KARABÜK ÜNİVERSİTESİ
LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ

DEPARTMENT OF ENVIRONMENTAL ENGINEERING
Content of Master's Degree Programme in Environmental Engineering with Thesis

COURSE CODE	COURSE NAME AND CONTENTS	T	A	C	ECTS
CVM742	**Soil Chemistry**	3	0	3	8
Purpose and Content	The objective of the course is teach the students the fundamental processes of soil chemistry and the impact of these processes on fate and transport of organic and inorganic pollutants. The knowledge gained on this course will provide the basics for making land remediation, reclamation and management decisions. In this course, the chemical processes in soil and the consequences of these processes related to soil and water contamination will be examined. Firstly, the fundamental concepts (i.e., chemical properties of soil components, soil solution and solid phase chemistry, sorption phenomena, ion exchange and oxidation-reduction reactions) that are necessary to understand the chemical reactions occurring in soils will be described. Then, the chemical transformations of organic and inorganic soil pollutants and the methods on treatment of soil contamination will be studied.				
CVM743	**Aquatic Chemistry**	3	0	3	8
Purpose and Content	The aims of this course are (1) to introduce basic thermodynamic concepts and equilibrium chemistry and structure of water; (2) to define basic concepts and reactions of acids-bases, complexed compounds, precipitationdissolution and oxidation-reduction; and (3) to provide information and examples of application aspects of equilibrium chemistry. Throughout the corse, the following topics will be covered: Thermodynamic basis of chemical equilibrium; Structure of water and solvent properties; Acid and base chemistry, definitions, equilibrium solutions; Applications of acid and base chemistry: pC-pH diagrams; titration, buffer intensity; Coordination chemistry and complex compounds; Precipitation and dissolution; Crystallization: equilibrium solutions, phase diagrams; Oxidation and reduction: definition and basic concepts, oxidation and reduction diagrams, equilibrium solutions.				
CVM756	**Fluorescence Spectroscopy in Environmental Analysis**	3	0	3	8
Purpose and Content	The aims of this course are (1) to introduce basic concepts of fluorescence spectroscopy; (2) demonstration of molecular electronic structures; (3) demonstration of electronic transition types in organic molecules; (4) demonstration of analysis of organic pollutants; (5) demonstration of analysis of inorganic pollutants				
CVM757	**Surface Chemistry in Environmental Engineering**	3	0	3	8
Purpose and Content	The aims of this course are (1) to introduce basic concepts in surface chemistry; (2) demonstration of the adsorption process; (3) demonstration of adsorption isotherms; (4) demonstration of the ion exchange mechanism; (5) demonstration of ion exchange species				
CVM730	**Biogas and Production Technologies**	3	0	3	8
Purpose and Content	The aim of this course is to provide students with information about the production of renewable energy from animal, domestic and vegetal wastes or suitable biomass; to teach the structure, operation and design of biogas facilities. Definition of biogas and the resources used in biogas production, Biogas' potential in the world as a new energy source and comparison with other energy sources, Stages of				

	formation of biogas, Basic parameters and criteria affecting biogas production, Comparison of the anaerobic reaction method with other biological methods, Biogas production Reactor Models, Biogas reactor design techniques and calculations, separation of pollutants in biogas, usage areas of biogas, combustion of biogas and adiabatic flame temperature calculation, evaluation of biogas production wastes, cost calculations of biogas production systems.

CVM703	**Instrumental Analysis and Evaluation Methods in Environmental Engineering**	3	0	3	8
Purpose and Content	The aim of the course is to give knowledge about Introduction and application of instrumental analytical methods in environmental engineering and science. Objectives of instrumental analysis, Sampling and sample preparation methods, Solid phase, liquid-liquid and solid-liquid extraction, spectroscopy, chromatography, Basic statistical evaluation.				

CVM734	**Biomass technology and biofuels**	3	0	3	8
Purpose and Content	The aim of the course is to provide description about biomass as a renewable energy source,To provide information on basic concepts of biomass conversion technologies, To provide information on biofuels and biofuel production. Definition of biomass, Biomass resources, structure and properties of biomass, biomass conversion technologies, thermochemical technologies, biological technologies, liquefaction of biomass, pyrolysis of biomass, hydrothermal process, products derived from biomass, bioethanol, biodiesel, activated carbon production, biofuels, advantages of biofuels, environmental impacts, potential of biofuels in the future.				

