis methods are based	**5**	**4**	**4**	**4**	**3**	**5**	**5**	**3**	**3**	**3**	**4**
2	Learns the measurement systems used by these methods and how to establish a relationship	**5**	**4**	**5**	**4**	**3**	**4**	**4**	**4**	**3**	**4**	**3**

	with the qualitative and quantitative properties of the molecule.											
3	Learns the general characteristics of spectroscopic analysis outputs (graphs, spectra, etc.) and how to use them.	**4**	**4**	**5**	**4**	**3**	**4**	**4**	**3**	**5**	**3**	**3**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4127	**2**	**0**	**0**	**2**	**4**	**Z**	**TR**	**4/FALL**
Course Name (Turkish**)**	**Polimer Kompozitler**							
Course Name (English**)**	**Polymer Composites**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	Composite materials, general structures and applications, types of composite materials, polymeric composite materials and general applications.
Course Outline	Course content includes nano-sized materials; nanomaterial synthesis with chemical, physical and biological methods; characterization of nanomaterials; interdisciplinary approach in nanotechnology; nano-sized production; nanotechnology in the medical field; chemical behaviors at the nano-sized; nanomaterial industry.
Textbook/ Material / Resources	Kompozit Malzemelere Giriş, Seçkin Yayıncılık, 4.baskı, 2022. Atkins, P.W. 1986. Physical Chemistry.
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Pamukkale University	Mechanical Engineering	Composite Materials and Manufacturing Methods	**2-0-0-2;3,5**	Elective
Bursa Uludag University	Chemistry	Polymeric Composite Materials	**3-0-0-3;5**	Elective
Yeditepe University	Materials Science and Nanotechnology Engineering	Composite Materials	**3-0-0-3;6**	Essential

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Instructors who can teach the course (Title, Name and Surname)	*Signature*
Doç. Dr. Mustafa Ersin PEKDEMİR	

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

Having sufficient knowledge in chemistry-related fields and examining the relationship between related fields and one's own field. In addition, the ability to follow developments in science and technology and to constantly renew oneself is the main goal.

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

The course will proceed in the form of theoretical explanation.

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)

Stakeholder Name	Opinion (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution

Week	Theory	Application/Laboratory
1	Composite materials	
2	General properties of composites	
3	Advantages and disadvantages of composite materials	
4	Classification of composite materials	
5	Ceramic and Metal Matrix Composites	
6	Polymer matrix composites	
7	General properties of polymer matrix composites	
8	Structural properties of polymer matrix composites	
9	Thermal properties of polymer matrix composites	
10	Midterm	
11	Surface properties of polymer matrix composites	
12	Biological, biochemical properties of polymer matrix composites, biodegradability	
13	General applications of polymer matrix composites	
14	Electronic applications of polymer matrix composites	
15	Biomedical applications of polymer matrix composites	
16	Final	

Assessment

	Activity	Custom	Contribution to Success Grade (%)
Evaluation Criteria	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60
		Sum:	100
Remarks			

Content Design and Subject Weight (%)	Mathematics and Basic Sciences	60
	Engineering Sciences	*40*

	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application	*1*	*3*	*1*
Self-Study (including pre-class and exam preparation)	*10*	*2*	*20*
Make-up Exam	*1*	*1*	*1*
Experiment and Observation			
Class Participation (Theory)	*14*	*2*	*28*
Homework			
Final Exam Practice	*1*	*1*	*1*
Laboratory			
Article Review			
Writing an Article			
Reading	*10*	*2*	*20*
Case Study			
Performance			
Problem Solution			
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument	*9*	*3*	*27*
Application/Practice			
Other			
TOTAL WORKLOAD:			**98**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**4**

