COURSE IDENTIFICATION FORM

Course Code and Name: DIJ111- Digital Literacy				**Department of :** Institute of Graduate Education – Chemical Technologies Department – Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	2	0	2	2	3	Turkish	Optional
Prerequisite (s)	None						
Instructor	Prof. Dr. Ragıp ADIGÜZEL					**Mail :**radiguzel@munzur.edu.tr **Web :**www.munzur.edu.tr	
Course Assistant	None					**Mail :** **Web :**	
Groups / Classes	Master degree						
Course Aim	• It is aimed to provide an individual with the ability to use information technologies in line with his/her needs.						
Course Goals	• To increase the knowledge and application capabilities of students in the subjects of Internet Technologies, Portable Technologies, Social Networks, Information Ethics, Technology and Lifelong Learning, Cloud Computing, Technology, Society and Human and Future Technologies.						
Course Learning Outs and Proficiencies	• To be able to define the basic concepts of the Internet • To be able to explain the functions of search engines • To be able to list the types of portable technology • To be able to explain the general features of Web 2.0 and social networks • To be able to summarize the use of technology and people's lifestyles in hunter-gatherer, agricultural, industrial and information societies • To be able to explain the concept and importance of information ethics • To be able to explain human-computer interaction • To be able to explain the basic principles and strategies of lifelong learning						
Course Basic and Auxiliary Contexts	• Electronic resources in PDF, ePUB, MOBI and HTML5 formats prepared by Anadolu University Open Education System • All kinds of books, videos, e-books, etc. related to the course						

Methods of Give a Lecture	E-Learning, Digital Platform

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	• Internet Technologies
2	• Internet Technologies
3	• Portable Technologies
4	• Portable Technologies
5	• Social Networks
6	• Social Networks
7	• Technology, Society and Human
8	• **Midterm Exam**
9	• Technology, Society and Human
10	• Information Ethics
11	• Technology and Lifelong Learning
12	• Technology and Lifelong Learning
13	• Cloud Computing
14	• Future Technologies

COURSE IDENTIFICATION FORM

Course Code and Name: GON111- Volunteering Activities				**Department of :** Institute of Graduate Education – Chemical Technologies Department – Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	1	2	3	2	4	Turkish	Optional
Prerequisite (s)	None						
Instructor	All Faculty Members					**Mail :** **Web :**www.munzur.edu.tr	
Course Assistant	None					**Mail :** **Web :**	
Groups / Classes	Master degree						
Course Aim	• The aim is to strengthen the ties between the university and the society by using the knowledge, skills and accumulation that the students have acquired throughout their education; to ensure that they gain sensitivity to various issues and problems in the society, especially migration and disasters, disabled people and disadvantaged groups, with humanitarian, social and economic problems; to ensure that humanitarian, social, cultural and moral values and skills are developed through some volunteer activities that they will participate and carry out, and to increase the visibility and awareness in the society on issues that are of high social sensitivity, such as disabled life, migration and disaster; thus, to ensure that the students take part in voluntary work for a period of time within the scope of a plan to be prepared in advance in a volunteering field of their choice and to share their results.						
Course Goals	• To increase the knowledge and application capabilities of students in the subjects of Internet Technologies, Portable Technologies, Social Networks, Information Ethics, Technology and Lifelong Learning, Cloud Computing, Technology, Society and Human and Future Technologies.						
Course Learning Outs and Proficiencies	• Ability to develop and use the connections between the university and society by using the knowledge, skills and accumulation they have acquired throughout their education. • Ability to cope with human, social, economic etc. problems. • Ability to increase visibility and awareness in society on issues of high social sensitivity such as disabled life, migration and disaster, and the ability to develop new approaches in complex situations and solve them by taking responsibility.						

Course Basic and Auxiliary Contexts	• Field-specific scientific publications
Methods of Give a Lecture	Lecture, Question-Answer, Discussion, Drill and Practice, Demonstration, Group work, Brainstorming, Experiment/Laboratory/Workshop/Field application, Project-based learning (including field work)

		If Available, to Sign (x)	**General Average Percentage (%) Rate**
Assessment Criteria	**1. Quiz**		
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)	X	**100**
	Final Examination		

Semester Course Plan

Week	**Subjects**
1	Concepts of Management and Organization
2	The Concept of Volunteering and Volunteer Management;
3	Basic Volunteering Areas (Disaster and Emergency, Environment, Education and Culture, Sports, Health and Social Services, etc.);
4	Project Development Related to Volunteer Work and Participation in Volunteer Work in the Field;
5	Ethics, Moral, Religious, Traditional Values and Principles in Volunteer Work; Participation in Volunteer Work in Public Institutions, Local Governments and Non-Governmental Organizations (NGOs);
6	Ethics, Moral, Religious, Traditional Values and Principles in Volunteer Work; Participation in Volunteer Work in Public Institutions, Local Governments and Non-Governmental Organizations (NGOs);
7	Ethics, Moral, Religious, Traditional Values and Principles in Volunteer Work; Participation in Volunteer Work in Public Institutions, Local Governments and Non-Governmental Organizations (NGOs);

8	Ethics, Moral, Religious, Traditional Values and Principles in Volunteer Work; Participation in Volunteer Work in Public Institutions, Local Governments and Non-Governmental Organizations (NGOs);
9	Ethics, Moral, Religious, Traditional Values and Principles in Volunteer Work; Participation in Volunteer Work in Public Institutions, Local Governments and Non-Governmental Organizations (NGOs);
10	Ethics, Moral, Religious, Traditional Values and Principles in Volunteer Work; Participation in Volunteer Work in Public Institutions, Local Governments and Non-Governmental Organizations (NGOs);
11	Ethics, Moral, Religious, Traditional Values and Principles in Volunteer Work; Participation in Volunteer Work in Public Institutions, Local Governments and Non-Governmental Organizations (NGOs);
12	Ethics, Morality, Religious, Traditional Values and Principles in Volunteer Work; Participation in Volunteer Work in Public Institutions, Local Governments and Non-Governmental Organizations (NGOs);
13	Ethics, Morality, Religious, Traditional Values and Principles in Volunteer Work; Participation in Volunteer Work in Public Institutions, Local Governments and Non-Governmental Organizations (NGOs);
14	Risk Groups and Volunteerism in Society; Immigrants and Volunteerism.

COURSE IDENTIFICATION FORM

Course Code and Name: KT5001 Specialty Field Course				**Department of :** Institute of Graduate Education-Department of Chemical Technologies- Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	6	0	6	0	10	Turkish	**Compulsory**
Prerequisite (s)							
Instructor		All Thesis Advisors				**Mail :** **Web :**www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes		Master Degree					
Course Aim	• Transferring the knowledge, experience and knowledge of the advisor faculty member in the scientific field in which he/she works to the students, and providing them with scientific ethics and work discipline, and the ability to follow and evaluate current literature.						
Course Goals							
Course Learning Outs and Proficiencies	• Ability to evaluate, develop and use the information acquired on the thesis subject at an expert level. • Ability to need information and access the information sought. • Ability to observe scientific and ethical values in the stages of collecting, evaluating and publishing data related to the thesis topic. • Ability to devise and develop methods to solve a problem related to the thesis topic and to evaluate the results. • Ability to convey current developments and own work on the thesis topic in written, oral and visual form. • Ability to develop new approaches and take responsibility for solving complex situations encountered in the thesis topic applications.						
Course Basic and Auxiliary Contexts	• Field-specific scientific publications • Sources determined and recommended by the student's thesis advisor						
Methods of Give a Lecture							

	Face-to-Face and digital platform

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz		
	2. Quiz		
	3. Quiz		
	4. Quiz		
	Homework (Ten)		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)	**X**	**100**
	Final Examination		

Semester Course Plan

Week	Subjects
1	Determining a research question that is academically consistent and worth examining
2	Presenting a critical approach to the research topic
3	Determining the literature in the relevant field
4	Preparing a thesis proposal
5	Creating a thesis content outline
6	Preparing a timeline
7	Developing data collection tools appropriate for the problem
8	Collection and analysis of data
9	Interpretation of findings
10	Drawing conclusions from research findings
11	Making recommendations based on research results
12	Reporting research results
13	Checking the conformity of research to scientific principles
14	Conducting the writing of the research as a thesis/project

COURSE IDENTIFICATION FORM

Course Code and Name: KT5002-Master Seminar				**Department of :** Institute of Graduate Education-Department of Chemical Technologies- Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	0	2	2	0	5	Turkish	**Compulsory**
Prerequisite (s)							
Instructor		All Thesis Advisors				**Mail :** **Web :**www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes		Master Degree					
Course Aim	• To carry out master's thesis/project studies based on scientific principles.						
Course Goals							
Course Learning Outs and Proficiencies	• Determines the topic that will form the basis of the master's degree study. • Applies the feedback received in the seminar to the study. • Gains presentation preparation skills. • Gains presentation skills. • Accesses information in depth and breadth by conducting scientific research, evaluates, interprets and applies information. • Completes and applies information using scientific methods using limited or incomplete data. • Evaluates information from different disciplines. • Determines field-specific problems and explains methods to solve them. • Applies innovative methods in solutions. • Lists new and/or original ideas. • Distinguishes information on current techniques and methods applied in the field of chemical technologies. • Designs and applies analytical, modeling and experimental based research. • Follows innovations in the field of chemical technologies.						

Course Basic and Auxiliary Contexts	• Field-specific scientific publications
Methods of Give a Lecture	Face-to-Face and Digital Platform

		If Available, to Sign (x)	General Average Percentage (%) Rate
Assessment Criteria	**1. Quiz**		
	2. Quiz		
	3. Quiz		
	4. Quiz		
	Homework (Ten)		
	Oral Examination	**X**	**100**
	Practice Examination (Laboratory, Project etc.)		
	Final Examination		

Semester Course Plan

Week	Subjects
1	Determination of the topic for the master's seminar study
2	Selection of the topic to be studied
3	Literature review
4	Listing of literature studies on the subject
5	Determination of the method on the subject
6	Implementation of the preliminary preparations according to the method determined
7	Determination of the topic for the master's seminar study
8	Putting the study into practice
9	Master's seminar study
10	Master's seminar study
11	Master's seminar study
12	Master's seminar study
13	Master's seminar study
14	Interpretation and presentation of the results of the master's seminar study

COURSE IDENTIFICATION FORM

Course Code and Name: KT5003- Master's Thesis				**Department of :** Institute of Graduate Education- Department of Chemical Technologies- Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	0	2	2	0	5	Turkish	**Compulsory**
Prerequisite (s)							
Instructor		All Thesis Advisors				**Mail :** **Web :**www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes		Master Degree					
Course Aim	• The Chemical Technologies Master's Program aims to train expert researchers who can follow and contribute to developments in our country's industry and production activities as a result of multidisciplinary collaboration between the fields of chemistry, chemical engineering, science and materials science, and who know and define the applications of modern chemical technologies required for these activities.						
Course Goals							
Course Learning Outs and Proficiencies	• He/she observes scientific and ethical values in the stages of collecting, evaluating and publishing data related to the thesis topic. • He/she can develop new approaches in complex situations that he/she will encounter in the applications on the thesis topic and solve them by taking responsibility. • He/she can design and develop a method to solve a problem on the thesis topic and evaluate the results. • He/she can evaluate, develop and use the information he/she has acquired on the thesis topic at an expert level. • He/she needs information and can reach the information he/she is looking for. • He/she can convey current developments and his/her own studies on the thesis topic in written, verbal and visual form.						
Course Basic and Auxiliary Contexts	• Articles specific to the field and thesis topic						
Methods of Give a Lecture	Face-to-Face and Digital Platform						

		If Available, to Sign (x)	General Average Percentage (%) Rate
Assessment Criteria	**1. Quiz**		
	2. Quiz		
	3. Quiz		
	4. Quiz		
	Homework (Ten)		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)	**X**	**100**
	Final Examination		

Semester Course Plan

Week	Subjects
1	Master's thesis study
2	Master's thesis study
3	Master's thesis study
4	Master's thesis study
5	Master's thesis study
6	Master's thesis study
7	Master's thesis study
8	Master's thesis study
9	Master's thesis study
10	Master's thesis study
11	Master's thesis study
12	Master's thesis study
13	Master's thesis study
14	Master's thesis study

COURSE IDENTIFICATION FORM

Course Code and Name: KT5004-Inorganic Reaction Mechanism				**Department of :** Institute of Graduate Education-Department of Chemical Technologies- Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	5	Turkish	Optional
Prerequisite (s)							
Instructor		Prof. Dr. Ragıp ADIGÜZEL				**Mail :**radiguzel@munzur.edu.tr **Web :**www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes		Master Degree					
Course Aim	• To have an idea about whether a reaction is theoretically thermodynamically and kinetically stable and through which mechanism the reaction can occur by taking into account complex reactions and reaction mechanisms.						
Course Goals							
Course Learning Outs and Proficiencies	• Upon completion of this course, students; can judge whether a reaction is thermodynamically stable and kinetically labile or inert, • To be able to comment on the mechanism by which a reaction will take place theoretically, taking into account complex reactions and reaction mechanisms, • Interpret the concept of trans effect on square plane substitution reactions, taking into account the properties of ligands.						
Course Basic and Auxiliary Contexts	• Gary L. Miessler, Donald A Tarr, İnorganik Kimya, Üçüncü Baskıdan Çeviri Editörleri: Prof. Dr. Nurcan Karacan, Prof. Dr. Perihan Gürkan, Palme Yayıncılık, Ankara, 2009. • Cemal Kaya, İnorganik Kimya, 3. Baskı Cilt 2, Palme Yayıncılık, Ankara, 2011. • M.L. Tobe, Reaction mechanism in inorganic chemistry, Butterworths, london, 1952. • L. William,M.C. Jolly, Modern Inorganic Chemistry Craw Hill.inc., New York, 1991.						