CVM 760	**Geotechnical Management of Waste by-products**	3	0	3	8
Purpose and Content	The objective of this course is to teach the basic and advanced problems regarding the landfilling of waste by products in terms of both Geotechnical and Environmental concerns. The course content includes: An overview on waste-by products including both industrial and agricultural waste by products; An overview on Geotechnical Engineering concepts; An overview on soil stabilization concepts; An overview on general parameters affecting soil stabilization; An overview on problems associated with traditional stabilizers; An overview on problems associated with landfilling the waste-by products from both geotechnical and environmental perspectives, An investigation on the mechanisms of soil stabilization by waste by-products, An overview on general and advanced parameters affecting soil behaviour during stabilization period including type of waste by products, curing times, improvement methods, soil types, curing conditions, etc.				

CVM 759	**Sustainable-Environmentally Friendly Improvement of problematic soils**	3	0	3	8
Purpose and Content	The objective of this course is to teach the Geotechnical aspects of problematic soils and their issues for environmental engineering projects. By and large, the main aims of this course, among others, are to replace the traditional methods for soil improvements with sustainable, modern and environmentally friendly approaches. The course content includes: Principles of sustainability in geo-environmental engineering area; Properties and testing of problematic soils; Issues related to traditional stabilization of problematic soils; Issues related to the problematic soils from environmental and geotechnical engineering; Soil improvement mechanism, The difference between soil stabilization method and soil reinforcement method; Engineering properties and use of sustainable and environmental friendly materials in soil improvement.				

CVM 739	**Turkey environmental problems**	3	0	3	8
Purpose and Content	İngilizce metinIn the context of globalization, to gain the ability to have some suggestions for the urban and industrial environmental problems that arise in Turkey and their solutions.Turkey's priority environmental problems, comparison of provinces and periods; Causes, solution and prevention of environmental problems.				

CVM711	**Ecotoxicology I**	3	0	3	8
Purpose and Content	The aim of this course are definition and classification of toxicology, detection methods of harmful chemicals important for human health and environment in the environment, the importance of pollution caused by these chemicals for human health, internationally valid test methods and professional terms used in these tests etc. To increase the knowledge and skills of students on issues.				

CVM 745	**Environmental Applications of Microwaves**	3	0	3	8
Purpose and Content	To gain the ability to use microwaves tecnology in soil and water pollution improvement and waste applicationsMicrowave heating theory, The use of microwaves in waste sludge, water and medical waste, the use of microwaves in soil remedition, The use of microwaves in the decontamination of organic compounds and toxic metals, Microwave enhanced oxidation techniques, Heavy metal removal				

CVM732	**Industrial Pollution Management**	3	0	3	8
Purpose and Content	The aim of this course is to provide information about the definition and scope of industrial pollution, sources of pollution, monitoring of pollution and the necessary methods and methods for reducing and removing industrial pollution. Course content: Definition and scope of industrial pollution, sources of pollution, monitoring of pollution and necessary methods and methods for reducing and eliminating industrial pollution. Examples of pollution sources and pollution removal methods in some industries. Types of waste and source of waste from industrial establishments. Measures to be taken to reduce industrial wastes, Source of wastewates and treatment methods of waste water, Sources of gas emissions and teratment methods, Noise pollution and control methods, Indoor pollution, Alternative treatment methods, Membrane treatment methods, Pollution sources and control methods by industrial plants and Information about common apps				

CVM736	**Geographic Information System Applications**	3	0	0	8
Purpose and Content	General Concepts and historical development of GIS. Basic map information. Satellites, detection systems and satellite image interpretation techniques. Use of remote sensing techniques in civil engineering. Geographic information systems (GIS). Definition, usage and application areas. GIS software. Applications in Türkiye and the World. Laboratory application examples				

CVM738	**Statistical Methods in Environmental Engineering**	3	0	0	8
Purpose and Content	Data types, sampling and data collection, frequency tables, data visualization, measures of central tendency (mean, mode, median), measures of dispersion (variance and standard deviation), introduction to probability, conditional probability and independence, probability density function. Distributions (Normal, Binomial, Bernoulli).				

