Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM3144	**2**	**0**	**0**	**2**	**4**	**C**	**TR**	**3/SPRİNG**
Course Name (Turkish**)**	Anorganik Kimya Laboratuvarı							
Course Name (English**)**	**Inorganic Chemistry Laboratuvary**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	Learning laboratory safety and techniques Being able to conduct experimental studies in the synthesis of inorganic compounds, evaluating experimental data, interpreting results and writing scientific reports
Course Outline	Laboratory Safety and Important Points, Synthesis of Cr_2O_3 and $CrCl_3$, Synthesis of Cu_2O, Synthesis of $[Co(NH_3)6]Cl_3$, Synthesis of $[Co(NH_3)_4CO_3]$ and $[Co(NH_3)_5Cl]Cl_2$, Synthesis of $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5ONO]Cl_2$, Synthesis of $K_3[Cr(C_2O_4)_3]$. $3H_2O$, Magnetic Susceptibility, Synthesis of $[Ni(C_4N_2H_7O_2)_2]$, Synthesis of $K_3[Cr(C_2O_4)_3]$. $3H_2O$, Composition of Complexes, Determination of CFSE, Synthesis of $(NH_4)_2Cu(SO_4)_2$. nH_2O and $[Cu(NH_3)_4]SO_4.H_2O$
Textbook/ Material / Resources	M. Boybay, M. Arslan, Inorganic Chemistry Laboratory Applications, F.Ü. Chemistry Department, Elazığ, 1999.
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Erciyes University	**Chemistry**	**Inorganic Chemistry Laboratuvary**	**0-0-4--4-4**	**C**
Uludağ University	**Chemistry**	**Inorganic Chemistry Laboratuvary**	**0-0-4-4-4**	**C**
Atatürk University	**Chemistry**	**Inorganic Chemistry Laboratuvary**	**0-0-4-2-3**	**C**

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

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)
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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** (It should be given as a summary, it should not exceed two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/ Laboratory**
1	Safety and Important Points to Consider in the Laboratory	
2	Synthesis of Cr2O3 and CrCl3	
3	Synthesis of Cu2O	
4	Synthesis of [Co(NH3)6]Cl3	
5	Synthesis of [Co(NH3)4CO3] and [Co(NH3)5Cl]Cl2	
6	Synthesis of [Co(NH3)5NO2]Cl2 and [Co(NH3)5ONO]Cl2	
7	Synthesis of K3[Cr(C2O4)3] . 3H2O	
8	Magnetic Susceptibility	
9	**MIDTERM EXAM**	
10	Synthesis of [Ni(C4N2H7O2)2]	
11	Synthesis of K3[Cr(C2O4)3] . 3H2O	
12	Composition of Complexes	
13	Calculation of Crystal Field Splitting and Stability Energies	
14	Synthesis of (NH4)2Cu(SO4)2. nH2O and [Cu(NH3)4]SO4.H2O	
15	**FINAL**	

Assessment			
Evaluation Criteria	**Activity**	**Custom**	**Contribution to Success Grade (%)**
	Midterm Exams		
	Quizzes	10	20
	Assignments	10	12
	Projects		
	Term Paper		
	Laboratory		
	Other	2	8
	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			
Self-Study (including pre-class and exam preparation)	*1*	*20*	*20*
Make-up Exam	*1*	*3*	*3*
Experiment and Observation			
Class Participation (Theory)			
Homework	*10*	*1*	*10*
Final Exam Practice	*1*	*3*	*3*
Laboratory	*14*	*4*	*56*
Article Review			
Writing an Article			
Reading			
Case Study			
Performance			
Problem Solution			
Project Preparation			
Project Submission			
Quiz	*10*	*1*	*10*
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam	*1*	*1*	*1*
Team/Group Work			
Argument			
Application/Practice			
Other			
TOTAL WORKLOAD:			**103**
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 of the basic subjects of inorganic chemistry	**5**	**5**	**5**	**5**	**4**	**4**	**4**	**4**	**4**	**4**	**1**
2	Gaining theoretical knowledge, designing and conducting experiments, collecting, analyzing and interpreting data	**4**	**5**	**5**	**4**	**3**	**4**	**4**	**4**	**3**	**3**	**1**
3	Acquisition of the ability to conduct single and multi-disciplinary team work.	**5**	**5**	**5**	**5**	**5**	**2**	**5**	**5**	**5**	**5**	**1**
4	Understanding of the ability to transfer information orally and in writing and to communicate effectively	**5**	**5**	**4**	**4**	**4**	**4**	**3**	**3**	**4**	**5**	**1**
5	Ability to work individually and in groups	**5**	**5**	**4**	**4**	**3**	**4**	**4**	**4**	**4**	**5**	**1**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM3112	**2**	**0**	**0**	**2**	**4**	**E**	**TR**	**3/SPRİNG**
Course Name (Turkish**)**	**Mesleki Yabancı Dil**							
Course Name (English**)**	**Vocational Foreign Language**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	In this course, students will be provided with oral and written communication skills in English in accordance with the requirements of their professional lives, scientific and technical vocabulary in the field of Chemistry and sentence structures in scientific publications will be taught, and the ability to read and understand scientific articles and texts related to their fields will be provided.
Course Outline	Basic grammar rules. Translating English articles and book texts in the fields of Science and Chemistry into Turkish. Teaching the rules applied in writing English articles.
Textbook/ Material / Resources	1. Essential Grammar in Use, Fourth Ed., Raymond Murphy,Cambridge University, 2022. 2.Writing Scientific English: A Textbook of English as a Foreign Language for Students of Physical and Engineering Sciences, John M. Swales, Nelson,London 1971, Cornell Üniversitesi. 3. The Mayfield Handbook of Technical and Scientific Writing, Leslie Perelman, Edward Barrett McGraw-Hill Companies,Incorporated, 1997 . 4. Çeşitli bilimsel Kimya kitapları ve Kimya alanında yayımlanmış makaleler.
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Çanakkale Onsekiz Mart University	**Chemistry**	**Vocational Foreign Language**	**2-0-0-2-3**	**E**
Selçuk University	**Chemistry**	**Vocational Foreign Language**	**2-0-0-2-4**	**C**
Yozgat Bozok University	**Chemistry**	**Vocational Foreign Language**	**2-0-0-2-2**	**E**

