ENVIRONMENTAL ENGINEERING

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY

ENVIRONMENTAL ENGINEERING

The mission of the Environmental Engineering Department is to provide the high quality environmental engineering education as required by the industry and the public; to advance the understanding and application of the principles of environmental science and engineering; to enhance and maintain sustainable economic development efforts and to improve the well-being of the society in general through teaching, research and community outreach programs.

Content

Message from the Chair

Environmental Engineers are the technical professionals who identify and design solutions for environmental problems. Environmental Engineers provide safe drinking water, treat and properly dispose of wastes, maintain air quality, control water pollution, and remediate contaminated sites due to spills or improper disposal of hazardous substances. They monitor the quality of the air, water, and land, and they develop means to protect the environment. Environmental Engineers work in many venues, including engineering consulting firms that design and construct air and water pollution-control systems; industries that need to treat air or wastewater discharges; private and municipal groups that supply drinking water; companies that treat and dispose of hazardous chemicals; governmental agencies; laboratories that develop pollution-control systems; agencies that transfer knowledge to the developing world; and public interest groups that advocate environmental protection.

Therefore, the curriculum in the department is structured to provide students with appropriate background in the physical, chemical, biological and engineering sciences together with the mathematical, planning, management, analysis and design tools necessary to address complex environmental engineering concerns.

Prof. Bülent İçgen

About Us

The Department of Environmental Engineering has been established in January 1973 as the first department in environmental engineering program in Turkey. The establishment was in response to the growing concern over the environment and the need for fully qualified engineers capable of undertaking professional responsibilities for optimum development and prudent management of water, air and land resources. This department evolved from the Sanitary Engineering division of the Civil Engineering Department, which had been offering graduate courses in this field since 1967. As a distinct department, the Department of Environmental Engineering has started undergraduate education in 1978 and had its first graduates in 1982. The first PhD degree was given in 1988. Today our department accepts students with the highest scores taken from Turkey's National Placement Examination among all other environmental engineering departments nationwide. Our department is the first Environmental Engineering Department in Turkey that has been accredited for its undergraduate program by ABET (Accreditation Board of Engineering and Technology). In 2002, our undergraduate program obtained substantial equivalency from ABET and the program has been accredited by the Engineering Accreditation Commission of ABET since 2007.

Graduates of our department are expected to identify and contribute to the solution of current and emerging envi- ronmental problems in a creative and independent manner. In this regard, our graduates have a highly wide range of employment opportunities and the rate of employment among them is considerably high, more than 85%. As of 2020, about 15% of our employed graduates have been working abroad. The highest proportion of our graduates (about 65%) are employed under private sector in establishments such as Tüpraş, Petkim, MNG Holding, Yüksel Proje, TAI (Turkish Aerospace Industries), REC Türkiye, DOKAY Engineering and Consultancy Ltd. Co., ENKON, Technology Development Foundation of Turkey (TTGV). Almost 25% of our graduates are employed in the public institutions such as Ministry of Environment and Urbanization, Ministry of Forestry and Water Affairs, General Directorate of State Hydraulic Works, Energy Market Regulatory Authority, Ministry of Development and Ministry of Transport, Maritime and Communications. The remaining 10% is employed in Non-Governmental Organizations (NGOs), academia and others.

Facts and Figures

Founded in 1973

Duration of Study
Bachelor 4 years
Master 2 years

FULL-TIME FACULTY
7 Professors
2 Associate Professors
2 Assistant Professors

STUDENTS
341 Undergraduate
64 Graduate
20 International

2 Double Major
8 Minor

COURSE CREDITS
142 Undergraduate
21 Graduate

PROJECTS & PUBLICATIONS
48 TUBITAK projects
5 Int. research projects
13 BAP projects
6 DRFM projects
29 Consulting projects

69 National publications*
344 International publications*

*(journal/ proceeding) (for last 5 years)**

DEGREES
1589 B.Sc.
375 M.Sc.
46 Ph.D.

Undergraduate Curriculum

First Semester

MATH119	Calculus with Analytic Geometry	(4-2)5
PHYS105	General Physics I	(3-2)4
CHEM107	General Chemistry	(3-2)4
ENVE101	Introduction to Environmental Engineering	(2-0)2
ENG101	English for Academic Purposes I	(4-0)4
OHS 101	Occupational Health and Safety I	NC
IS100	Introduction to Information Technologies and Applications	NC

Second Semester

MATH120	Calculus for Functions of Several Variables	(4-2)5
PHYS106	General Physics II	(3-2)4
CE101	Civil Engineering Drawing	(2-2)3
ENVE102	Environmental Chemistry I	(3-0)3
CENG240	Programming with Python for Engineers	(2-2)3
ENG102	English for Academic Purposes II	(4-0)4