	Program Outcomes (PO) / **Learning Outcomes (LO)** *(Course Outcomes)*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Learn about composite materials, their general structures and applications	**5**	**3**	**4**	**1**	**3**	**3**	**4**	**2**	**5**	**5**	**2**
2	Learn about the types of composite materials	**5**	**3**	**4**	**1**	**3**	**3**	**4**	**2**	**5**	**5**	**2**
3	Learn about polymeric composite materials and their general applications	**5**	**3**	**4**	**1**	**3**	**3**	**4**	**2**	**5**	**5**	**2**
	Learn about the structures, production techniques and design of polymer nanocomposites	**5**	**3**	**4**	**1**	**3**	**3**	**4**	**2**	**5**	**5**	**2**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4129	**2**	**0**	**0**	**2**	**4**	**Z**	**TR**	**4/FALL**
Course Name (Turkish**)**	**İletken Polimerler**							
Course Name (English**)**	**Conductive Polymers**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	Teaching the synthesis, formation, properties and application areas of conductive polymers.
Course Outline	Fundamentals and properties of conductive polymers, Synthesis of conductive polymers, Electrochemistry of conductive polymers, Characterization methods of conductive polymers, Application areas of conductive polymers.
Textbook/ Material / Resources	Terje A. Skotheim and John R. Reynolds (Editors), Handbook of Conducting Polymers, Conjugated Polymers-Theory, Synthesis, Properties, and Characterization, 3rd Edition, CRC Press, Taylor & Francis Group, 2007. Andreas Elschner, Stephan Kirchmeyer, Wilfried Lövenich, Udo Merker and Knud Reuter, PEDOT-Principles and Applications of an Intrinsically Conductive Polymer, CRC Press, Taylor & Francis Group,2011.
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Marmara University	Polymer Science and Technology	**Conductive Polymers**	**3-0-0-3-8**	Elective
Atılım University	Science	**Conductive Polymers**	**3-0-0-3-5**	Elective
Bilecik Seyh Edebali University	Science	**Conductive Polymers**	**3-0-0-3-7,5**	Elective

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Dr. Öğr. Üyesi Mehmet Fatih COŞKUN	
Instructors who can teach the course (Title, Name and Surname)	*Signature*
Prof. Dr. Kadir DEMİRELLİ	
Doç. Dr. Fatih BİRYAN	
Dr. Öğr. Üyesi Mehmet Fatih COŞKUN	

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

In recent years, conductive polymers have gained great importance due to both academic and commercial applications. The introduction of conductive polymers and the application areas of conductive polymers will be examined.

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

Face to face presentation, blackboard presentation, powerpoint presentations

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)	
Stakeholder Name	**Opinion** (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution

Week	Theory	Application/Laboratory
1	Introduction to Conductive Polymers	
2	Fundamentals of Conductive Polymers	
3	Properties of Conductive Polymers	
4	Properties of Conductive Polymers	
5	Solubility and Doping of Conductive Polymers	
6	Characterization of Conductive Polymers	
7	Characterization of Conductive Polymers	
8	Properties of Polyyaniline and Polypyrrole	
9	Midterm	
10	Conductivity Measurement Techniques	
11	Electrochemistry of Conductive Polymers	
12	Synthesis Methods of Conductive Polymers	
13	Application Areas of Conductive Polymers	
14	Application Areas of Conductive Polymers	
15	Final	
16		

Assessment

	Activity	Custom	Contribution to Success Grade (%)
Evaluation Criteria	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60
		Sum:	100
Remarks			

Content Design and	Mathematics and Basic	100

Subject Weight (%)	Sciences	
	Engineering Sciences	
	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application	*1*	*3*	*3*
Self-Study (including pre-class and exam preparation)	*3*	*18*	*54*
Make-up Exam	*1*	*3*	*3*
Experiment and Observation			
Class Participation (Theory)	*14*	*2*	*28*
Homework			
Final Exam Practice	*1*	*3*	*3*
Laboratory			
Article Review			
Writing an Article			
Reading			
Case Study			
Performance			
Problem Solution	*2*	*2*	*4*
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument	*10*	*2*	*20*
Application/Practice			
Other			
TOTAL WORKLOAD:			**115**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**4**