Methods of Give a Lecture	Face-to-Face and digital platform

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	Homework (Ten)		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	1. Chemical kinetics: Rate laws, integrated rate equations, Activation parameters
2	2. Basic concepts, Stability and inertness
3	3. Kinetic techniques, Classification of mechanisms
4	4. Kinetic consequences of reaction pathways: dissociation, interchange, association
5	Substitution Reactions in Square Plane Complexes, Trans Effect, Other Effects Affecting Substitution Reaction Rate, Substitution Reactions in Tetrahedral Complexes
6	Substitution Reactions in Square Plane Complexes, Trans Effect, Other Effects Affecting Substitution Reaction Rate, Substitution Reactions in Tetrahedral Complexes
7	Substitution in regular octahedral complexes, Kinetics, Mechanisms, Leaving Group Effects
8	Substitution in regular octahedral complexes, Kinetics, Mechanisms, Leaving Group Effects, Coordinated water displacement **Midterm exam**
9	Chelate and ligand effects, Metal Effect
10	Acid and Base Catalysis, Stereochemistry of Octahedral Substitution reactions
11	Organometallic Substitution Reactions, Ligand Bonds, Metal Carbonyl Substitution Reactions, Metal Effects on Reactivity
12	Organometallic Substitution Reactions, Ligand Bonds, Metal Carbonyl Substitution Reactions, Metal Effects on Reactivity
13	Synthesis of coordination compounds using substitution reactions
14	Thermodynamic stability of coordination compounds

COURSE IDENTIFICATION FORM

Course Code and Name: KT5005- Inorganic Electronic Spectroscopy				**Department of :** Institute of Graduate Education- Department of Chemical Technologies- Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	5	Turkish	Optional
Prerequisite (s)							
Instructor		Prof. Dr. Ragıp ADIGÜZEL				**Mail :**radiguzel@munzur.edu.tr **Web :**www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes		Master Degree					
Course Aim		• To determine which types of transitions correspond to the experimentally determined electronic absorption spectra in coordination compounds.					
Course Goals							
Course Learning Outs and Proficiencies		• Upon completion of this course, students will be able to; distinguish between permitted and prohibited transitions according to selection rules, • derive the ground state and excited state term symbols of d-orbitals and rank them in terms of energy, • theoretically calculate the d-d transitions of a complex using Tanebe-Sugana and Orgel diagrams and state which transitions the observed peaks correspond to.					
Course Basic and Auxiliary Contexts		• Gary L. Miessler, Donald A Tarr, İnorganik Kimya, Üçüncü Baskıdan Çeviri Editörleri: Prof. Dr. Nurcan Karacan, Prof. Dr. Perihan Gürkan, Palme Yayıncılık, Ankara, 2009. • A. B. Lever, Inorganic Electronic Spectroscopy,2nd ed., Elsevier, New York, 1986.					
Methods of Give a Lecture		Face-to-Face and digital platform					

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	Homework (Ten)		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	**Subjects**
1	Absorption of light and the Beer-Lambert law
2	Quantum numbers of multi-electron atoms
3	Spin-orbit pairing and term symbols
4	Electronic transitions in molecules and selection rules
5	Electronic transitions in molecules and selection rules
6	Tanabe-Sugana diagrams and d^2-d^8 electron configurations
7	Tanabe-Sugana diagrams and d^2-d^8 electron configurations
8	**Midterm exam**
9	Jahn-Teller decay and spectra (d^1 and d^9 electron configurations)
10	Splitting of terms in the crystal field, Orgel diagrams and 10 Dq
11	Examples of using Tanabe-Sugana diagrams, Determination of Δ_o from spectra
12	Examples of using Tanabe-Sugana diagrams, Determination of Δ_o from spectra
13	Charge transfer bands
14	Interpretation of electronic spectra of complexes

COURSE IDENTIFICATION FORM

Course Code and Name: KT5006- Organometals Chemistry				**Department of :** Institute of Graduate Education- Department of Chemical Technologies- Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	5	Turkish	Optional
Prerequisite (s)							
Instructor		Prof. Dr. Ragıp ADIGÜZEL				**Mail :**radiguzel@munzur.edu.tr **Web :**www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes		Master Degree					
Course Aim	• To have an idea about the properties, synthesis and catalysis reactions of organometallic compounds.						
Course Goals							
Course Learning Outs and Proficiencies	• They will learn that organometallic compounds are used as catalysts in the synthesis of many inorganic and organic substances. • They can explain the principle of the metal-carbon bond. • They can distinguish the bonding difference between organometallic compounds and other coordination compounds.						
Course Basic and Auxiliary Contexts	• 1. Gary L. Miessler, Donald A Tarr, İnorganik Kimya, Üçüncü Baskıdan Çeviri Editörleri: Prof. Dr. Nurcan Karacan, Prof. Dr. Perihan Gürkan, Palme Yayıncılık, Ankara, 2009. • 2. Cemal Kaya, İnorganik Kimya, Cilt 2, 3. Baskı, Palme Yayıncılık, Ankara, 2011. • 3. Namık K. Tunalı, Saim Özkar. İnorganik Kimya, Gazi Üniversitesi Yayınları, 1993, Ankara. • 4. G. Spessard, G. Miessler; 1997. Organometallic Chemistry, Prentice Hall, 1997						
Methods of Give a Lecture							

	Face-to-Face and digital platform

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	Homework (Ten)		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	General properties, history and recent developments of organometallic compounds
2	Organic ligands and their nomenclature
3	Electron rule (electron counting, 18 electron rule, square planar complexes
4	Ligands (carbonyl complexes, carbonyl-like ligands, hydride and dihydrogen, extended π systems)
5	Organometallic compounds of transition elements, nomenclature of organometallic compounds,
6	Bonds between metal atoms and organic π systems; linear π systems, cyclic π systems, fullerene complexes
7	Bonds between metal atoms and organic π systems; complexes containing M–C, M=C and M≡C bonds (alkyl and similar complexes, carbene complexes, carbyne complexes)
8	**Midterm exam**
9	Synthesis and reactions of organometallic compounds
10	Reactions in which ligands transform into a new structure (intercalation, carbonyl intercalation, 1,2 insertion reactions, hydride separation reactions, extraction reactions
11	Organometallic catalysts (catalytic deuteration, hydroformylation, monsanto acetic acid process, wacker process, hydrogenation with wilkinson catalyst, olefin metathesis)
12	Heterogeneous catalysts (ziegler-Natta polymerizations, water gas reaction
13	Spectrum analysis and structure determination of organometal complexes (FTIR, UV, NMR spectra)
14	Examples on structure determination

COURSE IDENTIFICATION FORM

Course Code and Name: KT5007- Organometals Chemistry				**Department of :** Institute of Graduate Education-Department of Chemical Technologies- Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	5	Turkish	Optional
Prerequisite (s)							
Instructor		Prof. Dr. Ragıp ADIGÜZEL				**Mail :**radiguzel@munzur.edu.tr **Web :**www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes		Master Degree					

Course Aim	• To teach how to define coordination compounds and determine the physical and chemical properties of the molecular structures that form these compounds.
Course Goals	
Course Learning Outs and Proficiencies	• When the course is completed, students will be able to formulate, name and describe the structural properties of coordination compounds, • Have extensive knowledge of bonding theories and explain the bond formation of compounds, • Know the coordination compounds used in daily life and industry.
Course Basic and Auxiliary Contexts	• Gary L. Miessler, Donald A Tarr, İnorganik Kimya, Üçüncü Baskıdan Çeviri Editörleri: Nurcan Karacan, Perihan Gürkan, Palme Yayıncılık, Ankara, 2009. • Cemal Kaya, İnorganik Kimya, Cilt 2, 3. Baskı, Palme Yayıncılık, Ankara, 2011. • Namık K. Tunalı, Saim Özkar. İnorganik Kimya, Gazi Üniversitesi Yayınları, 1993, Ankara. • Tunalı, N., Özkar, S., Anorganik Kimya, Gazi Kitapevi, 2005.

Methods of Give a Lecture	Face-to-Face and digital platform

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	Homework (Ten)		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Definition of coordination compound, examples in life and industry
2	Werner Theory
3	Formulation and naming of coordination compounds
4	Isomerism
5	Coordination numbers and structures
6	VSEPR theory
7	Coordinative bonds; Molecular Orbital theory
8	Molecular Orbital theory **Midterm exam**
9	Valence bond theory
10	Crystal-field theory
11	Ligand-field theory
12	Ligand types and properties
13	Areas of use of coordination compounds
14	Areas of use of coordination compounds

COURSE IDENTIFICATION FORM

Course Code and Name: KT5008-Inorganic Polymers				**Department of :** Institute of Graduate Education – Chemical Technologies –Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	5	Turkish	Optional
Prerequisite (s)	None						
Instructor	Prof. Dr. Ragıp ADIGÜZEL					**Mail :** radiguzel@munzur.edu.tr **Web :**www.munzur.edu.tr	
Course Assistant	-					**Mail :** **Web :**	
Groups / Classes	Master degree						
Course Aim	To provide information about the structural properties and usage areas of inorganic polymers.						
Course Goals							
Course Learning Outs and Proficiencies	When the course is completed, students will be able to distinguish the differences between inorganic polymers and other polymers, Learn the synthesis methods and bonding methods of polymers, Recognize the areas where inorganic compounds are used in industry.						
Course Basic and Auxiliary Contexts	• Stuart R. Batten, Coordination Polymers Design, Analysis and Application, 2009. • Atkins, S., Inorganic Chemistry, Oxford Univercity Press, 1999. • Miessler, G. L., Tarr, D. A., İnorganik Kimya, Palme Yayınları, 2002. • Yayınlanmış bilimsel makaleler						
Methods of Give a Lecture	Face-to-Face and Digital Platform						

		If Available, to Sign (x)	General Average Percentage (%) Rate
Assessment Criteria	**1. Quiz**	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Definition of inorganic polymers and differences from other polymers
2	Synthesis methods
3	Classification according to bonding types
4	Supramolecular isomerism
5	Building blocks
6	Guest-host structures, Complementary anions
7	Intramolecular and intermolecular interactions
8	**Midterm Exam**
9	Transition metal inorganic polymers
10	Ligand and its types
11	Industrial uses of inorganic polymers
12	Industrial uses of inorganic polymers
13	Industrial uses of inorganic polymers
14	Industrial uses of inorganic polymers

COURSE IDENTIFICATION FORM

-Course Code and Name: KT5009 Fundamentals of Advanced Analytical Chemistry I	**Department of :** Institute Of Graduate Education – Chemical Technologies - Masters With Thesis Program

Semester	Theoretic Hour	Practice Hour	Total Hour	Credits	ECTS	Education Language	Type: Compulsory Elective
Fall/Spring	3	0	3	3	5	Turkish	Optional

Prerequisite (s)		
Instructor	Associate professor Berna KOÇAK	**Mail :bernakocak@munzur.edu.tr** **Web :**www.munzur.edu.tr
Course Assistant		**Mail :** **Web :**
Groups / Classes	Master degree	
Course Aim	To provide students with the basic knowledge and concepts necessary to perform qualitative and quantitative chemical analyses.	
Course Goals		
Course Learning Outs and Proficiencies	• Learning all kinds of concentration units • Learning to prepare solutions • Learning to evaluate analytical data • Learning acid-base balances • Learning to draw acid-base titration curves	
Course Basic and Auxiliary Contexts	• • Skoog, D.A., West D.M., Holler, F.J (trans. Kılıç, E, Köseoğlu, F.) (1996). Fundamentals of Analytical Chemistry, 7th Edition. Ankara: Bilim Publishing. Lee, J:	
Methods of Give a Lecture	Face to Face and Digital Platform	