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Prof. Dr. Hülya TUNCER	
Dersi verebilecek öğretim elemanları (Unvanı, Adı ve Soyadı)	*İmza*
Faculty members of the Chemistry Department	

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

The aim of this course is to teach students of the Chemistry department the basic rules of a foreign language in their field, to develop their vocabulary, to help them read and understand scientific texts and articles on their field, and to help students express themselves. To ensure that they can use a foreign language effectively and efficiently in academic environments and in their professional lives.

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

Theoretical teaching, student-focused, interactive and eclectic approach to teaching.

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** (It should be given as a summary, it should not exceed two lines.)

Weekly Course Content Distribution

Week	Theory	Application/ Laboratory
1	General review of English grammar, providing information about professional English.	
2	Explanation of English sentence structures	
3	English academic writing rules, providing the necessary information to read and write an academic text.	
4	To provide technical terms and expressions used in the field of chemistry.	
5	Academic text/article reading exercise on various topics related to chemistry (general chemistry topics)	
6	Academic text/article reading exercise on various topics related to chemistry (general chemistry topics)	
7	Academic text/article reading exercise on various topics related to chemistry (inorganic chemistry topics)	
8	Academic text/article reading exercise on various topics related to chemistry (inorganic chemistry topics)	
9	Academic text/article reading exercise on various topics related to chemistry (analytical chemistry topics)	
10	Academic text/article reading exercise on various topics related to chemistry (analytical chemistry topics)	
11	Academic text/article reading exercise on various topics related to chemistry (physical chemistry topics)	
12	Academic text/article reading exercise on various topics related to chemistry (physical chemistry topics)	
13	Academic text/article reading exercise on various topics related to chemistry (biochemistry topics)	
15	**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	*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)	*14*	*2*	*28*
Make-up Exam			
Experiment and Observation			
Class Participation (Theory)	*14*	*2*	*28*
Homework			
Final Exam Practice	*1*	*2*	*2*
Laboratory			
Article Review	*7*	*2*	*14*
Writing an Article			
Reading	*6*	*2*	*12*
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:			**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**

	Program Outcomes (PO) / **Learning Outcomes (LO)** *(Course Outcomes)*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Students have professional English vocabulary in the field of Chemistry.	**5**	**5**	**5**	**4**	**4**	**4**	**5**	**5**	**5**	**4**	**4**
2	Students have English grammar, basic reading comprehension and writing skills.	**5**	**5**	**4**	**4**	**5**	**5**	**5**	**4**	**4**	**4**	**3**
3	Students can read, understand and discuss scientific texts in English in their field.	**4**	**5**	**3**	**3**	**5**	**3**	**4**	**3**	**5**	**3**	**3**

4	Students have professional English knowledge required for business life.	**4**	**4**	**5**	**3**	**4**	**5**	**4**	**2**	**5**	**4**	**2**
5	Students can use English effectively for social and professional purposes related to their field.	**3**	**5**	**4**	**5**	**2**	**5**	**2**	**4**	**4**	**5**	**2**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM3104	**2**	**0**	**0**	**2**	**4**	**E**	**TR**	**3/SPRİNG**
Course Name (Turkish**)**	GIDA KİMYASI							
Course Name (English**)**	Food Chemistry							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	Learning the Concepts of Bioorganic Chemistry
Course Outline	General chemical composition of foods, Structure and properties of water, Proteins and their properties in foods, Deterioration of foods, Storage and cooking methods of foods, Importance of degradation reactions of molecules in foods
Textbook/ Material / Resources	Food Chemistry (Ed. H.-D. Belitz, W. Grosch, P. Schieberle, M.M. Burghagen). Food Biochemistry and Food Processing (Ed. W.K. Nip, L.M.L. Nollet, Y.H. Hui) Wiley-Blackwell 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	**Chemistry**	Food Chemistry	**2-0-0-2;3**	**E**
Aydın Adnan Menderes University	**Chemistry**	Food Chemistry	**2-0-0-2;3**	**E**
Eskişehir Osmangazi University	**Chemistry**	Food Chemistry	**2-0-0-2;3**	**E**

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Dr. Aysel SARI	
Dersi verebilecek öğretim elemanları (Unvanı, Adı ve Soyadı)	*İmza*

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

Food is any raw (unprocessed), semi-processed or fully processed substance that humans and animals eat and drink to sustain their vital functions and that forms the source of their lives. Chemistry is defined as the branch of science that studies the basic structures of substances, the combinations of these structures, their transformations, the methods of solving these structures, their combinations and production. Food chemistry, which is formed by the combination of these two branches, has emerged as the branch of science that studies the structure, properties, and changes that occur in foods and their components. Another definition is: Food chemistry is defined as the branch of science that studies the chemical behaviors of the components (each element in a compound) in the composition of foods, both individually and together. Students are aware of the sensitivity of the subject and are taught the importance of food chemistry in living life.

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

Teknolojik öğrenme araçlarından faydalanılarak, yapılmış bilimsel çalışmaların ışığında Yüzyüze/Online ve teorik olarak işlenmesi öngörülmektedir.