Third Semester

ENVE201	Fundamentals of Environmental Engineering Processes	(3-0)3
MATH219	Introduction to Differential Equations	(4-0)4
ES223	Statics and Strength of Materials	(4-0)4
CHEM229	Organic Chemistry for Engineers	(3-2)4
ENVE208	Environmental Chemistry Laboratory	(1-4)3
ENG211	Academic Oral Presentation Skills	(3-0)3
HIST2201	Principles of Kemal Atatürk I	NC

Course Descriptions

ENVE101 Introduction to Environmental Engineering (2-0)2
Scope, definition and historical development of Environmental Engineering. Overall and coherent view of environmental engineering concepts and environmental engineering education. Technical, economical and organizational considerations of environmental quality management. Environmental ethics.

ENVE102 Environmental Chemistry I (3-0)3
Scope of environmental chemistry. Discussion of important relevant concepts of chemistry, and introduction of basic environmental chemical concepts including pH, alkalinity, hardness, dissolved oxygen, Biochemical Oxygen Demand (BOD), and Chemical Oxygen Demand (COD). Acid-base chemistry and its significance in environmental engineering. Dissolution and precipitation chemistry, and chemical precipitation reactions in water and wastewater treatment. Coordination chemistry, oxidation and reduction chemistry and its environmental chemical applications.

ENVE201 Fundamentals of Enviromental Engineering Processes (3-0)3
Introduction to environmental engineering calculations; analysis of pollution control processes: chemical and biochemical kinetics, mass balances, reactor analysis, energy balances, mass-transport processes with particular emphasis on examples of environmental pollution control processes.

ENVE202 Environmental Microbiology (3-2)4
Introduction to general microbiology. Water and wastewater microbiology. Degradation metabolism of compounds by microorganisms. Enzyme kinetics. Batch growth kinetics. Recycling of minerals and nutrients. Epidemiology and control of diseases. Biological safety.

ENVE206 Physico-chemical Principles of Environmental Engineering (3-0)3
Colloidal systems. Analysis of Brownian motion and diffusion. Behavior of particles under gravitational force. Electrical properties of particles. Mechanisms for coagulation. Mechanisms of flocculation. Behavior of gases. Phase equilibria. Transport properties.

ENVE208 Environmental Chemistry Laboratory (1-4)3
Laboratory experience for various areas of environmental chemistry. Laboratory rules and safety regulations. Selected experiments; instrument calibration, volumetric analysis, gravimetric analysis, optical methods of analysis.

ENVE300 Summer Practice I (Non-Credit)
The third-year undergraduate students of the Environmental Engineering Department are required to make a summer practice for 20 working days and submit reports, which are evaluated as part of their academic performance. The practice involves mainly observing a treatment system in operation and evaluating its performance.

Undergraduate Curriculum

Fourth Semester

ENVE206	Physicochemical Principles of Environmental Engineering	(3-0)3
ES303	Statistical Methods for Engineers	(3-0)3
CHE204	Thermodynamics I	(4-0)4
ENVE202	Environmental Microbiology	(3-2)4
ENVE307	Air Pollution	(3-0)3
HIST2202	Principles of Kemal Atatürk II	NC

Fifth Semester

ENVE303	Unit Operations and Processes of Water Treatment	(3-0)3
ENVE309	Fundamentals of Biological Treatment	(3-0)3
CE375	Environmental Engineering Hydrology	(3-0)3
CE374	Fluid Mechanics	(3-0)3
	Non-Technical Elective*	
OHS301	Occupational Health and Safety II	NC
ENVE300	Summer Practice I	NC
TURK303	Turkish I	NC

Sixth Semester

ES361	Computing Methods in Engineering	(3-0)3
ENVE304	Unit Operations and Processes of Wastewater Treatment	(3-0)3
ENVE312	Water Supply and Urban Drainage	(3-0)3
ENVE322	Transport Processes in Environmental Engineering	(3-0)3
	Restricted Elective*	
	Non-Technical Elective*	
TURK304	Turkish II	NC

Course Descriptions

ENVE303 Unit Operations & Processes of Water Treatment (3-0)3
Screening, coagulation and flocculation, sedimentation and flotation, ion removal by chemical precipitation, disinfection, ion exchange, adsorption, membrane processes and solids handling.

ENVE304 Unit Operations & Processes of Wastewater Treatment (3-0)3
Types and characteristics of wastewaters, screening-shredding, grit removal, equalization, sedimentation, floatation, gas transfer (aeration, stripping), principles of biological treatment, biological treatment processes (activated sludge and modifications, biological nutrient removal systems, membrane bioreactors, anaerobic treatment units, attached growth systems, oxidation ponds), chemical precipitation, membrane processes, advanced oxidation processes, adsorption, sludge processing and disposal.