	Program Outcomes (PO) / **Learning Outcomes (LO)** *(Course Outcomes)*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Learning the application areas of conductive polymers	**5**	**4**	**4**	**4**	**3**	**5**	**5**	**3**	**3**	**3**	**4**
2	Gaining the ability to conduct independent research	**5**	**4**	**5**	**4**	**3**	**4**	**4**	**4**	**3**	**4**	**3**
3	Gaining the ability to learn lifelong by following technological developments	**4**	**4**	**5**	**4**	**3**	**4**	**4**	**3**	**5**	**3**	**3**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4135	**2**	**0**	**0**	**2**	**4**	**Z**	**TR**	**4/FALL**
Course Name (Turkish**)**	Biyoorganik Kimya							
Course Name (English**)**	Bioorganic Chemistry							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	Learning the Concepts of Bioorganic Chemistry
Course Outline	Chemical composition of bioorganic molecules, properties of bioorganic molecules, properties of proteins, properties of bioorganic molecules, properties of carbohydrates, properties of vitamins, properties of hormones, properties of lipids and fatty acids.
Textbook/ Material / Resources	Schmuck, Carsten (Editor)/ Wennemers, Helma (Editor)/ Breslow, Ronald (Editor), Highlights in Bioorga Applications, Vch Verlagsgesellschaft, 2004 SM.Hecht, Bioorganic Chemistry: Peptides and Proteins, Oxford University Press, 1998 D.L.Nelson, M.M.Cox, Principles of Biochemistry, W. H. Freeman, 2004
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Ankara University	Chemical	Bioorganic Chemistry	**2-0-0-2;3**	Elective
Aydin Menderes University	Chemical	Bioorganic Chemistry	**2-0-0-2;3**	Elective
Eskisehir Osmangazi University	Chemical	Bioorganic Chemistry	**2-0-0-2;3**	Elective

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Dr. Aysel SARI	
Instructors who can teach the course (Title, Name and Surname)	*Signature*

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

Bioorganic chemistry is a scientific discipline that combines organic chemistry and biochemistry. It is the branch of chemistry that deals with the study of biological processes by chemical methods. Protein and enzyme function are examples of these processes. Sometimes biochemistry is used interchangeably for bioorganic chemistry. The difference between the two is that bioorganic chemistry is organic chemistry that focuses on biological aspects. While biochemistry aims to understand biological processes using chemistry, bioorganic chemistry attempts to extend organic-chemical research (i.e. structures, synthesis and kinetics) into biology. Bioorganic chemistry overlaps with bioinorganic chemistry when investigating metalloenzymes and cofactors. In this context, students are made aware of the sensitivity of the subject and learn the importance of biochemistry in living life.

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

It is planned to be processed face to face/online and theoretically, using technological learning tools and in the light of scientific studies.

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)	
Stakeholder Name	**Opinion** (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution

Week	Theory	Application/Laboratory
1	General information and introduction of bioorganic molecules	
2	Structure and properties of carbohydrates	
3	Structure and properties of proteins	
4	Structure of amino acids and protein formation mechanism	
5	Formation and functions of peptide bonds in the structure of proteins	
6	Structure and properties of lipids	
7	Structure and functions of fatty acids	
8	Phospholipids and Steroids	
9	Midterm	
10	Structural properties of enzymes	
11	Nucleic acids and nucleotides	
12	Chemical structure of vitamins	
13	Chemical structure of minerals	
14	Structure and properties of essential molecules	
15	Final	
16		

Assessment

	Activity	Custom	Contribution to Success Grade (%)
Evaluation Criteria	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		

	Final Exam	1	60
		Sum:	100
Remarks			

Content Design and Subject Weight (%)	Mathematics and Basic Sciences	100
	Engineering Sciences	
	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application	*1*	*3*	*3*
Self-Study (including pre-class and exam preparation)			
Make-up Exam	*1*	*3*	*3*
Experiment and Observation			
Class Participation (Theory)	*14*	*2*	*28*
Homework	*5*	*2*	*10*
Final Exam Practice	*1*	*3*	*3*
Laboratory			
Article Review	*14*	*2*	*28*
Writing an Article			
Reading			
Case Study			
Performance			
Problem Solution			
Project Preparation			
Project Submission			
Quiz			
Report Preparation	*3*	*3*	*9*
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument	*10*	*1*	*10*
Application/Practice			
Other			
TOTAL WORKLOAD:			**94**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**4**