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** (It should be given as a summary, it should not exceed two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/ Laboratory**
1	Food chemistry molecules general information and introduction	
2	General chemical compositions of foods	
3	Structure and properties of water	
4	Structure of amino acids and protein formation mechanism	
5	Proteins and their properties in foods	
6	Structure and properties of lipids	
7	Structure and functions of fatty acids	
8	**MIDTERM EXAM**	
9	Food storage and cooking methods	
10	Degradation of structural properties of foods	
11	Chemical structure of vitamins and foods they are found in	
12	Chemical structure of minerals	
13	Structure of essential molecules and foods they are found in	
15	**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	*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	**4**	**1**	**4**
Final Exam Practice	**1**	**3**	**3**
Laboratory			
Article Review	**14**	**3**	**42**
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			
Application/Practice			
Other			
TOTAL WORKLOAD:			**92**
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	Food chemistry molecules have general information	**5**	**5**	**4**	**4**	**4**	**5**	**5**	**4**	**5**	**5**	**5**
2	Understands the structure of amino acids and how they form proteins, Proteins and their properties in foods	**5**	**5**	**4**	**4**	**4**	**5**	**5**	**4**	**5**	**5**	**5**

3	Explains the structure and properties of lipids and the structure and functions of fatty acids	**5**	**5**	**4**	**4**	**4**	**5**	**5**	**4**	**5**	**5**	**5**
4	Knows, understands and explains the chemical structure of vitamins and minerals.	**5**	**5**	**4**	**4**	**4**	**5**	**5**	**4**	**5**	**5**	**5**
5	Knows the structure of essential molecules and the foods they are found in.	**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**
CHEM3156	**2**	**0**	**0**	**2**	**4**	**S**	**TR**	**3/SPRİNG**
Course Name (Turkish)	**Polimer Teknolojisi**							
Course Name (English)	**Polymer Technology**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	Learning the historical development of polymers and basic concepts. Learning the synthesis methods and application areas of polymers Polymer industry
Course Outline	Historical development, basic concepts and definitions, classification of polymers, physical and chemical properties of polymers, polymerization techniques, polymer foams, chemical bonds and polymer structure, morphology, crystallinity, glass transition temperature, polymer modification
Textbook/ Material / Resources	Polymer Technology, Prof. Dr. Mehmet SAÇAK, Gazi Publications
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Ankara University	**Chemistry**	**Introduction to Polymer Technology**	**3-0-0-3-5**	**C**
Atılım University	**Chemistry**	**Polymer Science and Technology**	**3-0-0-3-5**	**E**

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.)

• Teaches the basic principles of polymer chemistry.

• Provides a logical approach to polymer characterization.

• Teaches the historical development of polymers, basic definitions and concepts.

• Discusses the relationship between structure and properties.

• Discusses the properties and applications of polymers.

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 (It should be given as a summary, it should not exceed two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/Laboratory**
1	Introduction to Carbonyl Chemistry	
2	Nucleophilic Addition to Aldehydes and Ketones-1	
3	Nucleophilic Addition to Aldehydes and Ketones-2	
4	Acetals and Ketals	
5	Reaction of Aldehydes with Amine Compounds	
6	Reaction of Ketones with Amine Compounds	
7	Nucleophilic Addition to Carboxylic Acid Esters	
8	Examples	
9	**MIDTERM EXAM**	
10	Polymer foams	
11	Chemical Bonding and Polymer Structure	
12	Polymer Modification	
13	Glass Transition Temperature	
14	Additives Used in Polymers	
15	**FINAL**	

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	*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	*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:			**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**

	Learning Outcomes (LO) *(Course Outcomes)*	**Program Outcomes (PO)** *1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Learning the application areas of polymers	**5**	**4**	**4**	**4**	**3**	**5**	**5**	**3**	**3**	**3**	**4**
2	Gaining the ability to do 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**
CHEM3146	**2**	**0**	**0**	**2**	**4**	**C**	**TR**	**3/SPRİNG**
Course Name (Turkish**)**	**Hesaplamalı Organik Kimya**							
Course Name (English**)**	**Computational Organic Chemistry**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	To provide information on the basic concepts, methods and applications of computational chemistry and to provide the ability to use package programs that perform theoretical calculations and to apply them to various chemical events.
Course Outline	Introduction to computational methods, quantum chemistry calculations, Hartree-Fock (HF) approaches, Ab initio method, basis sets, Post HF methods and electron correlation, Use of package programs, 3-dimensional drawing applications of molecules on the computer, 3-dimensional visualization applications of molecules on the computer, Density Functional Theory (DFT), input preparation in the package program, Semi-empirical methods, structure optimization in the package program, energy calculations, Intramolecular/intermolecular interactions, conformation scanning in the computer, Conformational effects (stereoelectronic effects) in substituted cyclohexanes, Electrostatic potential, visualization of electron and spin densities, Calculation and visualization of HOMO-LUMO orbitals, Calculation of spectral properties, Calculation and animations of IR vibrational modes, Potential energy surfaces, stationary points
Textbook/ Material / Resources	Foresman, J.B.; Frisch, Æ. ExploringChemistrywithElectronic StructureMethods, 3rd ed.; Gaussian, Inc.: Wallingford, CT, 2015. ISBN: 978-1-935522-03-4. KennethL. Williamson,Robert D. Minard,KatherineM. Masters"Büyük Ölçekli ve Küçük Ölçekli, Organik Kimya Deneyleri", Çeviri editörleri: Tahsin Uyar, Özgen AlankuşÇalışkan, ISBN:9786053551164, Palme, Ankara, 2013. Hesapsal Organik Kimya Ders Notları, Safiye Erdem: http://mimoza.marmara.edu.tr/~erdem/ Computational Organic Chemistry, S. M. Bachrach Essentials of Computational Chemistry, C. J. Cramer Computational Chemistry, D. C. Young.
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Marmara University	**Chemistry**	**Computational Organic Chemistry**	**3-1-2-0-7**	**C**
Lıldız Teknik University	**Chemistry**	**Computational Organic Chemistry**	**3-2-4-0-5**	**C**
Eskişehir Osmangazi University	**Chemistry**	**Computational Organic Chemistry**	**3-0-3-0-5**	**C**