ENVE307 Air Pollution (3-0)3
Atmosphere and its composition. Sources and scales of air pollution. Effects of air pollution on human, animals, plants and structures. Atmospheric chemistry and photochemical smog. Ambient air sampling, measurement and analysis. Air pollution monitoring. Role of meteorology on air pollution. Air quality criteria. Emission and emission standards. Stack gas sampling and analysis. Dispersion of air pollutants. Emission inventory. Introduction to air pollution modeling.

ENVE309 Fundamentals of Biological Treatment (3-0)3
Introduction to continuous culture kinetics, inhibited growth kinetics. Chemostat cultures, deviation from ideal, chemostat cultures with biomass recycle. Plug-flow cultures. Fed-batch and repeated batch cultures. Introduction to activated sludge process kinetics. Nitrification and denitrification systems. Basics of anaerobic suspended culture systems. Microbiology of wastewater treatment.

ENVE312 Water Supply and Urban Drainage (3-0)3
Water management. Sources of water. Population estimation. Water Demand/Use and Wastewater Generation. Water transmission. Water distribution components. Pumps. Design of water distribution systems. Components and characteristics of sewage. Sewer appurtenances and special structures. Design principles of sanitary, storm and combined sewers. Stormwater management.

ENVE322 Transport Processes in Environmental Engineering (3-0)3
Reactive and nonreactive environmental processes. Mass transport processes in environmental media–air, water and soil. Heat transport. Mass transfer and transformation processes. Development of governing equations for combinations of transport, transfer and transformation processes in environmental systems. Computational aspects of environmental mass and heat transport processes.

Undergraduate Curriculum

Seventh Semester

ENVE 404	Environmental Modeling	(3-0)3
ENVE 407	Environmental Engineering Design I	(2-2)3
ENVE 412	Solid Waste Management	(3-0)3
	Technical Elective*	
	Technical Elective*	
ENVE 400	Summer Practice II	NC

Eighth Semester

ENVE 408	Environmental Engineering Design II	(2-2)3
	Technical Elective*	
	Technical Elective*	
	Technical Elective*	
	Free Elective*	

Course Descriptions

ENVE400 Summer Practice II (Non-Credit)
The fourth-year undergraduate students of the Environmental Engineering Department are required to make a summer practice for 20 working days and submit reports, which are evaluated as part of their academic performance. The practice involves mainly environmental management, treatment system design, etc.

ENVE404 Environmental Modeling (3-0)3
Scope of environmental modeling. Fundamentals of mathematical modeling. System analysis and modeling. Modeling engineered and natural environmental systems. Development and application of mathematical models for selected engineered and natural environmental systems. Computer applications related to analytical and numerical solutions of model equations using various software packages. Model development and application.

ENVE407 Environmental Engineering Design I (2-2)3
Concepts in engineering design, engineering ethics, principles of project management, environmental legal infrastructure, treatment plant processes, plant hydraulics and sludge handling, application of environmental engineering principles on open ended design problem software applications in process selection and design.

ENVE408 Environmental Engineering Design II (2-2)3
Continuation of ENVE 407, tender management, safety and economical considerations in engineering design, cost analysis and project evaluation, detailed design applicable to the problem, completion of a design project in teams with a final report and presentation.

ENVE412 Solid Waste Management (3-0)3
Generation of solid wastes. On-site handling, storage and processing. Collection, transfer and transport of solid wastes. Processing techniques and equipment. Recovery of resources, conversion products and energy. Disposal methods for solid wastes and residual matter: Sanitary landfill, incineration, composting and other techniques.

Graduate Curriculum

M.S. in Environmental Engineering

ENVE 500	M.S. Thesis	NC
ENVE 590	Research Methods & Ethics in Environmental Engineering	(0-0)NC
ENVE 598	Graduate Seminar in Environmental Engineering II	(0-0)NC
ENVE 599	Graduate Seminar in Environmental Engineering I	(0-0)NC
	7 Elective Courses	

Total minimum credit: 21
Number of courses with credit (min): 7

Ph.D. in Metallurgical and Materials Engineering

ENVE 600	Ph.D. Thesis	NC
ENVE 590	Research Methods & Ethics in Environmental Engineering*	(0-0)NC
ENVE 698	Graduate Seminar in Environmental Engineering III	(0-0)NC
ENVE 699	Graduate Seminar in Environmental Engineering IV	

*If not taken previously

Total minimum credit: 21
Number of courses with credit (min): 7

Ph.D. on B.S. in Environmental Engineering

ENVE 590	Research Methods & Ethics in Environmental Engineering	(0-0)NC
ENVE 598	Graduate Seminar in Environmental Engineering II	(0-0)NC
ENVE 599	Graduate Seminar in Environmental Engineering I	(0-0)NC
ENVE 600	Ph.D. Thesis	NC
ENVE 698	Graduate Seminar in Environmental Engineering III	(0-0)NC
ENVE 699	Graduate Seminar in Environmental Engineering IV	(0-0)NC
	14 Elective Courses	

Total minimum credit: 42
Number of courses with credit (min): 14

Course Descriptions

ENVE500 M.S. Thesis (Non-Credit)
Program of research leading to M.S. degree arranged between student and a faculty member. Students register to this course in all semesters while the research program or write-up of thesis is in progress.