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Introduction to chemical analysis
2	Errors in chemical analysis
3	Random errors in analysis
4	Application of statistics in the analysis and evaluation of data
5	Solutions and solution concentrations
6	Solutions and solution concentrations
7	Chemical equilibrium, equilibrium constant, systematic solution in equilibrium systems
8	**Midterm exam**
9	Strong acids and bases and titration curves
10	Buffer solutions
11	Complex acid-base systems
12	Titration curves of complex acid-base systems
13	Buffer solutions obtained from complex acid-base systems
14	General repetition

COURSE IDENTIFICATION FORM

-Course Code and Name: KT5010-Fundamentals of Advanced Analytical Chemistry-II	**Department of :** Institute Of Graduate Education – Chemical Technologies - Masters With Thesis Program

Semester	Theoretic Hour	Practice Hour	Total Hour	Credits	ECTS	Education Language	Type: Compulsory Elective
Fall/Spring	3	0	3	3	5	Turkish	Optional

Prerequisite (s)		
Instructor	Associate professor Berna KOÇAK	**Mail :bernakocak@munzur.edu.tr** **Web :**www.munzur.edu.tr
Course Assistant		**Mail :** **Web :**
Groups / Classes	Master degree	
Course Aim	To provide students with the basic knowledge and concepts required to perform qualitative and quantitative chemical analyses	
Course Goals		
Course Learning Outs and Proficiencies	-To provide basic information for theoretical approaches in solving problems related to precipitation, complexation and reduction-oxidation balances -To learn the basic concepts required for the methods to be selected in real sample analyses	
Course Basic and Auxiliary Contexts	• Skoog, D.A., West D.M., Holler, F.J (trans. Kılıç, E, Köseoğlu, F.) (1996). Fundamentals of Analytical Chemistry, 7th Edition. Ankara: Bilim Publishing. Lee, J:	
Methods of Give a Lecture	Face to Face and Digital Platform	

		If Available, to Sign (x)	General Average Percentage (%) Rate
Assessment Criteria	**1. Quiz**	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Aqueous solutions and chemical equilibrium, application of equilibrium constants and solubility product constants, solubility and common ion effect.
2	Effect of electrolytes on solubility balances, Ionic strength, activity coefficients, Dbye-Hückel equation.
3	Solution of solubility balance problems in complex systems and solubility calculations, mass and charge balances, effect of pH on solubility.
4	Solubility of precipitates in the presence of complementing reagents, separation of ions by controlling the precipitant concentration, separations with sulfur
5	Gravimetric analysis methods, properties of precipitates, coagulation of colloids, crystal formation, calculation of results from gravimetric data
6	Precipitation titrimetry, titration curves with titrimetric methods, precipitation titrations with silver, precipitation indicators, Mohr, Volhard
7	Complexation titrations, complex formation, titrations with inorganic and organic complexing agents, introduction to EDTA titrations.
8	**Midterm Exam**
9	Structure and properties of EDTA. Calculation of α4 values, EDTA titration curves, other complex effects, calculation of αM.
10	Indicators for EDTA, titration methods with EDTA, direct, reverse and displacement titrations, EDTA titration scope, hardness in water.
11	Introduction to electrochemistry, electrochemical cells and their types, Electrode potentials, Nernst equation and limitations, formal potential.

12	Applications of standard potentials, calculation of E(cell), calculation of redox, formation and solubility equilibrium constants
13	13Electrode potentials in redox titrations, redox titration curves, redox indicators.
14	Applications of redox titrations, auxiliary reducing and oxidizing agents, adjustment of $KMnO_4$ and titration applications, iodometric titration.

COURSE IDENTIFICATION FORM

Course Code and Name: KT5011-Electrochemistry				**Department of :** Institute of Graduate Education – Chemical Technologies - Masters With Thesis Program			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	5	Turkish	Optional
Prerequisite (s)							
Instructor	Associate professor Berna KOÇAK					**Mail :bernakocak@munzur.edu.tr** **Web :** www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes	Master degree						
Course Aim	Understand electrochemical systems, learn research methods, and evaluate results						
Course Goals							
Course Learning Outs and Proficiencies	To learn basic electrochemical information and analysis techniques that are valid for this information. To learn the information to evaluate the data obtained from electrochemical techniques.						
Course Basic and Auxiliary Contexts	Skoog, D.A., West D.M., Holler, F.J (trans. Kılıç, E, Köseoğlu, F.) (1996). Fundamentals of Analytical Chemistry, 7th Edition. Ankara: Bilim Publishing. Lee, J:						
Methods of Give a Lecture	Face to Face and Digital Platform						

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	**Subjects**
1	What is electrochemistry? What are the cell types? Explanations
2	Determination of Cell Potential, Anode-Cathode potentials, liquid contact potential
3	Intracellular resistance drop, Polarization effects
4	What are the electrode types? Standard Hydrogen, Calomel andAg/AgCl reference electrodes
5	Working electrodes: Metal, membrane (glass, liquid and solid state) electrodes, pH electrodes
6	Potentiometric Method: Direct and titration technique
7	Conductometric Method
8	**Midterm exam**
9	Electro gravimetric Method
10	Introduction to Voltammetric Methods, Polarography, its development and types
11	Mathematical modeling of Polarography and qualitative-quantitative applications
12	Amperometric Titration, Chronoamperometry
13	Coulometry at Constant Potential
14	General repetition

COURSE IDENTIFICATION FORM

Course Code and Name: KT-5012 Selected Topics In Physical Chemistry	**Department of :** Institute Of Graduate Education – Chemical Technologies - Masters With Thesis Program

Semester	Theoretic Hour	Practice Hour	Total Hour	Credits	ECTS	Education Language	Type: Compulsory Elective
Fall	3	0	3	3	5	Turkish	Elective

Prerequisite (s)		
Instructor	Doç. Dr. Gülben TORĞUT	**Mail : gtorgut@munzur.edu.tr** **Web :** www.munzur.edu.tr
Course Assistant		**Mail :** **Web :**
Groups / Classes	Master Degree	
Course Aim	To ensure a better understanding of some undergraduate physical chemistry topics and the use of information in this field.	
Course Goals		
Course Learning Outs and Proficiencies	• Students become scientific individuals who know and apply the basic laws and principles of physical chemistry, • They can access new scientific information in their field and gain high-level skills in research methods related to their field • They can perform thermodynamic calculations and quantum mechanical calculations • Students gain the ability to be aware of the parameters that may affect their experiments during their experimental work.	
Course Basic and Auxiliary Contexts	• Y. Sarıkaya "Fizikokimya" 3. Baskı, Gazi Kitabevi, Ankara, 2000. • P.W Atkins, "Physical Chemistry" Sixth Edition, Oxford University, 1998.	
Methods of Give a Lecture	Face-to-Face and Digital Platform	

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Physicochemical Concepts and First Law of Thermodynamics
2	Second and third laws of thermodynamics
3	Phase diagrams and phase transformations of pure substances
4	Viscosity and surface tension
5	Partial molar properties
6	Rault and Henry laws, introduction to phase diagrams of two-component mixtures
7	A general application and solving questions
8	**Midterm Exam**
9	Application of thermodynamic laws to reactions and chemical equilibrium
10	Thermodynamics of ions and electrolytic conductivity
11	Reaction rates, rate expressions, reaction order
12	Chromatographic methods
13	Reaction mechanisms, catalyst
14	Solving questions

COURSE IDENTIFICATION FORM

Course Code and Name: KT5013-Advanced Polymer Chemistry-II				**Department of :** Department of Chemical Technologies Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	5	Turkish	Optional
Prerequisite (s)	-						
Instructor	Assist Prof. Dr. Esra BARIM					**Mail :** esrabarim@munzur.edu.tr **Web :** www.munzur.edu.tr	
Course Assistant	-					**Mail :** **Web :**	
Groups / Classes	Master						
Course Aim	To give advenced polymer information to MSc students						
Course Goals	At the end of this course students; • Summarise the polymers and their physical and chemical properties and structure. • Different polymerization methods for preparation of new polymeric materials. • Gives advenced information about polymer chains. • Gives ability to interpret the reactions during experimental works • Have knowledge about the application areas of polymers • Gives advenced information about polymer chemistry						
Course Learning Outs and Proficiencies	• Have the ability to apply the theoretical knowledge about polymers in the laboratory, know how to use laboratory techniques in chemical analysis • Make the interpretation of accuracy and precision of experimental data • Can understand the problems of modern chemistry and improve scientific thinking skills • Have the ability to analysis and interpret of experimental data with spectroscopic methods • Follow the developments in science and technology, use the modern techniques and equipments • Performs research and analysis in the field of chemistry technology, gain the ability of access to information and using all kinds of databases • Gain the ability of working as individual and within team • Understand the ethical responsibilities • Can adapt to changing conditions, can work interdisiplinary						

Course Basic and Auxiliary Contexts	• Polymer Chemistry, Raymond B. Seymour, Charles, E. Carraher • Polymer Chemistry, M.Saçak • Polymer Chemistry, Bahattin Baysal • Textbook of Polymer Science, Fred W. Billmeyer Jr. • Polymer Chemistry; Properties and Applications Andrew Peacock and Allison Calhoun
Methods of Give a Lecture	Lecture, discussion, group work

		If Available, to Sign (x)	**General Average Percentage (%) Rate**
Assessment Criteria	**1. Quiz**	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	**Subjects**
1	Coordination polymerization
2	Ring-opening polymerization
3	Atom transfer radical polymerization
4	Copolymerization
5	Types of copolymerization
6	Monomer reactivity ratios
7	Monomer reactivity ratios
8	**Midterm Exam**
9	Block copolymers
10	Graft copolymer
11	Conductive polymers
12	Properties of some conductive polymers
13	Polymerization systems
14	Properties of polymers and applications

COURSE IDENTIFICATION FORM

Course Code and Name:KT5014-Polymeric Composites And Their Characterization				**Department of :** Institute Of Graduate Education – Chemical Technologies - Masters With Thesis Program			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	5	Turkish	Optional
Prerequisite (s)							
Instructor		Assoc. Prof. Dr. Gülben TORĞUT				**Mail :** gtorgut@munzur.edu.tr **Web :**www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes		Master degree					
Course Aim		Definition of composite and introduction of its components, classification, teaching of its properties and areas of use.					
Course Goals		•					
Course Learning Outs and Proficiencies		• Production of polymeric composite materials, characterization of the produced composite materials and evaluation of their usage areas.					
Course Basic and Auxiliary Contexts		• Funda Tıhmınlıoğlu, Semra Ülkü, Filiz Özmıhçı, Hilal Pehlivan, TÜBİTAK - The Scientific and Technological Research Council of Türkiye, 2002, İZMİR					
Methods of Give a Lecture		Face-to-Face and Digital Platform					

		If Available, to Sign (x)	General Average Percentage (%) Rate
Assessment Criteria	**1. Quiz**	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	General definition and classification of composite materials
2	Areas of use of composite materials
3	Matrixes
4	Fillers
5	Production methods of polymeric based composite materials
6	General definition and classification of nanocomposite materials
7	Methods used in the characterization of composite and nanocomposite materials
8	XRD and TEM analyses of composite and nanocomposite materials
9	Thermal properties of composite and nanocomposite materials
10	Mechanical properties of composite and nanocomposite materials
11	Physical properties of composite and nanocomposite materials
12	Examples of selected studies in the literature in recent years
13	Properties and areas of use of clay-based polymeric composites
14	Properties and areas of use of PMMA-based composites

COURSE IDENTIFICATION FORM

Course Code and Name: KTKT5015-Advanced Polymer Chemistry-I				**Department of :** Department of Chemical Technologies PhD Program			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	5	Turkish	Optional
Prerequisite (s)		-					
Instructor		Assist Prof. Dr. Esra BARIM				**Mail :** esrabarim@munzur.edu.tr **Web :** www.munzur.edu.tr	
Course Assistant		-				**Mail :** **Web :**	
Groups / Classes		Master					
Course Aim		To give advenced polymer information to MSc students					
Course Goals		At the end of this course students; • Summarise the polymers and their physical and chemical properties and structure. • Describe molecular weight of polymers, different polymerization methods for preparation of new polymeric materials. • Gives advenced information about polymer chemistry • Gives ability to interpret the reactions during experimental works					
Course Learning Outs and Proficiencies		• Have the ability to apply the theoretical knowledge about polymers in the laboratory, know how to use laboratory techniques in chemical analysis • Make the interpretation of accuracy and precision of experimental data • Can understand the problems of modern chemistry and improve scientific thinking skills • Have the ability to analysis and interpret of experimental data with spectroscopic methods • Follow the developments in science and technology, use the modern techniques and equipments • Performs research and analysis in the field of chemistry technology, gain the ability of access to information and using all kinds of databases • Gain the ability of working as individual and within team • Understand the ethical responsibilities • Can adapt to changing conditions, can work interdisiplinary					
Course Basic and Auxiliary Contexts		• Polymer Chemistry, Raymond B. Seymour, Charles, E. Carraher • Polymer Chemistry, M.Saçak • Polymer Chemistry, Bahattin Baysal • Textbook of Polymer Science, Fred W. Billmeyer Jr. • Polymer Chemistry; Properties and Applications Andrew Peacock and Allison Calhoun					