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

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** (It should be given as a summary, it should not exceed two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/ Laboratory**
1	Introduction to computational methods, quantum chemistry calculations 1.1. Introduction to the course, content and general information. 1.2 With computational methods. 1.3 What can be done with computational methods? 1.4 Chemical Structure Drawings1. 1.5 Computer Programs 1.6 Molecular Structure Databases	
2	MOLECULAR MECHANICAL CALCULATIONS 2.1 General Information 2.2 Energy Equality in Molecular Mechanics 2.3 Calculations Made with Molecular Mechanics	
3	INTRODUCTION TO QUANTUM MODELLING 3.1 Schrödinger Equation 3.2 Approaches	
4	HARTREE FOCK MODEL 4.1 HF methods 4.2 Restricted HatreeFock Model 4.3 Unrestricted HatreeFock Model	
5	SEMI-EXPERIMENTAL MODELS 5.1 General Information About Semi-Experimental Methods 5.2 Some Semi-Experimental Methods	
6	ELECTRON CORRELATION 6.1 Correlation Energy 6.2. Some ab Initio Methods	
7	TEMELKÜMELER(BASİSSETS) 7.1TemelKümelerHakkındaGenelBilgiler 7.2TemelKümelerinSınıflandırılması	
8	DENSITY FUNCTIONAL THEORY (DFT) 8.1. General Information About DFT 8.2. Some Density Functionals	
9	**MIDTERM EXAM**	
10	APPLICATIONS	

	10.1 Molecular Structure Drawings 10.2 Preparing Input for Calculations	
11	Conformation Analysis 11.1 Geometry Optimization	
12	Thermodynamic Properties	
13	Examples applications	
14	Examples applications	
15	**FINAL**	

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*	*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*	*3*	*52*
Homework			
Final Exam Practice	*1*	*3*	*3*
Laboratory			
Article Review			
Writing an Article			
Reading			
Case Study			

Performance			
Problem Solution	*20*	*1*	*20*
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument	*11*	*1*	*11*
Application/Practice			
Other			
TOTAL WORKLOAD:			**112**
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	Recognize electronic structure calculation methods, know their strengths and weaknesses.	**5**	**4**	**2**	**3**	**5**	**4**	**3**	**2**	**3**	**3**	**2**
2	Can correctly choose the valid method to calculate a particular property	**5**	**4**	**2**	**3**	**5**	**4**	**3**	**2**	**3**	**2**	**2**
3	Can use a standard molecular modeling package (prepare input files, analyze output files).	**5**	**4**	**2**	**3**	**5**	**4**	**3**	**3**	**3**	**3**	**2**
4	Can draw molecules in 3-dimensions, imagine them, and see isomer relationships.	**5**	**4**	**2**	**3**	**5**	**4**	**3**	**2**	**3**	**2**	**2**
5	Can detect and predict intramolecular interactions that cause molecules to be stable/unstable. Can detect and predict intramolecular interactions that cause molecules to be stable/unstable.	**5**	**4**	**2**	**3**	**5**	**4**	**3**	**2**	**2**	**1**	**2**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM3148	**2**	**0**	**0**	**2**	**4**	**S**	**TR**	**3/SPRİNG**
Course Name (Turkish**)**	**Adli Kimya**							
Course Name (English**)**	**Forensic Chemistry**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	The aim of this course is to provide skills that contribute to the resolution of crimes by identifying findings related to crime, mainly through evaluations in the field of chemistry and analyses based on the foundations of positive sciences such as physics, biology and engineering.
Course Outline	Basic knowledge of the use of chemistry in forensic investigations.
Textbook/ Material / Resources	- Gercek Z. Forensic Chemistry, Nobel Academic Press, 2014. - David E. Newton. Forensic Chemistry, 2007, New York.
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Selçuk University	**Chemistry**	**Forensic Chemistry**	**3-0-0-3-5**	**E**
Ankara University	**Chemistry**	**Introduction to Forensic Chemistry**	**2-0-0-2-2**	**E**

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 teach the basic concepts in Forensic Chemistry and to provide knowledge of typical analysis methods.

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** (It should be given as a summary, it should not exceed two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/ Laboratory**
1	Introduction to forensic sciences, place of forensic chemistry in forensic sciences, basic concepts	
2	Instrumental Analysis Methods Used in Forensic Chemistry	
3	Separation Techniques	
4	Purification Techniques	
5	Crime Scene Investigation	
6	Explosion, explosives and explosive substance analyses	
7	Toxicological Analyses	
8	Alcohol, Drug and Medication analyses	
9	**MIDTERM EXAM**	
10	Drugs, drug substance analysis	
11	Paints, inks and writing analysis	
12	Soil, glass and metallic materials analysis and general evaluation	
13	Blood and Fingerprint Analysis	
14	Hair, Nail and DNA analysis	
15	**FINAL**	