ENVE501 Pollution Control in Sea Environment I (3-0)3
Hydrodynamic/oceanographic characteristics (current, turbulent mixing, density, structure, etc.). Waste dispersion characteristics. Turbulent diffusion / dispersion theories. Turbulent diffusion / dispersion measurements. Dilution and mixing of pollutants and heated discharges from sea outfalls. Jet and plume mixing. turbulent buoyant jets in uniform and stratified environments.

ENVE502 Modelling Soil and Groundwater Pollution (3-0)3
Mathematical models for flow and transport of contaminants in soil and groundwater systems. Analytical and numerical solutions of mathematical models. Stochastic aspects of subsurface flow and contaminants. Case studies and applications of selected computer programs to investigate problems of various complexity. Current research topics and directions.

ENVE503 Industrial Water and Wastewater Treatment (3-0)3
Industrial wastewater and sludge treatment with special reference to hazardous wastes. Case studies for various industries; characteristics and composition of the wastes and availability of waste treatment technology. Radioactive and thermal pollution control.

ENVE504 Pollution Transport in River Systems (3-0)3
Introduction to advanced river water quality models. General model formulation structures. Constituent reactions and interrelationships. Computer applications to selected cases. Uncertainty analysis.

ENVE505 Industrial Air Pollution Control (3-0)3
Air pollution indices. Planning industrial air pollution survey; sources, inventories, emission factors, other factors, stack sampling; isokinetic sampling, sampling trains. Area sampling for industrial pollutants. Air quality monitoring design for industrial areas. Various strategies for industrial air pollution control.

ENVE506 Advances in Water Supply Engineering (3-0)3
Use of computer models for pipe sizing of distribution network design. Computer analysis of pipe networks (Lopp and Node Methods; Optimization of Networks with Discrete Methods; Extended Period Simulation). Treatment of waters, which requires non-standard (special techniques) approaches.

ENVE507 Advanced Water and Wastewater Treatment (3-0)3
Purpose and benefits of advanced treatment; processes for solids removal. Processes for nutrient removal. Membrane processes, biological-chemical treatment, physical- chemical treatment. Selecting and combining unit processes to obtain the desired water quality.

Graduate Curriculum

Course Descriptions

ENVE508 Advanced Topics in Atmospheric Dispersion (3-0)3
Review of dispersion characteristics of the atmospheric boundary layer. Complex models of dispersion. Numerical modelling techniques. Heavy gas dispersion. Effects of clouds in dispersion. Deposition of pollutants on soil and water. Complex terrain dispersion. Effects of buildings on dispersion. Dispersion in buildings. Design of monitoring programs for atmospheric air quality.

ENVE509 Contaminated Site Remediation (3-0)3
Properties of the contaminants, phase distribution, source control; site characterization and monitoring (vadose zone and aquifer characteristics, extent of contamination); in situ soil and groundwater remediation technologies e.g., pump and treat, capture zone analysis, permeable reactive barriers, air sparging, soil vapor extraction, bioventing, land treatment, monitored natural attenuation; design, operation and performance assessment of the remedial systems; remedial goal and risk assessment; assessment of remedial alternatives, cost analyses; case studies and computer applications on remedial systems.

ENVE510 Principles of Risk Assessment and Management (3-0)3
Assessment of acute hazards of toxic and flammable materials used in chemical industries. Hazard identification using fault trees, and consequence assessment using mathematical models. Physical principles of consequence modeling. Estimation of industrial risks and comparison with other commonly understood risks. Risk management decision making in design of chemical industries and land use planning.

ENVE513 Atmospheric Chemistry (3-0)3
Description of the atmosphere. Greenhouse effect. Stratospheric ozone. Photochemical smog. Acid rain. Brief introduction to atmospheric aerosols.