Methods of Give a Lecture	Face to Face and Digital Platform, Lecture, discussion, group work

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Polymer concept, classification and nomenclature of polymers
2	Chemical and physical properties of polymers
3	Thermal transitions in polymers
4	Molecular weight and molecular weight distribution in polymers
5	Determination of molecular weight of polymers
6	Fractionation of polymers and fractionation methods
7	Step-growth polymerization
8	Mid-term exam
9	Kinetics of step-growth polymerization
10	Free-radical chain polymerization
11	Kinetics of free-radical chain polymerization
12	Determination of rate constants in free-radical chain polymerization
13	Anionic polymerization and polimerization kinetic
14	Cationic polymerization and polimerization kinetic

COURSE IDENTIFICATION FORM

Course Code and Name: KT5016-Polymer Technology-I				**Department of :** Institute Of Graduate Education – Chemical Technologies - Masters With Thesis Program			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	5	Turkish	Optional
Prerequisite (s)							
Instructor		Assist. Prof. Dr. Esra BARIM				**Mail :**esrabarim@munzur.edu.tr **Web :www.munzur.edu.tr**	
Course Assistant						**Mail :** **Web :**	
Groups / Classes		Master degree					
Course Aim		To examine the importance, production, usage areas and technologies of polymeric materials widely used in industry and daily life.					
Course Goals		•					
Course Learning Outs and Proficiencies		-Have high knowledge about commercial polymers and technologies that have a wide range of uses. -Use this knowledge in many areas of industry and scientific research. -Have knowledge about the application areas of polymers in technology. -Have the ability to use modern techniques and/or equipment required for their applications.					
Course Basic and Auxiliary Contexts		• M. Saçak " Polimer Teknolojisi" Gazi Kitabevi, Ankara					
Methods of Give a Lecture		Face-to-Face and Digital Platform					

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**25**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		**25**
	Final Examination	**X**	**50**

Semester Course Plan

Week	**Subjects**
1	General definitions and concepts
2	Inputs used in polymer production
3	Polymerization techniques
4	Thermoplastics and thermoplastic technology
5	Thermoplastics and thermoplastic technology
6	Thermosetting and thermoset technology
7	Thermosetting and thermoset technology
8	**Midterm Exam**
9	Elastomers elastomer technology
10	Elastomers elastomer technology
11	Fibers and fiber technology
12	Fibers and fiber technology
13	Additives used in polymers
14	Polymer processing techniques

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COURSE IDENTIFICATION FORM

Course Code and Name: KT5017-Polymer Technology-II				**Department of :** Institute Of Graduate Education – Chemical Technologies - Masters With Thesis Program			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	5	Turkish	Optional
Prerequisite (s)							
Instructor	Assist. Prof. Dr. Esra BARIM					**Mail :** esrabarim@munzur.edu.tr **Web :** www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes	Master degree						
Course Aim	To examine the importance, production, usage areas and technologies of polymeric materials widely used in industry and daily life.						
Course Goals	•						
Course Learning Outs and Proficiencies	- Have high knowledge about commercial polymers and technologies that have a wide range of uses. - Use this knowledge in many areas of industry and scientific research. - Have knowledge about the application areas of polymers in technology. - Have the ability to use modern techniques and/or equipment required for their applications.						
Course Basic and Auxiliary Contexts	• M. Saçak " Polimer Teknolojisi" Gazi Kitabevi, Ankara						
Methods of Give a Lecture	Face-to-Face and Digital Platform						

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**25**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		**25**
	Final Examination	**X**	**50**

Semester Course Plan

Week	**Subjects**
1	Physical and Chemical Properties of Polymers
2	Effect of Environment on Polymers
3	Solubility in Polymers
4	Combustion of Polymers
5	Electrical Properties
6	Optical Properties
7	Mechanical Properties of Polymers
8	**Midterm Exam**
9	Force Types
10	Deformation
11	Stress and Strain
12	Elastic Deformation, Viscous Deformation
13	Viscoelastic Deformation
14	Stress Strain Relations in Polymers

COURSE IDENTIFICATION FORM

Course Code and Name: KT5018-Thermal Analysis Method	Department of : Institute of Graduate Education – Department of Chemical Technologies – Master's Program with Thesis

Semester	Theoretic Hour	Practice Hour	Total Hour	Credits	ECTS	Education Language	Type: Compulsory Elective
Fall	3	0	3	3	5	Turkish	Optional

Prerequisite (s)		
Instructor	Prof. Dr. Ragıp ADIGÜZEL Assist. Prof. Dr. Esra BARIM	**Mail :**radiguzel@munzur.edu.tr **Web :** www.munzur ed.tr **Mail :**esrabarim@munzur.edu.tr **Web :** www.munzur ed.tr
Course Assistant	None	**Mail :** **Web :**
Groups / Classes	Master degree	
Course Aim	• Ability to interpret data obtained as a result of thermal analysis of materials and to solve problems in the field of chemistry.	
Course Goals		
Course Learning Outs and Proficiencies	• Ability to analyze materials used in chemistry applications with thermal analysis methods. • Ability to apply the Differential Thermal Analysis (DTA) technique. • Ability to apply the Thermogravimetric Analysis (TGA) technique. • Ability to apply the Differential Scanning Calorimetry (DSC) technique. • Ability to interpret data obtained from thermal analysis of materials and solve problems in the field of chemistry.	
Course Basic and Auxiliary Contexts	Principles and Applications of Thermal Analysis, Paul Gabbott, Blacweel Publishing, 2007. Thermal Analysis: Fundamentals and Applications to Polymer Science; T. Hatakeyama, F.X.Quinn, Wiley, Thermal Analysis Lecture Notes	
Methods of Give a Lecture	Face to Face and Digital Platform	

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**20**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)	X	**30**
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Differential Thermal Analysis (DTA)
2	Differential Thermal Analysis (DTA)
3	Differential Scanning Calorimetry (DSC)
4	Differential Scanning Calorimetry (DSC)
5	Calibration and Sample Preparation
6	Temperature Gradient
7	Thermogravimetric Analysis (TGA)
8	**Midterm Exam**
9	Thermogravimetric Analysis (TGA)
10	Temperature Calibration, Thermal Analysis Applications,
11	Reaction Rate and Kinetics
12	Glass Transition Temperature of Polymers,
13	Purity Analysis and Crystallinity Determination with DSC,
14	Other Thermal Analysis Methods

COURSE IDENTIFICATION FORM

Course Code and Name: KT5019-New and Renewable Energy Sources				Department of : Department of Chemical Technologies- Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall	3	0	3	3	5	Turkish	Optional
Prerequisite (s)	-						
Instructor	Assoc. Prof. Dr. Hakan YOĞURTÇU					**Mail :** hakanyogurtcu@gmail.com **Web :**	
Course Assistant						**Mail :** **Web :**	
Groups / Classes	Master Degree						
Course Aim	• Learning the advantages and disadvantages of clean and renewable alternative energy sources. Discussing the renewable energy potentials in the world and in Turkey and the usability of this potential. Researching solution proposals for the energy problem.						
Course Goals							
Course Learning Outs and Proficiencies	• Understand the importance of renewable energy sources compared to traditional fossil fuels • Learn energy production and energy conversion methods that can be applied to renewable energy sources • Compare and evaluate various energy sources in terms of efficiency, continuity, economy and applicability • Have knowledge about the future of renewable energy sources and technologies • Learn energy policies related to renewable energy sources						
Course Basic and Auxiliary Contexts	• John W. Twidell and Anthony D. Weir, Renewable Energy Resources, Chapman and Hall, 2006 • Johansson T. B., Kelly H., Reddy A.K.N., Williams R.H., Renewable Energy, 1993. • Öztürk, H., Yenilenebilir Enerji Kaynakları, Birsen Yayınevi, 2013						
Methods of Give a Lecture							

	Face-to-Face and digital platform supported

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	Homework		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Energy, energy sources and the concept of clean energy
2	Non-renewable and renewable energy sources
3	Fossil-based energy sources and the environment
4	Solar Energy
5	Wind Energy
6	Hydraulic energy and marine-based energy
7	Hydrogen Energy and Fuel Cells
8	**Midterm Exam**
9	Biomass energy: Sources and importance
10	Biomass energy: Biodiesel, Bioethanol, Biogas
11	Current status of renewable energy sources and technologies
12	Future of renewable energy sources and technologies
13	Comparison of non-renewable and renewable energy sources
14	Importance of renewable energy sources in energy policies

COURSE IDENTIFICATION FORM

Course Code and Name: KT5020-Numerical Analysis and Computer Application				Department of : Department of Chemical Technologies-Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall	3	0	3	3	5	Turkish	Optional
Prerequisite (s)							
Instructor		Assoc. Prof. Dr. Hakan YOĞURTÇU				**Mail :** hakanyogurtcu@gmail.com **Web :**www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes		Master degree					
Course Aim		• Analysis of equations used in the chemical industry, especially in engineering applications, and the realization of numerical solutions with the help of computer programs.					
Course Goals							
Course Learning Outs and Proficiencies		• To use knowledge of equation analysis and matrix principles in problem solving • • To be able to solve numerical algebraic, non-algebraic and differential equations • • To be able to solve numerical equations of fluid flow, heat transfer and mass transfer problems • • To gain the ability to use computers in problem solving					
Course Basic and Auxiliary Contexts		• R. G. Rice and D. D. Do, Applied Mathematics and Modeling for Chemical Engineers by, John Wiley & Sons Inc., New York, 1994. • Canale, R., Chapra, S., Mühendisler İçin Sayısal Yöntemler, Çeviri: Hasan Heperkan, Literatür Yayınevi, 2011.					
Methods of Give a Lecture		Face-to-Face and digital platform supported					

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz		
	2. Quiz		
	3. Quiz		
	4. Quiz		
	Homework (Ten)	**X**	**50**
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	**Subjects**
1	Summary of computer programming languages
2	Matrices
3	Matrix solutions
4	Numerical solutions of algebraic equation systems
5	Numerical solutions of algebraic equation systems
6	Numerical solutions of non-algebraic equation systems
7	Numerical solutions of non-algebraic equation systems
8	Numerical solutions of higher order differential equations
9	Numerical solutions of higher order differential equations
10	Numerical solutions of partial differential equations
11	Modeling and numerical solutions of fluid flow problems
12	Modeling and numerical solutions of heat transfer problems
13	Modeling and numerical solutions of mass transfer problems
14	Numerical solutions of reaction engineering problems

COURSE IDENTIFICATION FORM

Course Code and Name: KT5021-Drying Technology				**Department of :** Department of Chemical Technologies- Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall	3	0	3	3	5	Turkish	Optional
Prerequisite (s)	-						
Instructor	Assoc. Prof. Dr. Hakan YOĞURTÇU					**Mail :** hakanyogurtcu@gmail.com **Web :** www.munzur.edu.tr	
Course Assistant	-					**Mail :** **Web :**	
Groups / Classes	Master Degree						
Course Aim	• To introduce drying technology, which is one of the application branches of chemical technologies • To provide information about the methods applied in drying technology • To provide the knowledge and skills to analyze the quality and factors affecting quality in dried products • To provide information about new techniques applied in drying technology						
Course Goals							
Course Learning Outs and Proficiencies	• Learning the concepts of drying and drying technology • Learning the elements that affect product quality in the Chemistry and Food industry • Understanding the importance of Chemistry and Food drying techniques. • Learning the modeling of the drying process.						
Course Basic and Auxiliary Contexts	• Mujumdar A.S., Handbook of Industrial Drying, Taylor & Francis Group LLC, 2006. • Nema, P. K. , Kaur, B.P, Mujumdar, A.S., Drying Technologies for Foods: Fundamentals and Applications, New India Publishing Agency, 2015 B. Cemeroğlu, Meyve ve Sebze Teknolojisi II, Gıda Teknolojisi Derneği Yayınları, Ankara, 2004.						
Methods of Give a Lecture	Face-to-Face and digital platform supported						

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Importance of drying
2	Water activity
3	Water sorption isotherms
4	Physical properties of air-water mixtures
5	Basic principles of drying
6	Drying speed and its calculation
7	Factors affecting drying speed
8	**Midterm exam**
9	Fruit and vegetable drying
10	Changes in the structure of dried products and quality elements
11	Drying methods
12	Drying methods
13	Approximate solution of heat transfer problems by finite difference method
14	Approximate solution of heat transfer problems by finite difference method