	Program Outcomes (PO) / **Learning Outcomes (LO)** *(Course Outcomes)*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Gains general information about bioorganic molecules.	**5**	**5**	**4**	**4**	**4**	**5**	**5**	**4**	**5**	**5**	**5**
2	Knows, understands, and explains the structure	**5**	**5**	**4**	**4**	**4**	**5**	**5**	**4**	**5**	**5**	**5**

	and properties of carbohydrates, proteins, and amino acids.											
3	Knows, understands, and explains the structure and properties of lipids, the structure and functions of fatty acids.	**5**	**5**	**4**	**4**	**4**	**5**	**5**	**4**	**5**	**5**	**5**
4	Gains information about phospholipids and steroids.	**5**	**5**	**4**	**4**	**4**	**5**	**5**	**4**	**5**	**5**	**5**
5	Knows, understands, explains, and comments on the structural properties of enzymes, nucleic acids and nucleotides, the chemical structure of vitamins, the chemical structure of minerals, and the structure and properties of essential molecules.	**5**	**5**	**4**	**4**	**4**	**5**	**5**	**4**	**5**	**5**	**5**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4139	**2**	**0**	**0**	**2**	**4**	**Z**	**TR**	**4/FALL**
Course Name (Turkish**)**	**Heterosiklik Bileşikler**							
Course Name (English**)**	**Heterocyclic Compounds**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	It is the mutual examination of the synthesis methods, structures and properties of heterocyclic compounds.
Course Outline	1. Three-membered Heterocyclic Compounds (Oxirane, Oxirane, Aziridine, Azirine, Thiirane, Thiirane, Dioxirane, Diaziridine and Diazirine, Dithiirane, Oxaziridine) 2. Four-membered Heterocyclic Compounds Containing One Heteroatom (Oxetane, Oxetane, Azetidine (Azetane), Azetidinone (β-Lactam), Thietane, Azet) 3. Four-membered Heterocyclic Compounds Containing Two Heteroatoms (Dioxetane, Diazetidine, 1,2-Dithiethine and 1,2-Dithiethine) 4. Furans 3. Pyrroles 4. Thiophenes 5. Pyridines 6. Quinolines and Isoquinolines
Textbook/ Material / Resources	M. Balcı, Modern Heterosiklik Kimya, TÜBA, 2023
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Ataturk University	Chemical	**Heterocyclic Compounds**	**3-0-0-3-5**	Elective
Ondokuz Mayis University	Chemical	**Heterocyclic Compounds**	**2-0-0-2-4**	Elective
Eskisehir Osmangazi University	Chemical	**Heterocyclic Compounds**	**2-0-0-2-4**	Elective

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Prof. Dr. Ahmet CANSIZ	
Instructors who can teach the course (Title, Name and Surname)	*Signature*
Prof. Dr. Süleyman SERVİ, Prof. Dr. Hülya TÜNCER, Prof. Dr. Metin KOPARIR, Doç. Dr. Demet COŞKUN	

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)	
Stakeholder Name	**Opinion** (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution

Week	Theory	Application/Laboratory
1	Electrochemistry	
2	Electrolytic Conductivity	
3	Electrochemical Cells	
4	Electromotive Force	
5	Chemical Kinetics	
6	Reaction Rate and Equations	
7	Reaction Order and Half-Life	
8	Factors Affecting Reaction Rate	
9	Midterm	
10	Chemical Equilibrium	
11	Equilibrium Constant Relations and Importance of Its Size	
12	Expression of Changes in Equilibrium Positions and Effect of Masses (Q)	
13	Adsorption	
14	Adsorption Isotherms	
15	Final	
16		

Assessment

	Activity	Custom	Contribution to Success Grade (%)
Evaluation Criteria	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60

	Sum:	100
Remarks		

Content Design and Subject Weight (%)	Mathematics and Basic Sciences	100
	Engineering Sciences	
	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application	*1*	*3*	*3*
Self-Study (including pre-class and exam preparation)	*1*	*10*	*10*
Make-up Exam	*1*	*3*	*3*
Experiment and Observation			
Class Participation (Theory)	*14*	*4*	*56*
Homework			
Final Exam Practice	*1*	*3*	*3*
Laboratory			
Article Review			
Writing an Article			
Reading			
Case Study			
Performance			
Problem Solution	*14*	*1*	*14*
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument			
Application/Practice			
Other			
TOTAL WORKLOAD:			**89**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**4**