ENVE531 Environmental Applications of Biomolecular Engineering (3-0)3
Problems posed by natural and engineered environments for monitoring microorganisms; advantages and pitfalls of molecular techniques for microbial community analyses, FAME, PCR, 16S/18S rRNA sequencing, phylogenetic analysis and relationship between phylogenetic information and ecological function of the microbial communities; profiling of complex microbial populations by DGGE, TTGE, SSCP, RAPD, ARDRA, T-RFLP, LH-PCR, and RISA; enumeration, identification and monitoring of pollutant-degrading bacteria by using nucleic acid probes, FISH, MAR and SIP; omic technologies and post-genomic approaches, applications, applications of these biomolecular methods in environmental engineering.

ENVE532 Environmental Biotechnology (3-0)3
Advanced biological reactors, enzyme reactors, treatment with immobilized cells and enzymes, biodegradation of unusual compounds and tests for biodegradability, effect of metals on biological kinetics, biological recycling of mineral wastes and residues, thermophilic microorganisms and their application to waste treatment.

ENVE535 Advanced Biological Treatment (3-0)3
Review of biological treatment processes. Mechanism, kinetics and microbiology of nutrient removing activated sludge. IAWQ Task group models for nutrient removing activated sludge. Calibration techniques for the Task group models. Hands-on practice with SSSP and ASIM computer models. Microbiology of bulking and population dynamics of activated sludge. Sequencing batch, GAC and PAC activated sludge.

ENVE538 Advanced Environmental Chemistry (3-0)3
Nature and properties of environmental chemistry. Ingredients of environmental chemical work, sampling and sample storage, analysis method adoption and standard methods of analysis, chemicals for environmental analysis, their grades and purification techniques. Primary standards in environmental chemical work. Case studies.

ENVE539 Environmental Systems Engineering (3-0)3
Handling and treatment of engineering data. Experimental design. Systems approach to problem solving. Formulation of management models. Linear and nonlinear programming. Selected applications in water, air, and soil quality management, solid and hazardous waste management..

ENVE540 Heuristic Optimization and Modeling of Environmental Systems (3-0)3
Introduction to heuristic optimization and modeling techniques; genetic algorithms; ant colony optimization; neural networks; simulated annealing; case studies on application of heuristic optimization and simulation methods to environmental engineering problems including air pollution control, groundwater remediation, solid waste management, water quality management.

ENVE541 Anaerobic Treatment of Wastes (3-0)3
Chemistry, microbiology. Environmental requirements and control conditions for anaerobic treatment. Toxic materials and their control. Process design. Anaerobic treatment of organic wastes. Advances in anaerobic pond system design. Anaerobic treatment modeling. Energy recovery, effluent treatment of wastes. Anaerobic sludge treatment, utilization of digested sludge. Biogas recovery from anaerobic treatment plants.

Graduate Curriculum

Course Descriptions

ENVE547 Marine Pollution (3-0)3
Present health of the oceans. The need of contarol of pollution due to potentially harmful substances in the ocean. Definition of potentially harmful substances; Inorganics, organics, radioactive matter, solid waste. Marine environment as a waste receiving body Environmental capacity. Potential impairment of marine ecosystems and water uses. Case studies.

ENVE573 Fate of Pollutants in the Environment (3-0)3
Fundamental concepts regarding the fate of a pollutant once released into the environment. Classification of pollutants, equilibrium partitioning between gaseous, liquid and solid phases: vapor pressure, solubility in water, air-organic solvent, air-water partitioning, organic liquid-water partitioning, sorption, solid-water distribution, partitioning to living media. Abiotic and biotic transformation processes: hydrolysis, redox and photochemical reactions, biodegradation. Transport of pollutants and modeling concepts. Case studies.

ENVE590 Research Methods and Ethics in Environmental Engineering (0-0)NC
Research methods, ethics and ethical conduct in engineering research, setting a research goal, structuring a research plan, designing an independent research proposal, ethical behavior in academic writing and presentation.

ENVE598 Graduate Seminar in Environmental Engineering II (0-0)NC
It is a course in which a seminar is given by the M.S. and Ph.D. on B.S. candidates once during their graduate study. The candidate is expected to present of his/her thesis and the initial findings of his/her thesis, if available.

ENVE599 Graduate Seminar in Environmental Engineering I (0-0)NC
This is a graduate seminar course in the M.S. and Ph.D. on B.S. programs. Students register to this course once during their graduate study.

ENVE600 Ph.D. Thesis (Non-Credit)
Program of research leading to Ph.D. degree arranged between student and a faculty member. Students register to this course in all semesters while the research program or write-up of thesis is in progress.

ENVE698 Graduate Seminar in Environmental Engineering III (0-0)NC
It is a course in which a seminar is given by the Ph.D. on B.S. and Ph.D. candidates once during the graduate study. The candidate is expected to present the proposal of his/her thesis and the initial findings of his/her thesis, if available.