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)	*3*	*10*	*30*
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	*10*	*1*	*10*
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:			**95**
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	**5**	**5**	**4**	**4**	**5**	**4**	**5**	**4**	**4**	**3**	**1**
2	Consciousness of constantly renewing oneself and developing research skills in order to adapt to innovations and developing technology	**4**	**5**	**5**	**5**	**3**	**3**	**3**	**4**	**5**	**5**	**1**
3	Sensitivity to national and international effects on health, safety and the environment in chemical applications and in solving problems in the field of Chemistry	**5**	**4**	**4**	**4**	**5**	**3**	**3**	**5**	**4**	**4**	**1**
4	Awareness of professional and ethical responsibility	**5**	**5**	**5**	**5**	**2**	**2**	**2**	**2**	**5**	**5**	**1**
5	Quality and environmental awareness	**5**	**4**	**4**	**5**	**4**	**4**	**4**	**5**	**2**	**4**	**1**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM3160	**2**	**0**	**0**	**2**	**4**	**C**	**TR**	**3/SPRİNG**
Course Name (Turkish**)**	**Karbonil Kimyası**							
Course Name (English**)**	**Carbonyl Chemistry**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	To teach how reaction mechanisms work in organic synthesis. In addition, to provide students with synthesis and mechanism skills as it will shed light on the synthesis of active pharmaceutical ingredients used today.
Course Outline	Introduction to carbonyl chemistry, Nucleophilic addition to aldehydes and ketones, Formation of acetals and ketals, Addition of amine derivatives to aldehydes and ketones, Nucleophilic additions to other carbonyl group compounds, enols and enolates, alkylation of enolates, aldol condensations, other reactions related to carbonyl chemistry.
Textbook/ Material / Resources	Solomons, G., Fryhle, C., Organic Chemistry, (Translation from 7th Edition Okay, G., Yıldırır, Y), Literatür Publishing, Turkey, 2000 Jones, J., Core Carbonyl Chemistry, Oxford Science Publication, New York, 1997
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Sakarya University	**Chemistry**	**Carbonyl Chemistry**	**4-0-0-4- 6**	**E**

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

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

The carbonyl chemistry course, which is essential for modern organic chemistry, is to teach how the reaction mechanisms work in organic synthesis, as it forms the basis of most reactions used in organic chemistry.

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** (It should be given as a summary, it should not exceed two lines.)

Weekly Course Content Distribution

Week	Theory	Application/Laboratory
1	Introduction to Carbonyl Chemistry	
2	Nucleophilic Addition to Aldehydes and Ketones-1	
3	Nucleophilic Addition to Aldehydes and Ketones-2	
4	Acetals and Ketals	
5	Reaction of Aldehydes with Amine Compounds	
6	Reaction of Ketones with Amine Compounds	
7	Nucleophilic Addition to Carboxylic Acid Esters	
8	Examples	
9	**MIDTERM EXAM**	
10	Nucleophilic additions to carboxylic acid derivatives	
11	Enols and enolates	
12	Alkylation of enolates with alkyl halides	
13	Aldol condensations	
14	Other reactions related to carbonyl chemistry	
15	**FINAL**	

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	*1*	*3*	*3*
Midterm Exam Application	*2*	*18*	*36*
Self-Study (including pre-class and exam preparation)	*1*	*3*	*3*
Make-up Exam			
Experiment and Observation	*14*	*2*	*28*
Class Participation (Theory)			
Homework	*1*	*3*	*3*
Final Exam Practice			
Laboratory			
Article Review			
Writing an Article			
Reading			
Case Study			
Performance	*3*	*2*	*6*
Problem Solution			
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work	*10*	*3*	*30*
Argument			
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	Learning the reactions and mechanisms of carbonyl compounds	*5*	*4*	*4*	*4*	*3*	*5*	*5*	*3*	*3*	*3*	*4*
2	Gaining the ability to do 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**
CHEM3142	**4**	**0**	**0**	**4**	**5**	**C**	**TR**	**3/SPRİNG**
Course Name (Turkish)	**Fizikokimya II**							
Course Name (English)	**Physical Chemistry**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	The detailed examination of the subject of mixtures is to ensure that students thoroughly understand the phase diagrams of three-component systems and the chemical thermodynamics section.
Course Outline	1. Mixtures, 2. Chemical thermodynamics
Textbook/ Material / Resources	1.Sarıkaya, Yüksel., Physical Chemistry, Ankara University Publications, ANKARA (MAIN SOURCE) 2.Berkem, A.R. 1980 Modern Physical Chemistry, 720 pp. Istanbul University Publications, Publication No:10 ISTANBUL. 3.Atkins, P.W.1978. Physical Chemistry, 1007 pp.Oxford University Press, Oxford. Moore, J.W. 1972 Physical Chemistry, 969 pp. Longmann Group ltd, LONDON
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Marmara University	**Chemistry**	**Physical chemistry**	**4-0-0-5; 5**	**C**
Gazi University	**Chemistry**	**Physical chemistry**	**4-0-0-4; 4**	**C**
Eskişehir Osmangazi University	**Chemistry**	**Physical chemistry**	**4-0-0-4; 5**	**C**

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*

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

Understanding of the basic subjects of chemistry, Acquiring theoretical knowledge, Ability to identify, define, analyze and solve problems in chemistry and related fields, Making students comprehend the subjects specified in the course content as part of the basic subjects of chemistry and relating them to other branches of chemistry.