CVM753	**Environmental Impacts of Transportation**	3	0	3	8
Purpose and Content	The course aims to contribute to transport engineering by addressing issues such as the environmental impacts of transport, their generation, the effective parameters, the differences according to the type of transport, the measures to reduce them, the costs of these impacts and their place in transport planning.				

CVM715	**Biotechnology Applications in Environmental Engineering**	3	0	3	8
Purpose and Content	The aim of the biotechnology in environmental engineering course: Development of scientific abilities related to environmental issues in the bio-industry, monitoring of pollution, waste application, application of contaminated waters and regions, prevention of pollution and discussion of methods and methods that can be applied for these purposes. The content of this course consists of the following titles: environmental observation, wastewater application, cleaning technology, bioremediation, biotechnology and sustainable technology, biofuels, natural resource recovery, agricultural biotechnology, marine biotechnology, environmental management and law.				

CVM752	**The Production of Hydrogen Energy and Storage**	3	0	3	8
Purpose and Content	The purpose of the hydrogen energy and storage course is to teach students hydrogen production techniques, hydrogen storage principles and hydrogen fuel cells. Course content: Classical and renewable energy sources, properties of hydrogen, hydrogen and production methods, obtaining hydrogen as fuel and converting it into energy, storage and transportation of hydrogen and its problems, hydrogen technologies, advantages and disadvantages of hydrogen energy, hydrogen energy consumption, hydrogen energy generators, It consists of the following topics: hydrogen as the fuel of the future, thermodynamics of hydrogen energy producers, hydrogen system selection, fuel cells.				

CVM740	**İngilizce ders adını buraya yazınız**	3	0	3	8
Purpose and Content	The objective of the course is to teach the students sustainability in the energy and environmental framework. Show them to learn technology and technology dependent energy policy options and provide an assessment frame work to produce alternative solutions. In this respect, the conventional and renewable energy resources and the existing and future's technologies will be examined in relation to their environmental strengths and weaknesses. Their economic viability and their ability to satisfy the ever evolving regulatory expectations of the world community. Course Content: The energy use in the view of sustainability, resource availability, technical performance, environmental effects, and economics; fossil fuels: coal, petroleum and natural gas; renewable energy sources: solar, wind, geothermal, tidal, biomass and hydro; nuclear power.				

CVM749	**Advanced Analytical Chemistry**	3	0	3	8
Purpose and Content	Objectives of the Course: Having received advanced education in the field of Analytical Chemistry, reaching a universal level in research, and providing knowledge and communication skills on spectroscopy, chromatography and electroanalytical chemistry at national and international levels. Course Content: The basic principles of calibration, linear calibration model and the linear calibration errors, alternative types of calibration, the reliability of analytical measurements, trace analysis, precision, analytical results, presentation, analytical interpretation of results, data analysis, foundations, pile analysis, classification: data structures, modeling, analytical, images, multi-component analysis				

CVM750	**Atomic Absorption Spectroscopy**	3	0	3	8

Purpose and Content	Objectives of the Course: To give information about Atomic Absorption Spectroscopy, which is one of the modern Instrumental Analysis techniques, to give information about the parts of Atomic Absorption Spectroscopy, to give detailed information about sample preparation and measurement methods, to explain its importance in the literature. Course Content: Atomic Absorption Spectroscopy; absorption and concentration relationship, atomic absorption spectrometry, light sources, atomization systems, optical system, wavelength selection, detectors, signal, increasing S/N ratio, interference phenomena, selection of analytical line, optimization of measurement conditions, measurement process, calibration procedures, accuracy , analytical sensitivity, sample preparation, enrichment and separation techniques, indirect determinations by atomic absorption spectroscopy, applications

CVM751	**Structure Elucidation By Mass Spectroscopy**	3	0	3	8
Purpose and Content	Objectives of the Course:To provide students with knowledge about the interpretation of mass spectra of organic and inorganic compounds and the elucidation of their structures. Course Content: Basic principles, Mass spectrometry and ionization methods, Mass spectrum and peak types, Molecule ion peak, Molecule division peaks, Ion-molecule peaks, Double charged ion peaks, Metastable peaks, Finding the molecular formula, Types of molecule division, Molecular division of functional compounds (Alkanes, cycloalkanes, alkenes, arenes, alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids, amines, amides, nitriles, nitro compounds, sulfur compounds, halogenated compounds) Structure analysis and evaluated mass spectrum examples.				