ENVE699 Graduate Seminar in Environmental Engineering IV (0-0)NC
This is a graduate seminar course in the Ph.D. on B.S. and Ph.D. programs. Students register to this course in one of their first four semesters of their study in any semester other than the one they enroll in ENVE698.

ENVE707 Energy and the Environment (3-0)3
Energy resources in the world and in Turkey. Efficient use of resources, energy conversion technologies and their general environmental impacts, traditional and advanced energy conversion technologies based on fossil fuels, renewable energies and applications, sustainability in energy production. Green House Problem, CO2 capture and CO2 sequestration technologies, recent advances in research in this field. Comparative analysis of the existing systems with new systems and case studies on specific applications. biological kinetics, biological recycling of mineral wastes and residues, thermophilic microorganisms and their application to waste treatment.

ENVE742 Remote Sensing for Environmental Engineers (3-0)3
Introduction to remote sensing science and technology, data sources and structures; use of remote sensing in environmental problem detections; applications in the literature for various environmental problems and environmental system management; example applications for monitoring and management of water, soil, and air quality as well as contemporary environmental issues.

ENVE7xx Special Topics in Environmental Engineering (3-0)3
Courses not listed in the catalogue are given as Special Topics courses. Contents vary from year to year according to interest of students and instructor in charge. Courses include various environmental engineering topics.

ENVE8xx Special Studies (4-2)NC
M.S. students choose and study a topic under the guidance of a faculty member, normally his/her supervisor.

ENVE9xx Advanced Studies (4-0)NC
Graduate students as a group or a Ph.D. student choose and study advanced topics under the guidance of a faculty member, normally his/her supervisor.

Minor Programs

Minor Program in Environmental Chemistry

This program aims to provide an opportunity to the students to gain expertise in one of the sub-areas of the Environmental Sciences, namely Environmental Chemistry. This program is designed with the consideration of the modern concepts of Environmental Chemistry and laboratory training related to the environmental sampling and analysis.

Compulsory courses:

ENVE102	Environmental Chemistry I	(3-0)3
ENVE206	Physico-Chemical Principles of Environmental Engineering	(3-0)3
ENVE208	Environmental Chemistry Laboratory	(1-4)3
ENVE424	Instrumental Analysis in Environmental Engineering	(2-2)3
	2 of the following courses	
ENVE201	Fundamentals of Environmental Engineering Processes	(3-0)3
ENVE301	Environmental Pollution and Ecology	(3-0)3
ENVE307	Air Pollution	(3-0)3
ENVE310	Public Health	(3-0)3
ENVE330	Principles of Environmental Engineering	(2-2)3

Minor Program in Environmental Microbiology

This program aims to provide an opportunity to the students to have more expertise in one of the sub-areas of the Environmental Sciences, namely Environmental Microbiology. This program is designed with the consideration of the modern concepts of Environmental Microbiology and laboratory training.

Compulsory courses:

ENVE202	Environmental Microbiology	(3-2)4
ENVE301	Environmental Pollution and Ecology	(3-0)3
ENVE309	Fundamentals of Biological Treatment	(3-0)3
ENVE431	Molecular Tools in Environmental Engineering	(3-0)3
	2 of the following courses	
ENVE201	Fundamentals of Environmental Engineering Processes	(3-0)3
ENVE310	Public Health	(3-0)3
ENVE330	Principles of Environmental Engineering	(3-0)3
ENVE402	Wastewater Reuse	(3-0)3
ENVE424	Instrumental Analysis in Environmental Engineering	(2-2)3

Research Interests

The major research activities of the Department of Environmental Engineering are: water pollution and its control; protection of water resources against pollution; drinking water supply and delivery; drinking water treatment plant system selection and planning; drinking water quality assessment; sewer and rain water supply network design; domestic and industrial wastewater treatment plant system selection, planning and operation; biomolecular analysis; discharge of treated wastewaters into receiving bodies, investigation and modelling of its possible effects; air pollution and its control; identification, monitoring, modelling and control of air pollutants resulting from heating, traffic, industry and energy production, and application of clean technologies; evaluation and planning of clean production technologies; planning related to reduction of carbon footprint; recycling and disposal processes; protection of the soil and groundwater resources against pollution; remediation of contaminated sites; environmental management and planning; pollution prevention; development of environmental regulations; development of new regulations during EU harmonization process; preparation of Environmental Impact Assessment (EIA) reports for industrial and infrastructure investments, and the process monitoring; disposal of hazardous and harmful wastes; analysis, treatment and discharge of sludge; risk assessment and analysis.

Research Laboratories

Unit Operations and Processes Laboratory

Facilities for controlled experimentation exist in this laboratory for various unit operations involved in environmental engineering such as filtration, sedimentation, aeration, etc. The units are equipped with measuring and control instrumentation for performance evaluation and flexible operation

Chemistry Laboratory

Basic facilities are available for undertaking chemical, instrumental and other analysis work routinely made in environmental engineering and sciences. This laboratory is also used for teaching purposes of related courses.