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

Face-to-face verbal presentation, online in exceptional cases

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** (It should be given as a summary, it should not exceed two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/ Laboratory**
1	MIXTURES; Basic thermodynamic properties of open systems	
2	Partial molar properties	
3	Gibbsin phase rule, Ideal mixtures	
4	Nerst's partition law, Henry and Rault's laws	
5	Numerical properties	
6	Real mixtures without electrolytes, deviations from Rault's law	
7	Phase diagrams of some two-component systems (liquid-vapor, solid-liquid), Examples of phase diagrams of three-component systems	
8	CHEMICALTHERMODYNAMICS; Thermochemistry, internal energy and enthalpy of reaction	
9	**MIDTERM EXAM**	
10	Chemical reactions according to the second law of thermodynamics	
11	Reaction free enthalpy and spontaneity	
12	The concept of chemical equilibrium,	
13	Condition of equilibrium	
14	Various equilibrium constants/Make-up Exam	
15	**FINAL**	

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*	*10*	*20*
Make-up Exam	*1*	*2*	*2*
Experiment and Observation			
Class Participation (Theory)	*14*	*4*	*56*
Homework			
Final Exam Practice	*1*	*2*	*3*
Laboratory			
Article Review			
Writing an Article			
Reading	*14*	*1*	*14*
Case Study			
Performance			
Problem Solution	*13*	*1*	*13*
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:			**124**
ECTS CREDİTS OF THE COURSE: *(The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)*			**5**

	Program Outcomes (PO) / **Learning Outcomes (LO)** *(Course Outcomes)*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	The subject of mixtures will be understood in detail	**5**	**4**	**3**	**2**	**1**	**3**	**1**	**4**	**2**	**4**	**0**
2	They will understand and interpret some laws related to ideal mixtures	**5**	**3**	**2**	**3**	**0**	**3**	**5**	**4**	**3**	**3**	**1**
3	They will be able to evaluate phase equilibria and diagrams.	**5**	**3**	**4**	**5**	**0**	**4**	**3**	**2**	**4**	**4**	**1**
4	They will be able to understand the role of thermodynamics and kinetics in chemical equilibrium	**5**	**3**	**3**	**4**	**1**	**3**	**1**	**4**	**3**	**4**	**0**
5	They will be able to evaluate colligative	**5**	**2**	**4**	**4**	**0**	**3**	**4**	**5**	**3**	**4**	

	properties.											**0 0**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM3134	**0**	**4**	**0**	**2**	**3**	**C**	**TR**	**3/SPRİNG**
Course Name (Turkish**)**	**Organik Kimya Laboratuvarı-II**							
Course Name (English**)**	**Organic Chemistry Lab-II**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	Synthesis, purification and characterization of organic compounds containing different functional groups
Course Outline	After organic compounds containing different functional groups (alcohols, ethers, aldehydes, azo dyes, aromatic compounds and phenyl hydrozanes etc.) are synthesized, they are purified by appropriate purification methods and the IR, 1H-NMR, 13C NMR spectra of the reactants and products are taken to characterize the products.
Textbook/ Material / Resources	-Prof. Dr. Ender Erdik, Prof. Dr. Metin Obalı, Prof. Dr. Nadire Yüksekışık, Prof. Dr. Atilla Öktemer, Prof. Dr. Tarık Pekel, Prof. Dr. Ekmelettin İnsanoğlu "Denel Organic Chemistry" Ankara Univ. Faculty of Science Publication No: 145.1987 -Prof. Dr. Ender Erdik "Spectroscopic Methods in Organic Chemistry" Gazi Büro Bookstore Ankara - 1993
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Anadolu University	**Chemistry**	**Organic Chemistry Lab-II**	**0-4-0-2-4**	**C**
Yıldız Teknik University	**Chemistry**	**Organic Chemistry Lab-II**	**0-4-0-2-4**	**C**

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Doç. Dr. Demet COŞKUN	
Dersi verebilecek öğretim elemanları (Unvanı, Adı ve Soyadı)	*İmza*
Prof. Dr. Metin KOPARIR	
Prof. Dr. Hülya TUNCER	

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.)

One-on-one experiment in a laboratory environment

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 (It should be given as a summary, it should not exceed two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/Laboratory**
1		General Information
2		Benzoin
3		Benzoin Characterization
4		Benzyl
5		Benzyl Characterization
6		Benzyl Alcohol-Benzoic Acid
7		Benzyl Alcohol-Benzoic Acid Characterization
8		**MIDTERM EXAM**
9		Diazoaminoazobenzene
10		Characterization of Diazoaminoazobenzene
11		p-iotanil
12		Characterization of p-iotanil
13		Claisen Schmidt Reaction
14		Claisen Schmidt Characterization
15		**FINAL**

Assessment			
Evaluation Criteria	**Activity**	**Custom**	**Contribution to Success Grade (%)**
	Midterm Exams	1	20
	Quizzes	10	20
	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)	*1*	*14*	*14*
Make-up Exam	*1*	*2*	*2*
Experiment and Observation			
Class Participation (Theory)			
Homework			
Final Exam Practice	*1*	*2*	*2*
Laboratory	*14*	*4*	*56*
Article Review			
Writing an Article			
Reading			
Case Study			
Performance			
Problem Solution			
Project Preparation			
Project Submission			
Quiz	*1*	*10*	*10*
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument			
Application/Practice			
Other			
TOTAL WORKLOAD:			**86**
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	Can set up reaction systems.	*5*	*4*	*4*	*4*	*3*	*5*	*5*	*3*	*3*	*3*	*4*
2	Gaining the ability to do 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**
CHEM3140	**3**	**0**	**0**	**3**	**3**	**C**	**TR**	**3/SPRİNG**
Course Name (Turkish)	**Polimer Kimyası**							
Course Name (English)	**Physical Chemistry**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	To provide basic information to understand the structure, chemical and some physical properties of polymers or macromolecules.
Course Outline	Introduction to polymer chemistry, Concept of molecular weight in polymers, Fractions of polymers, Glass transition temperature in polymers, Polymerization reactions, Copolymerization and polymerization systems.
Textbook/ Material / Resources	Coşkun M., Demirelli K., Polymer lecture notes (72 pages) Saçak M., Polymer Chemistry (2nd Edition), Gazi Bookstore
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Marmara University	**Chemistry**	**Introduction to Polymer Chemistry**	**2-0-0-2; 3**	**C**
Gazi University	**Chemistry**	**Physical chemistry**	**2-0-0-2 ; 3**	**C**
Eskişehir Osmangazi University	**Chemistry**	**Organic Polymers**	**2-0-0-2; 4**	**C**

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	

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

Explaining the basic concepts of polymer chemistry, emphasizing the importance of polymer molecules in daily life and industrial aspects, making students comprehend the content of the basic polymer chemistry topics and relating them to other branches of chemistry.