COURSE IDENTIFICATION FORM

Course Code and Name: KT5022-Advanced Electrochemistry				**Department of : Institute of Graduate Education – Department of Chemical Technologies – Master's Program with Thesis**			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall	3	0	3	3	5	Turkish	Optional
Prerequisite (s)	None						
Instructor	Assoc. Prof. Dr. Yeliz İPEK					**Mail : yelizipek@munzur.edu.tr Web : https://akademik.yok.gov.tr/AkademikArama/view/viewAuthor.jsp**	
Course Assistant	None					**Mail : Web :**	
Groups / Classes	Master degree						
Course Aim	To gain knowledge about electrochemical processes and their calculations.						
Course Goals	To provide information about analytical electrochemistry, electrode types, chemically modified electrodes, solvent and support electrolytes, electrochemical coatings and batteries.						
Course Learning Outs and Proficiencies	Upon completion of the course, students will; • Know the elements and their properties used in electrochemical processes, • Know the basic principles of analytical electrochemistry, • Have knowledge about coatings and batteries.						
Course Basic and Auxiliary Contexts	• Peter T. Kissinger, William R. Heineman, Laboratory Techniques in Electroanalytical Chemistry, Second Edition, Marcel Dekker Inc., New York, Basel, Hong Kong, 1996.						
Methods of Give a Lecture	Face to Face and Digital Platform						

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Fundamentals of analytical electrochemistry
2	Fundamentals of analytical electrochemistry
3	Carbon electrodes
4	Film electrodes
5	Mercury electrodes
6	Chemically modified electrodes
7	Solvent and support electrolytes
8	**Midterm exam**
9	Electroorganic synthesis
10	Electroorganic synthesis
11	Coatings
12	Coatings
13	Batteries
14	Batteries

COURSE IDENTIFICATION FORM

Course Code and Name: KT5023-Electrochemical Sensors	Department of : Institute of Graduate Education – Chemical Technologies Department – Thesis Master's Program

Semester	Theoretic Hour	Practice Hour	Total Hour	Credits	ECTS	Education Language	Type: Compulsory Elective
Fall	3	0	3	3	5	Turkish	Optional

Prerequisite (s)	None	
Instructor	Assoc. Prof. Dr. Yeliz İpek	**Mail :** yelizipek@munzur.edu.tr **Web :** https://akademik.yok.gov.tr/AkademikArama/view/viewAuthor.jsp
Course Assistant	None	**Mail :** **Web :**
Groups / Classes	Master degree	
Course Aim	To teach how to design electrochemical sensors and evaluate sensor measurement results.	
Course Goals	• To teach electrochemical analysis methods, designing electrodes for a specific analyte and mathematical modelling of the designed sensor.	
Course Learning Outs and Proficiencies	Upon completion of the course, students will; • Know the measurement techniques used in electrochemical processes, • Know the methods of designing electrodes to be used as sensors, • Evaluate the electrochemical sensor measurement results.	
Course Basic and Auxiliary Contexts	• Peter T. Kissinger, William R. Heineman, Laboratory Techniques in Electroanalytical Chemistry, Second Edition, Marcel Dekker Inc., New York, Basel, Hong Kong, 1996.	
Methods of Give a Lecture		

	Face to Face and Digital Platform

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Introduction to electrochemistry
2	Electrochemical measurement techniques
3	Electrochemical measurement techniques
4	Design of electrochemical processes
5	Design of electrochemical processes
6	Introduction to electrochemical sensors and biosensors
7	Electrode preparation techniques
8	**Midterm exam**
9	Electrode preparation techniques
10	Measurement techniques in electrochemical sensors
11	Measurement techniques in electrochemical sensors
12	Evaluation and calculations of sensor measurements
13	Evaluation and calculations of sensor measurements
14	Evaluation and calculations of sensor measurements

COURSE IDENTIFICATION FORM

Course Code and Name: KT5024-Thin Film Coating Techniques	Department of : Institute of Graduate Education – Department of Chemical Technologies – Master's Program with Thesis

Semester	Theoretic Hour	Practice Hour	Total Hour	Credits	ECTS	Education Language	Type: Compulsory Elective
Fall	3	0	3	3	5	Turkish	Optional

Prerequisite (s)	None	
Instructor	Assoc. Prof. Dr. Yeliz İpek	**Mail :** yelizipek@munzur.edu.tr **Web :** https://akademik.yok.gov.tr/AkademikArama/view/viewAuthor.jsp
Course Assistant	None	**Mail : Web :**
Groups / Classes	Master degree	
Course Aim	To teach thin film coating techniques and to provide the ability to examine and present a scientific study.	
Course Goals	• To teach how to apply the dip coating technique, spin coating technique, Langmuir-Blodgett coating technique, sol-gel coating technique, electrochemical coating technique, chemical vapor deposition technique and physical vapor deposition technique.	
Course Learning Outs and Proficiencies	Upon completion of the course, students will; • Know the importance and areas of use of thin film coating techniques, • Know thin film coating techniques, • Have experience in reviewing articles and presenting a scientific study.	
Course Basic and Auxiliary Contexts	• David A., Shah S.I., Handbook of Thin Film Process Technoloy, Institute of Physics Publishing, Bristol and Philadelphia, 1995. • Yrd. Doç. Dr. Atilla Evcin Afyonkarahisar Kocatepe Üniversitesi Kaplama Teknikleri Ders Notları, 2006. • Savaş SÖNMEZOĞLU, Mehmed KOÇ, Seçkin AKIN, İnce film üretim teknikleri, Erciyes Üniversitesi Fen Bilimleri Enstitüsü Dergisi, 28(5):389-401.	

Methods of Give a Lecture	Face to face

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Introduction to thin film coating processes
2	Dip coating technique
3	Spin coating technique
4	Langmuir-Blodgett coating technique
5	Sol-gel coating technique
6	Electrochemical coating technique
7	Chemical vapor deposition technique
8	**Midterm Exam**
9	Physical vapor deposition technique
10	Article review and presentation
11	Article review and presentation
12	Article review and presentation
13	Article review and presentation
14	Introduction to thin film coating processes

COURSE IDENTIFICATION FORM

Course Code and Name: KT5025-Polymers Degradation				**Department of :** Institute of Graduate Education – Chemical Technologies - Thesis Master's Program			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall	3	0	3	3	5	Turkish	Optional
Prerequisite (s)		-					
Instructor		Assoc. Prof. Dr. Nedim GÜRLER				**Mail :** nedimgurler@munzur.edu.tr **Web :** www.munzur.edu.tr	
Course Assistant		-				**Mail :** **Web :**	
Groups / Classes		Master degree					
Course Aim		The aim of this course is to educate students about thermal, mechanical, enzymatic and biodegradation of polymers.					
Course Goals		To provide students with proficiency in photo, enzymatic, bio and thermal degradation of polymers.					
Course Learning Outs and Proficiencies		• Have knowledge about the degradation mechanism of polymers, • Have knowledge about thermal, enzymatic, mechanical, photodegradation and biodegradation.					
Course Basic and Auxiliary Contexts		• Lecture notes					
Methods of Give a Lecture		Face-to-Face and Digital Platform					

		If Available, to Sign (x)	General Average Percentage (%) Rate
Assessment Criteria	**1. Quiz**	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Introduction, degradation
2	Thermal degradation
3	Thermal degradation
4	Mechanical degradation
5	Mechanical degradation
6	Photodegradation
7	Photodegradation
8	**Midterm Exam**
9	Enzymatic degradation
10	Mechanical and barrier properties in the biodegradation of polymers
11	Biodegradation
12	Biodegradation in controlled composting environment
13	Biodegradation in controlled composting environment
14	Biopolymer biodegradation mechanism

COURSE IDENTIFICATION FORM

Course Code and Name: KT5026-Biopolymers				**Department of :** INSTITUTE OF GRADUATE EDUCATION – CHEMICAL TECHNOLOGIES - THESIS MASTER'S PROGRAM			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall	3	0	3	3	5	Turkish	Optional
Prerequisite (s)							
Instructor		Assoc. Prof. Dr. Nedim GÜRLER				**Mail :** nedimgurler@munzur.edu.tr **Web :** www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes							
Course Aim	To explain the difference between synthetic polymers and biopolymers and to educate students about the use of polymers obtained from biological sources in biomedical and environmental fields.						
Course Goals	• To provide students with competence in bio-derived polymers.						
Course Learning Outs and Proficiencies	• At the end of this course, students will have information about biopolymers, • Students will have information about the application areas of biopolymers in different areas, • Students will learn that biopolymers can be used in an environmentally friendly way instead of synthetic polymers that cause environmental pollution.						
Course Basic and Auxiliary Contexts	• Saçak M., Polymer Technology, Gazi Bookstore, Ankara, 2017. • Lecture notes						
Methods of Give a Lecture	Face-to-Face and Digital Platform						

		If Available, to Sign (x)	General Average Percentage (%) Rate
Assessment Criteria	**1. Quiz**	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Polymers
2	General information about synthetic polymers and biopolymers
3	Biodegradable polymers
4	Structure-property relationships in biodegradable polymers
5	Areas of use of biodegradable polymers
6	Use of biodegradable polymers as food packaging
7	Starch, cellulose and chitosan
8	**Midterm Exam**
9	Polymer modification, Modified starch and areas of use
10	Mechanical properties of biodegradable polymers
11	Water barrier properties in biodegradable polymers
12	Biodegradation mechanisms of polymers
13	Biodegradation
14	Smart polymers

COURSE IDENTIFICATION FORM

Course Code and Name: KT5027- Food Packaging				**Department of :** Institute of Graduate Education – Chemical Technologies - Thesis Master's Program			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall	3	0	3	3	5	Turkish	Optional
Prerequisite (s)							
Instructor		Assoc. Prof. Dr. Nedim GÜRLER				**Mail :** nedimgurler@munzur.edu.tr **Web :** www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes							
Course Aim	The aim of this course is to teach students food packaging and packaging technologies.						
Course Goals	To provide students with competence in food packaging and preservation.						
Course Learning Outs and Proficiencies	• Understand the importance of biodegradable polymers in food packaging, • Determine the packaging material suitable for food, • Have information about different packaging materials, • Have information about smart packaging.						
Course Basic and Auxiliary Contexts	• Lecture notes • Food packaging technology, Mustafa Üçüncü						
Methods of Give a Lecture	Face-to-Face and Digital Platform						

		If Available, to Sign (x)	General Average Percentage (%) Rate
Assessment Criteria	**1. Quiz**	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Introduction to food packaging
2	Paper and cardboard packaging,
3	Glass packaging and its properties Metal packaging and its properties
4	Active and smart packaging
5	Plastic packaging
6	Use of biodegradable polymers as food packaging
7	Use of starch cellulose as packaging material
8	**Midterm Exam**
9	Polymer modification, Modified starch and its areas of use
10	Areas of use of modified starch and cellulose
11	Areas of use of modified starch and cellulose
12	Food packaging interaction
13	Food packaging interaction
14	Mechanical and barrier properties of biodegradable polymers in food packaging

COURSE IDENTIFICATION FORM

Course Code and Name: KT5028 Nano-Synthesis and Characterization				Department of: Chemical Technologies Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
FALL/SPRING	3	0	3	3	5	Turkish	Optional

Prerequisite (s)	Not	
Instructor	Prof. Dr. Muharrem INCE	**Mail:** muharreminc e@munzur.edu.tr **Web:** www.munzur.edu.tr
Course Assistant		**Mail:** **Web:**
Groups / Classes	Master degree	
Course Aim	Learning the main synthesis methods of nanostructures, the methods frequently used for the characterization of nanostructures, and for what purposes they are used.	
Course Goals	• Determining the main synthesis methods of nanostructures (Plasma arc method, milling, sol-gel etc.) and how they are used. Determining the size, shape and surface area properties of the synthesized nanostructures; determining the spectroscopic and other methods and techniques needed for the characterization of nanostructures and the main measurement/imaging methods of the structural, physical, electrical and magnetic properties of materials.	
Course Learning Outs and Proficiencies	• Be able to distinguish the main synthesis methods of nanostructures, • Be able to choose a method according to the properties of the material during the synthesis phase, • Be able to distinguish what the definition of nanostructured materials means and how they differ from general materials, • Access information by conducting scientific research, evaluate and interpret information and adapt it to new situations. • Has comprehensive knowledge about the main characterization techniques of nanostructures. • Is aware of new and developing applications of his profession, examines and learns them when necessary. • Creates problems in practice, develops new and/or original ideas and methods to solve them and finds innovative solutions.	