	Learning Outcomes (LO) *(Course Outcomes)*	**Program Outcomes (PO)** *1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	They learn the structure and reactivity, synthesis and reactions of three-membered heterocyclic compounds..	**5**	**4**	**3**	**5**	**5**	**5**	**3**	**5**	**4**	**2**	**3**
2	They learn the structure and reactivity,	**5**	**2**	**5**	**4**	**4**	**4**	**4**	**3**	**4**	**5**	**3**

	synthesis and reactions of four-membered heterocyclic compounds containing one heteroatom.											
3	They learn the structure and reactivity, synthesis and reactions of four-membered heterocyclic compounds containing two heteroatoms.	**5**	**3**	**4**	**4**	**5**	**3**	**5**	**3**	**4**	**1**	**3**
4	They learn the structure and reactivity, synthesis and reactions of five-membered heterocyclic compounds containing one heteroatom.	**5**	**2**	**5**	**3**	**3**	**3**	**5**	**5**	**4**	**2**	**3**
5	They learn pyridine, quinoline and isoquinolines.	**5**	**4**	**2**	**4**	**4**	**4**	**2**	**2**	**4**	**2**	**3**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM 4141	**4**	**0**	**0**	**4**	**4**	**Z**	**TR**	**4/FALL**
Course Name (Turkish)	**Fizikokimya III**							
Course Name (English)	**Physical Chemistry III**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	Providing information about Electrochemistry, Chemical Kinetics, Chemical Equilibrium and Adsorption Chemistry
Course Outline	Electrochemistry, Electrolytic Conductivity, Electrochemical Cells, Electromotive Force, Chemical Kinetics, Reaction Rate and Equations, Reaction Order and Half-Life, Factors Affecting Reaction Rate, Chemical Equilibrium, Balance Constant Relations and Importance of Its Size, Change of Equilibrium Positions and Effect of Masses Expression (Q), Adsorption, Adsorption Isotherms
Textbook/ Material / Resources	Fizikokimya, Prof. Dr. Yüksel Sarıkaya, Gazi Kitapevi Modern Fizikokimya, Ali Rıza Berkem, İstanbul Üniversitesi Kimyasal Kinetik, Prof. Dr. Tevfik Atalay, Nobel Yayın Dağıtım
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Doç. Dr. Mehmet Mürşit Temüz	
Instructors who can teach the course (Title, Name and Surname)	*Signature*
Prof. Dr. Zülfiye İlter	

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)

Stakeholder Name	**Opinion** (Should be given as a summary, not exceeding two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/Laboratory**
1	Electrochemistry	
2	Electrolytic Conductivity	
3	Electrochemical Cells	
4	Electromotive Force	
5	Chemical Kinetics	
6	Reaction Rate and Equations	
7	Reaction Order and Half-Life	
8	Factors Affecting Reaction Rate	
9	Midterm	
10	Chemical Equilibrium	
11	Equilibrium Constant Relations and Importance of Its Size	
12	Expression of Changes in Equilibrium Positions and Effect of Masses (Q)	
13	Adsorption	
14	Adsorption Isotherms	
15	Final	
16		

Assessment			
	Activity	**Custom**	**Contribution to Success Grade (%)**
Evaluation Criteria	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60
		Sum:	100
Remarks			

Content Design and Subject Weight (%)	Mathematics and Basic Sciences	100
	Engineering Sciences	

	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	**Number**	**Duration (Hours)**	**Total workload (Hours)**
Fieldwork			
Midterm Exam Application	*1*	*2*	*2*
Self-Study (including pre-class and exam preparation)	*10*	*2*	*20*
Make-up Exam	*1*	*2*	*2*
Experiment and Observation			
Class Participation (Theory)	*14*	*4*	*56*
Homework			
Final Exam Practice	*1*	*2*	*2*
Laboratory			
Article Review			
Writing an Article			
Reading	*10*	*1*	*10*
Case Study			
Performance			
Problem Solution	*14*	*1*	*14*
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument	*4*	*1*	*4*
Application/Practice			
Other			
TOTAL WORKLOAD:			**110**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**4**

	Program Outcomes (PO) / **Learning Outcomes (LO)** *(Course Outcomes)*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Students will learn about Electrochemistry, batteries and electrolysis.	**5**	**5**	**5**	**4**	**2**	**4**	**4**	**3**	**4**	**2**	**1**
2	Students will learn about reaction rate and order.	**5**	**5**	**5**	**4**	**3**	**4**	**4**	**3**	**4**	**2**	**1**
3	Students will learn about chemical equilibrium and action-reaction conditions.	**5**	**5**	**5**	**4**	**2**	**4**	**4**	**3**	**4**	**2**	**1**
4	Students will have some basic concepts about Surface Chemistry.	**5**	**5**	**5**	**4**	**2**	**4**	**4**	**3**	**4**	**2**	**1**