Microbiology Laboratory

Basic facilities are present for undertaking routine microbiological analysis in this laboratory. The laboratory is also equipped with research equipment including respirometers, biological reactors and AOX instrument. Laboratory is used for teaching purposes in the related courses.

In this laboratory contaminant characterization in surface waters, groundwater, and soil can be realized. Experimental remediation studies are performed. Column experiments for transport of contaminants in subsurface can be conducted.

Air Pollution Control Laboratory

In this laboratory facilities for sampling and analysis of various air pollutants are present. Emission, immision and meteorological measurements can be done with the equipment available in the laboratory.

Instrumental Analysis Laboratory

In this laboratory accredited analytical work is conducted under the quality standard of TS EN ISO/IEC 17025 Standard for General Requirements for the Competence of Calibration and Testing Laboratories. This laboratory can only be used by authorized personnel. Analyses are conducted for public institutions and private companies.

Contaminant Hydrology Laboratory

In this laboratory contaminant characterization in surface waters, groundwater, and soil can be realized. Experimental remediation studies are performed. Column experiments for transport of contaminants in subsurface can be conducted.

Membrane Wastewater Treatment Plant

The University has an advanced biological treatment plant, which was erected and commissioned in 2003 through a joint project with Berlin Technical University and Environmental Engineering Department of METU. The plant was designed to treat wastewaters originating from the faculty housing and the dormitories. The plant consists of two units: a biological treatment tank and a membrane bio-reactor. The wastewater with 200 m3/day flowrate first passes the fine screens, after which it goes into an aeration tank where it is biologically treated. A rotating vacuum membrane system separates biological sludge from the effluent, thereby producing a sparklingly clear and sterile effluent, which is used for the irrigation of lawns. The plant also serves as an experiment and demo unit to both graduate and undergraduate students and enables students and researchers operate the system under various conditions for experimental purposes. The plant has recently received Rio+20 Best Practice Examples on Sustainable Development-2012 award.

Anaerobic Biotechnology Laboratory

This laboratory has basic facilities and infrastructure required for environmental anaerobic biotechnology. Typical research conducted include biochemical methane potential analyses, treatability studies, granulation, production of renewable energy and bio-based chemicals from wastes, etc.

Student Computer Laboratory

The laboratory is designed for the use of graduate and undergraduate students. There are 30 PCs which are connected to 2 servers and to the campus network. Various software packages in the fields of water supply engineering, wastewater engineering, air pollution, soil and groundwater pollution, waste disposal, and river pollution are available for users.

Unix Laboratory

The laboratory is designed for the use of graduate students and research. There are 10 PCs that run under the linux operating system. Various software packages that require high computational power are available for users.

Major Devices Used in the Laboratory

Atomic Absorption Spectrophotometer
Autoclave
Carbon Analyzer
Clean Room
Gas Chromatography (GC)
High Performance Liquid Chromatography (HPLC)
Ion Chromatography (IC)
LC MS MS
PCR
Rotary Evaporator
Soxhlet Apparatus
Stack Gas Analyzer
Total Organic Carbon Analyzer (TOC)
UV Spectrophotometer

Faculty

Ayşegül Aksoy

Professor of Environmental Engineering

Post-doc: Civil and Environmental Engineering Dept. University of California at Davis, USA 2001
Ph.D: Civil Engineering University of Virginia, USA 2000
M.S: Environmental Engineering METU 1994
B.S: Environmental Engineering METU 1991

RESEARCH AREA:
Environmental systems engineering, Soil and ground-water pollution control, Water quality modeling and management
Environmental remote sensing

PUBLICATIONS:

• Duzgun, H. Sebnem; Uskay, S. Onur; Aksoy, Aysegul, Parallel Hybrid Genetic Algorithm and GIS-Based Optimization for Municipal Solid Waste Collection Routing, Parallel Hybrid Genetic Algorithm and GIS-Based Optimization for Municipal Solid Waste Collection Routing, Journal of Computing in Civil Engineering, 30(3): Article 04015037, 2016

• Gorguner, Merve; Aksoy, Aysegul; Sanin, F. Dilek, A transport cost-based optimization for recycling of municipal sludge through application on arable lands, Resources Conservation and Recycling, 94: 146-156, 2015.

• Kurt, M, Aksoy, A, Sanin, FD, Evaluation of solar sludge drying alternatives by costs and area requirements, Water Research, 82(SI): 47-57, 2015.