Course Basic and Auxiliary Contexts	• Fundamentals and Applications of Nanomaterials, Z. Guo, L. Tan, Artech House 2009, ISBN-13:978-1-59693-262-3 • Nanomaterials: Synthesis, Characterization, and Applications (Advances in Nanoscience and Nanotechnology), by A. K. Haghi, A. K. Zachariah, N. Kalariakkal, Apple Academic Press (14 Mar 2013), ISBN-10: 1926895193 ISBN-13: 978-1926895192 • Lecture notes and scientific articles
Methods of Give a Lecture	• Face to face lectures, Power point presentations, Question & Answer, Discussion

		If Available, to Sign (x)	**General Average Percentage (%) Rate**
Assessment Criteria	**1. Quiz**	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	**Subjects**
1	What is nano-synthesis? Main nano-synthesis methods
2	Nano-synthesis methods
3	Characterization Methods: Zeta potential
4	Characterization Methods: Transmission Electron Microscopy (TEM)
5	Characterization Methods: Scanning Electron Microscopy (SEM)
6	Characterization Methods: Atomic Force Microscopy (AFM)
7	Characterization Methods: Scanning Tunneling Microscopy (STM)
8	Characterization Methods: X-Ray Diffraction Spectroscopy (XRD)
9	Characterization Methods: Fourier Transform Infrared (FT-IR) Spectroscopy
10	Characterization Methods: Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)
11	Characterization Methods: Ultraviolet-Visible Region (UV-VIS) Spectroscopy
12	Other characterization techniques used
13	Project presentations
14	Project presentations

COURSE IDENTIFICATION FORM

Course Code and Name: KT5029 Green Chemistry and Sustainability				Department of : Chemical Technologies Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
FALL/SPRIG	3	0	3	3	5	Turkish	Optional

Prerequisite (s)	Not	
Instructor	Prof. Dr. Muharrem INCE	**Mail:** muharremince@munzur.edu.tr **Web:** www.munzur.edu.tr
Course Assistant		**Mail:** **Web:**
Groups / Classes	Master degree	
Course Aim	In the context of green chemicals and sustainability, it is to serve academic needs and industrial applications in production, research and development in the fields of environment, medicine, food, etc.	
Course Goals	• Why green chemistry, basic principles, environment, health and safety integration, • method selection, material selection and identification of bioprocesses.	
Course Learning Outs and Proficiencies	• Learn about green chemistry in the context of sustainability. • Learn about the application areas of green chemistry. • Learn the relationship between green chemistry and engineering. •	
Course Basic and Auxiliary Contexts	• Green Chemistry and The Ten Commandments of Sustainability 2nd ed Stanley E. Manahan 2006 ChemChar Research, Inc Publishers Columbia, Missouri U.S.A. • Green Chemistry and Catalysis. I. Arends, R. Sheldon, U. Hanefeld Copyright © 2007 Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim ISBN: 978-3-527-30715-9. • Green Chemistry and Engineering: A Pathway to Sustainability, Anne E. Marteel-Parrish, Martin A. Abraham, Print ISBN:9780470413265 |Online ISBN:9781118720011 |DOI:10.1002/9781118720011 Copyright © 2014 American Institute of Chemical Engineers, Inc. • Lecture notes and scientific articles	
Methods of Give a Lecture	Face to face lectures, Powerpoint presentations, Question &Answer, Discussion	

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	**Subjects**
1	Green chemistry and sustainability
2	Green chemistry and green engineering
3	Green chemistry principles
4	Green chemistry principles
5	Green chemistry; integration of environment, health and safety
6	Green chemistry; integration of environment, health and safety
7	How do we know it is green?
8	Choosing paths and chemistry in green chemistry and green engineering
9	Material selection; solvents, catalysts and reagents
10	Reaction conditions and green chemistry
11	Bioprocesses
12	Bioprocesses
13	From lab to plant
14	From lab to plant

COURSE IDENTIFICATION FORM

Course Code and Name: KT5030 Nanoscience and Nanotechnology				Department of: Chemical Technologies Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
FALL/SPRING	3	0	3	3	5	Turkish	Optional
Prerequisite (s)	Not						
Instructor	Prof. Dr. Olcay KAPLAN INCE					**Mail:** olcaykaplan@munzur.edu.tr **Web:** www.munzur.edu.tr	
Course Assistant						**Mail:** **Web:**	
Groups / Classes	Master degree						
Course Aim	To introduce the basic principles and theories of nano-science, nano-materials and nano-technologies with the developing and transforming world. To provide the students who take the course with knowledge and skills about nano-science and nanotechnology, to emphasize that this current and constantly developing branch of science is very related to lifelong learning, as well as to explain the properties of nano-scale materials used for this purpose and introduce their applications.						
Course Goals	• To learn definitions and development processes of nano-science, nano-engineering and nano-technology; nanotechnological concepts and properties of nanomaterials together with measurement methods. • Determination of size and shape properties of nanomaterials, surface structures, properties and usage areas of nano-particles; effects of nano-material on ecosystem and organism. • To understand the synthesis and analysis methods of nano-structures.						
Course Learning Outs and Proficiencies	• Will be able to comprehend the importance of nano-science, nano-engineering and nano-technology. • Will be able to learn the properties of nano-scale structures. • Will be able to learn about the application areas of nanotechnology. • Will be able to learn the production and imaging methods of nanostructures.						
Course Basic and Auxiliary Contexts	• Charles P. Poole, and Frank J. Owens, (2003), Introduction to nanotechnology, John Wiley&Sons, Inc. ABD • M. Köhler, Wolfgang Fritzsche, (2004), Nanotechnology, Wiley-VCH Verlag GmbH, Almanya • Jeremy Ramsden, (2011). Fundamentals of Nanotechnology. METU publishing. • Lecture notes and scientific articles						
Methods of Give a Lecture	Face-to-Face and Digital Platform, Powerpoint presentations, Question and answer, Discussion						

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	**Subjects**
1	Nano-science, nano-engineering and nano-technology in the light of developing and transforming science
2	Current developments in nano-science and nano-technology
3	Nano-engineering and application areas
4	Relationship between nanomaterial properties and measurement methods
5	Characterization of nanoparticles
6	Characterization of nanoparticles
7	Synthesis of nanoparticles: Biosynthesis
8	Synthesis of nanoparticles: Chemical synthesis methods
9	Synthesis of nanoparticles: Chemical synthesis methods
10	Metal-based nanoparticles
11	Carbon-based nanostructures
12	Hybrid nanostructures
13	Hybrid nanostructures
14	The future of nanotechnology

COURSE IDENTIFICATION FORM							
Course Code and Name: KT5031 Nanotechnology and Application Areas				**Department of: Chemical Technologies Master's Program with Thesis**			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
FALL/SPRING	3	0	3	3	5	Turkish	Optional
Prerequisite (s)	Not						
Instructor	Prof. Dr. Olcay KAPLAN INCE					**Mail:** olcaykaplan@munzur.edu.tr **Web:** www.munzur.edu.tr	
Course Assistant						**Mail:** **Web:**	
Groups / Classes	Master degree						
Course Aim	To introduce nanotechnology and the basic principles and theories of these technologies in the light of developments in science and technology. To introduce nanoscale materials used in nanotechnology and their applications and superior properties. To gain knowledge and skills related to nanotechnology and its application areas.						
Course Goals	• Definitions and history of nanoscience, nanoengineering, nanotechnology concepts; measurement methods of nanoproperties; • To understand the shape and size of nanoparticles, surface structures, properties of nanoparticles as well as the usage areas of nanotechnology.						
Course Learning Outs and Proficiencies	• Will be able to comprehend the importance of nanoscience and nanotechnology. • Will be able to learn the properties of nano-sized particles. • Will be able to learn about the application areas of nanotechnology. • Will be able to compare the advantages and disadvantages of this technology in practice.						
Course Basic and Auxiliary Contexts	• Charles P. Poole, and Frank J. Owens, (2003), Introduction to nanotechnology, John Wiley&Sons, Inc. ABD • M. Köhler, Wolfgang Fritzsche, (2004), Nanotechnology, Wiley-VCH Verlag GmbH, Almanya • Jeremy Ramsden, (2011). Fundamentals of Nanotechnology. METU publishing. • Lecture notes and scientific articles						
Methods of Give a Lecture	Face-to-Face and Digital Platform, Powerpoint presentations, Question and answer, Discussion						

		If Available, to Sign (x)	General Average Percentage (%) Rate
Assessment Criteria	**1. Quiz**	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	The development process of nanotechnology
2	Nanotechnological developments in basic sciences
3	Applications of nanotechnology: Science and education
4	Applications of nanotechnology: Science and education
5	Applications of nanotechnology: Biotechnology and agriculture
6	Applications of nanotechnology: Biotechnology and agriculture
7	Applications of nanotechnology: Nanoelectronics and computers
8	Applications of nanotechnology: Nanoelectronics and computers
9	Applications of nanotechnology: Aviation and space
10	Applications of nanotechnology: Aviation and space
11	Applications of nanotechnology: Pharmacy and nanomedicine
12	Applications of nanotechnology: Pharmacy and nanomedicine
13	New areas of nanotechnology
14	New areas of nanotechnology

COURSE IDENTIFICATION FORM

Course Code and Name: KT5032- Intellectual and Industrial Property Rights	**Department of :** Institute of Graduate Education- Department of Chemical Technologies- Master's Program with Thesis

Semester	Theoretic Hour	Practice Hour	Total Hour	Credits	ECTS	Education Language	Type: Compulsory Elective
Fall/Spring	3	0	3	3	5	Turkish	Optional

Prerequisite (s)		
Instructor	All Faculty Members	**Mail :** **Web :**www.munzur.edu.tr
Course Assistant		**Mail :** **Web :**
Groups / Classes	Mater degree	
Course Aim	• The aim of this course is to provide students with information on intellectual property rights, legal regulations and application processes in the protection of intellectual and industrial property rights.	
Course Goals	The aim of this course is to provide students with information on basic rights and application processes in the fields of patent	
Course Learning Outs and Proficiencies	• Can distinguish the types and conceptual elements of intellectual property rights and evaluate their differences from each other. • Be informed about the current registration procedure in Turkey for intellectual property rights, especially patents, trademarks, designs and geographical indications. • Be informed about the law on intellectual and artistic works. • Understand and interpret the place of computer programs in intellectual property law and the means by which they are protected. • Be able to evaluate the importance of technology transfer agreements in which intellectual property rights and know-how are the subjects, and the reasons and consequences of the exemption granted to these agreements in terms of competition.	
Course Basic and Auxiliary Contexts	• Industrial Property Law • Turkish Patent and Trademark Office, Intellectual Property Rights Training Documents	
Methods of Give a Lecture	Face-to-Face and Digital Platform Observation, Field trip, Case study, Problem/Problem Solving, Brainstorming	

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	Homework (Ten)		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	**Subjects**
1	Intellectual property law in general
2	Basic concepts
3	Main elements of the intellectual property system
4	Intellectual and artistic works
5	Moral rights
6	Trademarks
7	Patent concept and application processes, Design and application processes
8	**Midterm Exam**
9	Geographical indication application processes
10	New plant varieties-Integrated circuit topographies
11	Know-how (technical and commercial knowledge) concept, protection of know-how
12	Patent databases
13	Freedom of activity research and patent mapping concept
14	Technology transfer concept

COURSE IDENTIFICATION FORM

Course Code and Name: KT5033- Entrepreneurship				**Department of :** Institute of Graduate Education-Department of Chemical Technologies- Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	5	Turkish	Optional
Prerequisite (s)		-					
Instructor		Prof. Dr. Ragıp ADIGÜZEL				**Mail :**radiguzel@munzur.edu.tr **Web :**www.munzur.edu.tr	
Course Assistant		-				**Mail :** **Web :**	
Groups / Classes		Master degree					
Course Aim		• To train entrepreneurial individuals by developing their conceptual and application skills on entrepreneurship and innovation. •					
Course Goals							
Course Learning Outs and Proficiencies		• Knows the meaning and importance of entrepreneurship. • Develops entrepreneurship and innovation comprehension skills. • Gains skills to evaluate their talents in terms of entrepreneurship by having innovative approaches. • Gains the ability to develop creative and innovative approaches to business problems.					
Course Basic and Auxiliary Contexts		• Girişimcilik, Orhan Küçük, Seçkin Yayınları, 2013. • Innovation & Entrepreneurship fourth edition, John Bessant and Joe Tidd, Wiley, 2023					
Methods of Give a Lecture		Face-to-Face and Digital Platform Interactive classroom environment, Case and workshop studies.					