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

Face-to-face oral presentation will be held online in exceptional cases.

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** (It should be given as a summary, it should not exceed two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application / Laboratory**
1	INTRODUCTION TO POLYMER CHEMISTRY: Definition of Polymer, Classification of Polymers	
2	CONCEPT OF MOLECULAR WEIGHT IN POLYMERS: Average Molecular Weight in Polymers, Average M.A. by Number	
3	Viscosity Average M.A., Average M.A. by Weight	
4	Molecular Weight Distribution Curves in Polymers, Heterogeneity Index in Polymers	
5	FRACTIONS OF POLYMERS; Dissolution in Polymers and Thermodynamic Aspects of Dissolution	
6	Solubility Parameter, Fractionation Methods	
7	GLASS TRANSITION TEMPERATURE IN POLYMERS; Definition of Glass Transition Temperature, Factors Affecting Glass Transition Temperature	
8	Determination of Glass Transition Temperature	
9	**MIDTERM EXAM**	
10	POLYMERIZATION REACTIONS; Radical Polymerization	
11	Cationic Polymerization	
12	Anionic Polymerization	
13	COPOLIMERIZATION; .Monomer reactivity ratios	
14	POLYMERIZATION SYSTEMS; Bulk Polymerization, Solution Polymerization, Suspension Polymerization	
15	**FINAL**	

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			
Self-Study (including pre-class and exam preparation)	*1*	*2*	*2*
Make-up Exam	*2*	*10*	*20*
Experiment and Observation	*1*	*2*	*2*
Class Participation (Theory)			
Homework	*14*	*3*	*42*
Final Exam Practice			
Laboratory	*1*	*2*	*2*
Article Review			
Writing an Article			
Reading			
Case Study	*8*	*1*	*8*
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:			**76**
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	Will be able to interpret basic definitions and concepts related to polymers.	**5**	**4**	**3**	**2**	**1**	**4**	**3**	**4**	**3**	**4**	**0**
2	Will be able to evaluate the structure of polymers and the meaning of molecular weight distribution.	**5**	**3**	**2**	**3**	**0**	**3**	**5**	**4**	**3**	**3**	**1**
3	Will discuss thermal properties of polymers and factors affecting them.	**5**	**3**	**4**	**5**	**0**	**4**	**3**	**3**	**4**	**4**	**1**
4	Will classify polymerization reactions according to their methods and mechanisms and distinguish the differences between them.	**5**	**3**	**3**	**4**	**1**	**4**	**1**	**4**	**3**	**4**	**0**
5	Will be able to make copolymer types based	**5**	**5**	**4**	**4**	**0**	**4**	**4**	**5**	**3**	**4**	

	on the calculation of monomer reactivity ratios.											**0**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM3138	**2**	**0**	**0**	**2**	**4**	**C**	**TR**	**3/SPRİNG**
Course Name (Turkish**)**	Organik Kimyada Reaktif Ara Ürünler							
Course Name (English**)**	Reactive Intermediates in Organic Chemistry							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	It aims to understand and teach the characteristic properties of reactive intermediates, carbocations, free radicals, molecular oxygen and singlet oxygen species and their reactions.
Course Outline	1. Reactive intermediates and their classification, 2. Carbocations: structure and classification, 3. Carbocations: reactions, 4. Radicals: structure and classification, 5. Radicals: reactions, 6. Carbanions: structure and classification, 7. Carbanions: reactions, 8. Carbenes: structure and classification, 9. Carbenes: reactions, 10. Nitrenes: structure and classification, 11. Nitrenes: reactions, 10. Obtaining Singlet Oxygen and its Reactions
Textbook/ Material / Resources	1.Organic Chemistry, Jonathan Clayden, Nick Greeves, Stuart Warren, Peter Wothers, Oxford Chemistry Primer, 2001 2. Organic Chemistry Reaction Mechanisms, Metin Balcı, TÜBA Publications, Ankara, 2012
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Karadeniz University	**Chemistry**	**Reactive Intermediates in Organic Chemistry**	**3-0-3-0-6**	**C**
Uludağ University	**Chemistry**	**Reactive Intermediates in Organic Chemistry**	**3-0-3-0-6**	**C**
Ankara University	**Chemistry**	**Reactive Intermediates in Organic Chemistry**	**3-0-3-0-6**	**C**

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Prof. Dr. Süleyman Servi	
Dersi verebilecek öğretim elemanları (Unvanı, Adı ve Soyadı)	*İmza*
Prof. Dr. Süleyman Servi	

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

Reactive intermediates play an important role in the synthesis of molecules and the formation of products. They contribute greatly to the understanding of organic reactions. Nitrogen and oxygen radicals also occur in living systems and are responsible for the formation of diseases.

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

It will be explained theoretically with computer support.