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz		
	2. Quiz		
	3. Quiz		
	4. Quiz		
	Homework (Ten)		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)	**X**	**100**
	Final Examination		

Semester Course Plan

Week	Subjects
1	Entrepreneurship in practice and general characteristics of entrepreneurs
2	Creativity and innovation concepts and applications
3	Innovation models
4	Innovative business ideas and applications
5	Business plan scope and content for new ventures
6	Marketing planning in entrepreneurship
7	Production and financial planning in entrepreneurship
8	Strategic planning applications for new ventures
9	Marketing plan applications for new ventures
10	Production planning applications for new ventures
11	Financial planning for new ventures
12	Intellectual asset management
13	Writing and presentation of business plans
14	Writing and presentation of business plans

COURSE IDENTIFICATION FORM

Course Code and Name: KT5034-Project Management	**Department of :** Institute of Graduate Education-Department of Chemical Technologies- Master's Program with Thesis

Semester	Theoretic Hour	Practice Hour	Total Hour	Credits	ECTS	Education Language	Type: Compulsory Elective
Fall/Spring	3	0	3	3	5	Turkish	Optional

Prerequisite (s)		
Instructor	All Faculty Members	**Mail :** **Web :**www.munzur.edu.tr
Course Assistant		**Mail :** **Web :**
Groups / Classes	Master degree	
Course Aim	• To provide students with information about project management, to develop the ability to evaluate project needs and project planning activities, to define and plan project selection, organization, scope, time and costs, and to develop the ability to program and manage projects with the support of computer software.	
Course Goals		
Course Learning Outs and Proficiencies	• Can define activities as projects. • Can evaluate project needs and project activities. • Can select projects, organize them, define and plan scope, time and costs. • Can program and manage projects with the support of computer software. • Has theoretical and practical knowledge on project preparation and evaluation of the stages of the project management process.	
Course Basic and Auxiliary Contexts	• Proje Yönetimi Bilgi Birikimi Kılavuzu (PMBOK kılavuzu), Project Management Institute, 2008 • Proje Yönetimi, İsmet Barutçugil, Kariyer Yayıncılık, 2008 • Proje yönetimi, Richard Luecke, Harvard Business School Pres, Türkiye İş Bankası Kültür Yayınları, 2009 • Project Management, A Managerial Approach,Meredith And Mantel 5th edition Wiley int. edition, 2002	
Methods of Give a Lecture	Face-to-Face and Digital Platform	

	Sample applications, teamwork, presentations, holistic approach to project management

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	Homework (Ten)		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Project Management: Introduction
2	Project management cycle, logical framework
3	Project life cycle and organization
4	Project management processes
5	Project integration management
6	Project plan development
7	Resource scheduling
8	**Midterm Exam**
9	Project time and cost management
10	Project procurement management
11	Project human resource management
12	Project communication management, project risk management
13	Computer Software Supported Implementation
14	Computer Software Supported Implementation

COURSE IDENTIFICATION FORM

Course Code and Name: KT5035-Scientific Research and Publication Ethic	Department of : Institute of Graduate Education – Department of Chemical Technologies – Master's Program with Thesis

Semester	Theoretic Hour	Practice Hour	Total Hour	Credits	ECTS	Education Language	Type: Compulsory Elective
Fall	3	0	3	3	5	Turkish	Optional

Prerequisite (s)	None	
Instructor	Assoc. Prof. Dr. Güzin PIHTILI	**Mail :** gpihtili@munzur.edu.tr **Web :** www.munzur.edu.tr
Course Assistant	None	**Mail :** **Web :**
Groups / Classes	Master degree	
Course Aim	The aim of the course is to introduce ethical and scientific research methods, to evaluate scientific ethical values with all their components, especially individual, social and legal aspects, and to discuss them of chemical ethics and chemical technologies.	
Course Goals		
Course Learning Outs and Proficiencies	• To be able to understand ethical rules in scientific research • To be able to identify behaviors that are contrary to scientific ethics • To be able to learn about legislation related to scientific ethics • To be able to understand chemical and chemical ethical rules in chemical technologies	
Course Basic and Auxiliary Contexts	• Baskent University: Regulations concerning ethical committee on animal experiments, 2003, Baskent University Press. • Biyoloji Budur-Canlı Dünyanın Bilimi. Ernst Mayr, TÜBİTAK, ISBN 978-975-403-481-3, 2008. • Engineering Ethics: An Industrial perspective (Hardcover) by Gail Dawn Baura, 2006, Elsevier Inc. • NanoEthics, Springer Netherlands, ISSN 1871-4757 (Print) 1871-4765 (Online). • Practical Ethics, Singer, P., Cambridge University Pres, (1993).	

Methods of Give a Lecture	Face to Face and Digital Program

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Introduction to ethics and scientific research methods in science and technology,
2	Ethics and rules in scientific research,
3	Behaviors contrary to scientific ethics,
4	Behaviors contrary to scientific ethics,
5	Ethics education in educating scientists,
6	Ethical responsibilities of scientists,
7	Science, society and ethical relations,
8	**Midterm Exam**
9	Ethical principles in scientific publications, Ethics in scientific knowledge production, Plagiarism and ethics, Survey ethics in laboratory and field research, Legal regulations related to ethics by YOK, TUBITAK, UNIVERSITIES.
10	Ethics in scientific knowledge production, plagiarism and ethics, Survey ethics in laboratory and field research, Legal regulations related to ethics by YOK, TUBITAK, UNIVERSITIES.
11	Plagiarism and ethics,
12	Survey ethics in laboratory and field research,
13	Legal regulations related to ethics by YOK, TUBITAK, UNIVERSITIES.
14	Legal regulations related to ethics by YOK, TUBITAK, UNIVERSITIES.

COURSE IDENTIFICATION FORM

Course Code and Name: KT5036- Advanced Kinetic				**Department of :** Institute of Graduate Education-Department of Chemical Technologies- Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	5	Turkish	Optional
Prerequisite (s)							
Instructor	Prof. Dr. Aslışah AÇIKSES					**Mail :**aslisahacikses@munzur.edu.tr **Web :** www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes	Master Degree						
Course Aim	• The aim of this course is to provide basic information on advanced kinetics to graduate students.						
Course Goals							
Course Learning Outs and Proficiencies	• When this course is completed, students will be able to; Kinetics, reaction rate, order, molecularity, types of order and how to find order on a reaction. • Predict how a reaction will be affected by temperature. • Reach the capacity to write a rate expression for a reaction by determining reaction mechanisms.						
Course Basic and Auxiliary Contexts	• P. W. Atkins; Physical Chemistry;1998 • CEBE. M. ;Fizikokimya;1987 • HURLY M. ;Chemistry (Principles and Reactios);1989						
Methods of Give a Lecture	Face-to-Face and Digital Platform						

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	**Subjects**
1	Kinetics
2	Reaction Rate
3	Factors Affecting Reaction Rate
4	Reaction Order
5	Methods for determining reaction order
6	Methods for determining reaction order
7	Methods for determining reaction order
8	**Midterm Exam**
9	Effect of temperature on reaction rate (Arrhenius Relation)
10	Chemical Reactions (Collision Theory)
11	Reaction Mechanisms
12	Reaction Mechanisms
13	Application of These Theories on Reaction Rate
14	Application of These Theories on Reaction Rate

COURSE IDENTIFICATION FORM

Course Code and Name: KT5037- Colloid Chemistry				**Department of :** Institute of Graduate Education-Department of Chemical Technologies- Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	5	Turkish	Optional
Prerequisite (s)							
Instructor		Prof. Dr. Aslışah AÇIKSES				**Mail :**aslisahacikses@munzur.edu.tr **Web :** www.munzur.edu.tr	
Course Assistant						**Mail :** **Web :**	
Groups / Classes		Master Degree					

Course Aim	• The aim of this course is to provide basic information on colloids to graduate students.
Course Goals	
Course Learning Outs and Proficiencies	• When this course is completed, students will be able to see that; There are intermediate mixtures between real solutions and heterogeneous mixtures, particles are suspended in the solution, The main feature that distinguishes colloidal solutions from other solutions is the size of these particles. The particle size of the dispersed phase is around 1-1000 nm. • They will be able to easily express terms such as sol, aerosol and emulsion. • They will be able to use methods such as ultracentrifugation, osmotic pressure, turbidity and viscosity in addition to the microscope method to determine the size of colloidal particles.
Course Basic and Auxiliary Contexts	• Prof. Dr. A. Tevfik; Kolloit Kimyası: • Prof. Dr. C. Mustafa; Fiziko Kimya;1987 • P. W. Atkins.; Physical Chemistry;1998 • Genel Kimya 1, İlkeler ve Modern Uygulamalar, Petrucci, Harwood, Herring, • Çeviri Editörleri: Tahsin Uyar, Serpil Aksoy,10. Baskı, Palme Yayıncılık, Ankara, 2010

Methods of Give a Lecture	Face-to-Face and Digital Platform

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Introduction to colloid chemistry
2	Methods of obtaining colloids
3	Particle shapes of colloids
4	Fine filtration and semipermeable purification
5	Movement of colloids
6	Optical properties of colloids
7	Viscosity
8	**Midterm Exam**
9	Surface tension
10	Tyndall effect
11	Adsorption of colloids
12	Electrical properties of colloids
13	Formation of sol-gel
14	Formation of sol-gel

COURSE IDENTIFICATION FORM

Course Code and Name: KT5038-Antimicrobial Polymers				**Department of :** Department of Chemical Technologies Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall	3	0	3	3	5	Turkish	Optional
Prerequisite (s)		-					
Instructor		Assoc. Prof. Güzin PIHTILI YILDIZ				**Mail : gpihtili@munzur.edu.tr** **Web : www.munzur.edu.tr**	
Course Assistant						**Mail :** **Web :**	
Groups / Classes		Master degree					
Course Aim		Antimicrobial natural polymers (antimicrobial peptides); Explain the synthesis, characterization, structure and industrial application of antimicrobial polymers.					
Course Goals		• Basic requirements for antimicrobial polymers • • Antimicrobial natural polymers (structure and properties of peptides) • • Synthesis and characterization of antimicrobial polymers. • • Biocidal cationic polymers (synthesis and characterization of polymers containing pyridine, guanidine, amine salts) • • Synthesis of Ag^{+}, TiO_2, ZnO based antimicrobial nanoparticles, • • Examination of the bactericidal antimicrobial polymer mechanism (instrumental analysis methods such as fluorescence spectroscopy, confocal microscopy, DLS techniques used to examine the interaction of polymers with the bacterial wall model, synthetic lipid globules and real bacterial wall) • • Sterile surface preparation and industrial applications (water treatment, food packaging, implant materials, textile products, paint, etc.)					
Course Learning Outs and Proficiencies		• Öğrenci antimikrobiyal doğal ve sentetik polimerler hakkında bilgi edinir. • Öğrenci antimikrobiyal polimerlerin sentezi ve karakterizasyonu kapsamında bilgi edinir. • Öğrenci doğal peptit türevlerine benzer sentetik oligomer ve polimerler (amfifilik yapı özelliği, hidrofobik/hidrofilik oranının önemi, yapı/aktivite ilişkisi) kapsamında bilgi edinir. • Öğrenci antimikrobiyal nanopartiküller (Ag^{+}, TiO_2, ZnO esaslı nanopartiküllerin sentezi, polimer-nanopartikülkolloidal yapılarının sentezi ve yüzey uygulamaları) kapsamında bilgi edinir. • Öğrenci bakteri-antimikrobiyal polimer mekanizmasının incelenmesinde					

	kullanılan enstrümantal teknikler hakkında bilgi edinir. • Öğrenci steril yüzey hazırlanması ve endüstriyel uygulamalar kapsamında bilgi edinir
Course Basic and Auxiliary Contexts	• • Bryskier, A. (Ed.). (2005). Antimicrobial Agents: Antibacterial and Antifungals. Washington DC: ASM Press. • Jones, D. (2010). The antibacterial lead discovery challenge. Nature Reviews Drug Discovery, 9(10), 751-752. • Saif, M.J.; Anwar, J. & Munawar, M.A. (2009). A Novel Application of Quaternary Ammonium Compounds asAntibacterial Hybrid Coating on Glass Surfaces. Langmuir, 25(1), 377-379 • Prncples of Polymerzaton, 4th edton (G. Odan, John Wley), • Antimicrobial Polymers 1st Edton,(Jose Mara Lagaron, Mara Jose Oco,Amparo Lopez-Rubo) John Wley), Brysker, A. (Ed.). (2005). • Antimicrobial Agents: Antibacterial and Antifungals. Washngton DC: ASM Press, Polymers for Bomedcal Applcatons (Anl Mahapatro, Ankur S. Kulshrestha) OUP USA, 2008, Antimicrobial Polymers. Jose Mara Lagaron,Mara Jose Oco, Amparo Lopez-Rubo. Wley.
Methods of Give a Lecture	Face to face

		If Available, to Sign (x)	**General Average Percentage (%) Rate**
Assessment Criteria	**1. Quiz**	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		

	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	Overview of antimicrobial polymers
2	Antimicrobial natural polymers I
3	Antimicrobial natural polymers II
4	Synthesis and characterization of antimicrobial polymers
5	Synthesis and characterization of antimicrobial polymers
6	Synthesis and characterization of antimicrobial polymers
7	Synthetic oligomers and polymers similar to natural peptide derivatives I (amphiphilic structure feature, importance of hydrophobic/hydrophilic ratio, structure/activity relationship)
8	**Midterm**
9	Synthetic oligomers and polymers II similar to natural peptide derivatives (amphiphilic structure feature, importance of hydrophobic/hydrophilic ratio, structure/activity relationship)
10	Antimicrobial nanoparticles I (Synthesis of Ag+, TiO_2, ZnO based nanoparticles, synthesis of polymer/nanoparticle colloid structures and surface applications) I
11	Antimicrobial nanoparticles II (Synthesis of Ag+, TiO_2, ZnO based nanoparticles, synthesis of polymer/nanoparticle colloid structures and surface applications) II
12	Investigation of bacterial / antimicrobial polymer mechanism I
13	Investigation of bacterial / antimicrobial polymer mechanism II
14	Industrial applications of antimicrobial polymers (such as water treatment, food packaging, implant materials such as catheters, textiles, paint)

COURSE IDENTIFICATION FORM

Course Code and Name: KT5039-Conductive Polymers				**Department of :** Department of Chemical Technologies Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall	3	0	3	3	5	Turkish	Optional
Prerequisite (s)	No						
Instructor	Assoc. Prof. Güzin PIHTILI YILDIZ					**Mail : gpihtili@munzur.edu.tr** **Web : www.munzur.edu.tr**	
Course Assistant						**Mail :** **Web :**	
Groups / Classes	Master degree						
Course Aim	Recognizing conductive polymers, which have gained great importance with both academic and commercial applications in recent years, and examining the application areas of conductive polymers. .						
Course Goals	• Introduction to Conductive Polymers, • Classification of electrochemically active polymers, • Electrical and Electrochemical Properties of Conductive Polymers, • Doping and conductivity properties, • Solubility of Conductive Polymers, • Characterization of Conductive Polymers • Conductivity Measurement Techniques, Synthesis methods of Conductive Polymers, • Application Areas of Conductive Polymers						
Course Learning Outs and Proficiencies	1. It plays a role in production and development in all areas related to chemistry. 2. Uses technologies effectively in solving problems in the field of chemistry. 3. To learn the application areas of conductive polymers						

Course Basic and Auxiliary Contexts	Stuart R. Batten, Coordination Polymers Design, Analysis and Application, 2009. • Atkins, S., Inorganic Chemistry, Oxford University Press, 1999. • Miessler, G. L., Tarr, D. A., Inorganic Chemistry, Palme Publications, 2002. • Published scientific articles
Methods of Give a Lecture	1.Conductng Polymers, G.Inzelt,F.Scholz,Sprnger,2008 2.Handbook of Conductand Polymers Conjugated polymers, T.A. Skotherm, J.R. Reynolds, CRC Press,2006.

		If Available, to Sign (x)	**General Average Percentage (%) Rate**
Assessment Criteria	**1. Quiz**	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	**Subjects**
1	Introduction to Conductive Polymers
2	Classification of electrochemically active polymers
3	Electrical and Electrochemical Properties of Conductive Polymers
4	Conductivity theory and conductivity in conductive polymers
5	Doping and conductivity property
6	Solubility of Conductive Polymers
7	Characterization of Conductive Polymers
8	**Midterm**
9	Synthesis methods of Conductive Polymers

10	• Conductivity Measurement Techniques
11	• Homework presentation
12	• Application Areas of Conductive Polymers
13	• Application Areas of Conductive Polymers
14	• Application Areas of Conductive Polymers

COURSE IDENTIFICATION FORM

Course Code and Name: KT5040-Polymer Production and Processing				**Department of :** Department of Chemical Technologies Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall	3	0	3	3	5	Turkish	Optional
Prerequisite (s)	No						
Instructor	Assoc. Prof. Güzin PIHTILI YILDIZ					**Mail : gpihtili@munzur.edu.tr** **Web : www.munzur.edu.tr**	
Course Assistant						**Mail :** **Web :**	
Groups / Classes	Master degree						
Course Aim	• In this course, the main production techniques used in the commercial scale production of polymers in laboratories and industry, • To be informed about the molding methods used to make the obtained polymers suitable for human use. • Will have information about the technological properties, polymerization processes, fabrication processes, commercial production techniques of commercially important polymers and molding techniques that make them available to the market as desired objects.						
Course Goals	• Students will be provided with a knowledge base in the field of developing polymer technology.						
Course Learning Outs and Proficiencies	• 1. The importance of polymers • 2. Technological properties of polymers • 3. Polymerization processes • 4. Fabrication processes • 5. Commercial polymers properties. • 6. Processing of plastics • 7. Processing of fibers • 8. Elastomers						

Course Basic and Auxiliary Contexts	• S. Basan Polimer "Üretimi ve İşlemeciliği" Ders Notları, Çorum 2014. Kaynaklar • M.Saçak, Polimer Teknolojisi, Gazi Kitabevi, Ankara, 2005. ISBN: 975-8895-82-6 • Ö.Tunç Savaşçı, N.Uyanık, G.Akovalı Plastikler ve Plastik Teknolojisi, Çantay Kitabevi,1998. ISBN: 975-7206-26-
Methods of Give a Lecture	Face to Face and Digital Platform

		If Available, to Sign (x)	**General Average Percentage (%) Rate**
Assessment Criteria	**1. Quiz**	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	**Subjects**
1	• Introduction to Polymers: Basic Concepts and Definitions, The Place and Importance of Polymers in Our Life, Chemical Structure and Classification of Polymers
2	• Polymerization Mechanisms
3	• Polymer Production Methods
4	• Polymer Production Methods
5	• Physical, Chemical, Mechanical, Thermal, Rheological and Morphological Properties of Polymers, Structure-Property Relationship
6	• Characterization Methods Applied to Polymers
7	• Thermoplastic Materials: Structures and Properties, Important Industrial Thermoplastics and Uses

8	•Exam
9	• Thermoset Materials: Structures and Properties, Important Industrial Thermoset Polymers and Their Uses
10	• Thermoset Materials: Structures and Properties, Important Industrial Thermoset Polymers and Their Uses
11	• Elastomeric Materials and Fibers: Structures, Properties and Uses, Important Industrial Elastomers
12	• Methods of Forming Polymeric Materials
13	• Polymeric Composite Materials: Classification, Preparation Methods, Application Areas
14	• Polymeric Composite Materials: Classification, Preparation Methods, Application Areas

COURSE IDENTIFICATION FORM

Course Code and Name: KT5041/ Spectroscopic Methods				**Department of :** Department of Chemical Technologies Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	6	Turkish	Optional
Prerequisite (s)		-					
Instructor		Ass. Prof. Güzin PIHTILI YILDIZ				**Mail : gpihtili@munzur.edu.tr** **Web :**	
Course Assistant						**Mail :** **Web :**	
Groups / Classes							
Course Aim	To provide students with the principles and concepts of basic spectroscopic techniques used to determine the structure of compounds.						
Course Goals	Acquisition of basic information, theoretical aspects, practical examples and applications of UV/Vis Spectroscopy • Acquisition of basic information, theoretical aspects, practical examples and applications of Infrared (IR) Spectroscopy • Acquisition of basic information, theoretical aspects, practical examples and applications of Nuclear Magnetic Resonance (NMR) Spectroscopy						
Course Learning Outs and Proficiencies	1. Learns the basic information, theoretical aspects, practical examples and applications of UV/Vis Spectroscopy by trying them out 2. Learns the basic information, theoretical aspects, practical examples and applications of Infrared (IR) Spectroscopy by trying them out 3. Learns the basic information, theoretical aspects, practical examples and applications of Nuclear Magnetic Resonance (NMR) Spectroscopy by trying them out.						
Course Basic and Auxiliary Contexts	Fundamentals of Molecular Spectroscopy, C.N. Banwell, McGraw Hill. Introduction to Molecular Spectroscopy, E.F. H. Brittain, W.O. George, C.H. J. Wells, Academic Press. Instrumental Analiz, Prof. Dr. Turgut Gündüz.						
Methods of Give a Lecture	Face to face						

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	• Basic information of spectroscopy, electromagnetic radiation
2	• Light energy and matter
3	• Spectroscopy Devices
4	• Spectroscopic Methods
5	• Basic principles of spectroscopic methods
6	• Characterization of electromagnetic radiation
7	• UV spectroscopy
8	• Midterm exam
9	• IR spectroscopy
10	• Analysis with IR spectroscopy
11	• Examples of analysis with IR spectroscopy
12	• NMR spectroscopy
13	• Analysis with NMR
14	• Examples on analysis with NMR

COURSE IDENTIFICATION FORM

Course Code and Name: KT5042/ Basic Laboratory Principles and Methods				**Department of :** Department of Chemical Technologies Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	6	Turkish	Optional
Prerequisite (s)		-					
Instructor		Ass. Prof. Güzin PIHTILI YILDIZ				**Mail : gpihtili@munzur.edu.tr** **Web :**	
Course Assistant						**Mail :** **Web :**	
Groups / Classes							
Course Aim	The purpose of this course is to teach basic laboratory principles and general laboratory procedures.						
Course Goals	It includes working discipline and safety in the laboratory, physical, chemical, instrumental analysis methods, properties of basic tools and equipment used in the laboratory, methods and calculations for preparing solutions to be used in analysis, evaluation and interpretation of the obtained data.						
Course Learning Outs and Proficiencies	1. Will have understood the general hygiene and safety rules to be followed in the laboratory, the principles of working in the laboratory, the principles of basic laboratory devices and methods 2. Will have acquired basic laboratory skills (example: weighing, preparing buffers, measuring pH, homogenizing, centrifuging). 3. Will have acquired the ability to apply general laboratory procedures						
Course Basic and Auxiliary Contexts	Laboratory Safety and Chemical Hygiene Plan. 2009. Ankara						
Methods of Give a Lecture	Face to face						

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)		
	Final Examination	**X**	**50**

Semester Course Plan

Week	Subjects
1	• Laboratory safety
2	• Safe work in the laboratory
3	• Aim of laboratory safety
4	• Laboratory hazards and exposure routes
5	• Laboratory accidents
6	• Laboratory workers risk analysis
7	• Laboratory tools and equipment
8	• Midterm Exam Week
9	• Use of basic laboratory equipment and safe application of laboratory methods
10	• Safety data sheet and danger-warning signs related to chemicals
11	• Personal safety in laboratories and principles of first aid to be applied in laboratory accidents
12	• Ensuring chemical safety in laboratory environment: Chemical hazard classes and sources
13	• Waste management: Medical waste, radioactive waste.
14	Hazardous Chemical Substance Waste

COURSE IDENTIFICATION FORM

Course Code and Name: KT5043/ Special Computer Applications in Chemistry				**Department of :** Department of Chemical Technologies Master's Program with Thesis			
Semester	**Theoretic Hour**	**Practice Hour**	**Total Hour**	**Credits**	**ECTS**	**Education Language**	**Type: Compulsory Elective**
Fall/Spring	3	0	3	3	6	Turkish	Optional
Prerequisite (s)		-					
Instructor		Ass. Prof. Güzin PIHTILI YILDIZ				**Mail : gpihtili@munzur.edu.tr** **Web :**	
Course Assistant						**Mail :** **Web :**	
Groups / Classes							
Course Aim	The course aims to teach graduate students how to use writing, drawing and file extension changing programs needed for preparing articles, posters and theses, and software programs related to UV, IR and NMR mass spectroscopy used in substance characterization..						
Course Goals	Lisans üstü eğitimde kullanılabilecek Origine, Chem office, UV probe, PE Spectrum, Acrobat Professional, programları uygulamaları						
Course Learning Outs and Proficiencies	1. Makes normal and three-dimensional drawings of reaction schemes 2. Takes UV-vis and IR spectra of synthesized chemicals from the device and interprets them. 3. Takes 1H and 13C-NMR spectra of synthesized chemicals from the device and interprets them						
Course Basic and Auxiliary Contexts	http://scistore.cambridgesoft.com http://www.ssi.shimadzu.com http://www.perkinelmer.com http://bruker-daltonics-flexanalysis.software.informer.com http://mestrelab.com http://www.originlab.com http://www.adobe.comhttp://www.wavefun.com/products/spartan.html						
Methods of Give a Lecture	Face to face						

Assessment Criteria		**If Available, to Sign (x)**	**General Average Percentage (%) Rate**
	1. Quiz	**X**	**50**
	2. Quiz		
	3. Quiz		
	4. Quiz		
	5. Quiz		
	Oral Examination		
	Practice Examination (Laboratory, Project etc.)	**X**	**50**
	Final Examination		

Semester Course Plan

Week	Subjects
1	• Finding and using microsoft word, excel, and chem draw templates for articles and theses on the internet
2	• Introduction to the ChemBio draw program
3	• Writing molecular formulas and chemical reactions with the ChemBio draw program
4	• Drawing 3D shapes of molecules with the ChemBio 3D ultra program
5	• Making ^{1}H-NMR and ^{13}C-NMR predictions in organic compounds with the ChemBio draw program
6	• Introduction to the Chemsketch program
7	• Writing molecular formulas and chemical reactions with the Chemsketch program
8	• Midterm Exam Week
9	• Effective use of the Acrobat professional program
10	• Introduction to the Origine program
11	• Introducing spectrum programs for FT-IR
12	• Peak reading from spectrum programs for FT-IR
13	• Using the Perkin Elmer spectrum IR software
14	• Changing the size and resolution values of image files