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** (It should be given as a summary, it should not exceed two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/ Laboratory**
1	Reactive Intermediates, Classification and Behavior in Chemical Reactions	
2	Structure, Formation and Classification of Carbocations	
3	Reactions of Carbocations,	
4	Structure and Classification of Radicals,	
5	Reactions of Radicals,	
6	Structure, Formation and Classification of Carbanions,	
7	Reactions of Carbanions	
8	**MIDTERM EXAM**	
9	Structure and Classification of Carbenes	
10	Reactions of Carbenes,	
11	Structure, Formation and Classification of Nitrenes,	
12	Reactions of Nitrenes	
13	Azeures and their reactions - MAKE-UP EXAM	
14	Obtainment and Reactions of Singlet Oxygen,	
15	**FINAL**	

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	*50*
	Engineering Sciences	*20*
	Social Sciences	
	Health Sciences	*30*
	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	10	30
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	1	1	1
Case Study			
Performance			
Problem Solution	4	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:			**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	To learn the reactive intermediate structures that occur in organic reactions.	**5**	**4**	**1**	**-**	**2**	**1**	**-**	**4**	**3**	**1**	**4**
2	To learn the structures and properties of reactive intermediate species.	**5**	**4**		**-**	**3**	**2**	**1**	**4**	**2**	**2**	**4**
3	To learn the reactions and mechanisms of reactive intermediate species.	**5**	**3**	**3**	**3**	**3**	**2**	**1**	**5**	**3**	**3**	**2**
4	To understand the biological properties of reactive intermediates (reactive oxygen species and reactive nitrogen species)	**5**	**4**	**4**	**3**	**3**	**4**	**2**	**3**	**5**	**5**	**4**

Course Information								
Course Code	**T**	**P**	**L**	**C**	**ECTS**	**Type** C/E	**Language** TR/ENG etc.	**Year/Semester**
CHEM3124	**0**	**0**	**4**	**2**	**4**	**C**	**TR**	**3/SPRİNG**
Course Name (Turkish**)**	**Enstrümental Analiz Labaratuvarı**							
Course Name (English**)**	**Instrumental Analysis Laboratory**							

Unit/Program	Chemistry Department/Undergraduate Program
Course Prerequisite	No
Course Objectives	To provide students with information about the working principles of various spectroscopic, chromatographic, electroanalytical and thermal analysis devices, the analyses that can be performed using these devices and the evaluation of the results of these analyses.
Course Outline	Instrumental techniques spectroscopic, chromatographic, electroanalytical and thermal analysis devices and their use, experimental process and reporting of results
Textbook/ Material / Resources	Enstrümental Analiz, Prof. Dr. Turgut Gündüz, Fersa Matbaacılıki Gazi Kitabevi Douglas A.Skoog, Donald M. West, F.James Holler Fundamentals of instrumental Analysis.Sounders College Publishing.
Internship Status	No

Course Precedents

University Name	**Program Name**	**Course Name**	**T-P-L-C; ECTS**	**Type**
Atatürk University	**Chemistry**	**Instrumental Analysis Laboratory**	**0-0-4-2-3**	**C**
Selçuk University	**Chemistry**	**Instrumental Analysis Laboratory**	**1-2-0-2-5**	**C**

The instructor who proposed the course (Title, Name and Surname)	*Signature*
Doç. Dr. Kenan KORAN	
Dersi verebilecek öğretim elemanları (Unvanı, Adı ve Soyadı)	*İmza*
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.)

Learning to analyze the applied part of theoretical knowledge in the field with the use of instrumental techniques and to evaluate the results is the use of the knowledge gained both as a graduate and postgraduate student.

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

The course will be continued with the practical use of relevant devices in instrumental analysis laboratories.

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** (It should be given as a summary, it should not exceed two lines.)

Weekly Course Content Distribution		
Week	**Theory**	**Application/Laboratory**
1		General Laboratory Operation and Safety Rules Information
2		Atomic Absorption Spectroscopy
3		UV-vis Spectroscopy
4		Infrared Spectroscopy
5		Nuclear Magnetic Resonance Spectroscopy-1H NMR
6		Nuclear Magnetic Resonance Spectroscopy-13C-NMR
7		Thin Layer-Column Chromatography
8		**MIDTERM EXAM**
9		Thermal Analysis Techniques DSC,
10		Thermal Analysis Techniques TGA,
11		Potentiometer-Voltameter
12		Fluorescence Spectroscopy
13		Rotation Angle with Polarimetry
15		**FINAL**

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	*1*	*2*	*2*
Midterm Exam Application	*10*	*2*	*20*
Self-Study (including pre-class and exam preparation)	*1*	*2*	*2*
Make-up Exam			
Experiment and Observation			
Class Participation (Theory)			
Homework	*1*	*2*	*2*
Final Exam Practice	*14*	*4*	*56*
Laboratory			
Article Review			
Writing an Article			
Reading			
Case Study			
Performance			
Problem Solution			
Project Preparation			
Project Submission	*14*	*1*	*14*
Quiz	*14*	*1*	*14*
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument			
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 the use of spectroscopic analysis techniques.	**4**	**2**	**5**	**1**	**-**	**1**	**2**	**-**	**3**	**-**	**-**
2	Knows the use and interpretation of NMR equipment.	**4**	**2**	**5**	**1**	**-**	**1**	**2**	**-**	**3**	**-**	**-**
3	Knows the analysis with thermal analysis techniques.	**4**	**2**	**5**	**1**	**-**	**1**	**2**	**-**	**3**	**-**	**-**
4	Knows the chromatographic analysis techniques.	**4**	**2**	**5**	**1**	**-**	**1**	**2**	**-**	**3**	**-**	**-**
5	Knows the analysis with electroanalytical techniques.	**4**	**2**	**5**	**1**	**-**	**1**	**2**	**-**	**3**	**-**	**-**