Filiz B. Dilek

Professor of Environmental Engineering

Post-doc: Civil Engineering (Environmental Engineering Group) University of New Castle upon Tyne, UK 1993-1994
Ph.D: Environmental Engineering METU 1991
M.S: Environmental Engineering METU 1985
B.S: Environmental Engineering METU 1982

RESEARCH AREA:
Water and wastewater treatment, Biological treatment of wastewaters, Industrial wastewater treatment, Microbiology of wastewater treatment, Physico-chemical treatment processes

PUBLICATIONS:

• Koc Orhon, K. B. Orhon, U. Yetis, F.B. Dilek. Fate of Triclosan in Laboratory-scale Activated Sludge Reactors - Effect of Culture Acclimation. Journal of Environmental Management, 216, 320-327, 2018.

• K. B. Orhon, A. Koc Orhon, F.B. Dilek, U. Yetis, Triclosan Removal from Surface Water by Ozonation - Kinetics and By-Products Formation, Journal of Environmental Management, 204, 327-336, 2017.

• Yukseler H, Uzal N, Sahinkaya E, Kitis M, Dilek FB, Yetis U. Analysis of the best available techniques for wastewaters from a denim manufacturing textile mill, Journal of Environmental Management, 203(3), 1118-1125, 2017.

Bülent İçgen

Professor of Environmental Engineering

Post-doc: Chemical Engineering University of Cape Town, South Africa 2003-2005
Ph.D: Biotechnology, METU, 2000
M.S: Biotechnology, METU 1994
B.S: Biology Hacettepe University 1990

RESEARCH AREA:
Bacterial degradation & transformation & detoxification, Bioremediation of contaminated environments, Biotechnology of aerobic & anaerobic waste treatment, Metabolic engineering & catabolic genes, Biomolecular tools in engineering applications, Biomarkers & bioindicators & DNA probes, Environmental omic technologies

PUBLICATIONS:

• Icgen, B. and Yilmaz, F. Biosorption of strontium from aqueous solutions by Micrococcus luteus Sr02 (2018) Geomicrobiology Journal, 35 (4), 284-293.

• Icgen, B. and Yilmaz, F. Screening and in situ monitoring of potential petroleum hydrocarbon degraders in contaminated surface water (2017) CLEAN -Soil, Air, Water, 45 (1), 1600194.

• Icgen, B. VanA-type MRSA (VRSA) emerged in surface waters (2016) Bulletin of Environmental Contamination and Toxicology, 97 (3), 359-366.

Faculty

İpek İmamoğlu

Professor of Environmental Engineering

Post-doc: Civil Engineering and Mechanics University of Wisconsin-Milwaukee, USA 2001
Ph.D: Civil Engineering and Mechanics University of Wisconsin-Milwaukee, USA 2001
M.S: Civil Engineering University of New Castle upon Tyne, UK1996
B.S: Environmental Engineering METU 1995

RESEARCH AREA:
Investigation of the fate of halogenated hydrophobic organic chemicals (such as PCBs, PBDEs, HBCD) in the environment via laboratory (biotic and abiotic microcosms, mesocosms) and modeling (such as chemical mass balance, factor analysis, positive matrix factorization, fate & transport model) studies.

PUBLICATIONS:

• Karakaş F., İ. İmamoğlu. " Estimation of Anaerobic Debromination Rate Constants of PBDE Pathways Using an Anaerobic Dehalogenation Model", Bulletin of Environmental Contamination and Toxicology, Apr; 98(4): 582-587 (2017).
• Demirtepe H., Kjellerup B., Sowers K.R. and İ. İmamoğlu "Evaluation of PCB dechlorination pathways in anaerobic sediment microcosms using an anaerobic dechlorination model", Journal of Hazardous Materials, 296 120-127 (2015).
• Gedik K., F. Demircioğlu and İ. İmamoğlu, "Spatial distribution and source apportionment of PCBs in sediments around Izmit industrial complexes, Turkey" Chemosphere, 81, 992-999 (2010).

F. Dilek Sanin

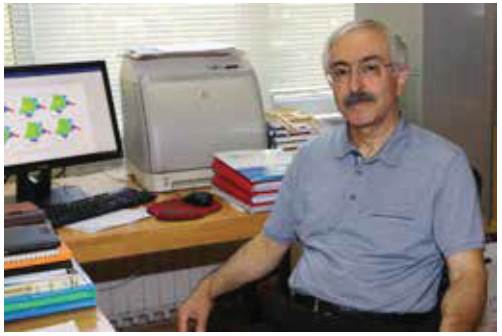
Professor of Environmental Engineering

Post-doc: Civil Engineering North Carolina State University, USA 1996 – 1998
Ph.D: Civil and Environmental Engineering Duke University, USA 1996
M.S: Environmental Engineering METU 1987
B.S: Environmental Engineering METU 1985

RESEARCH AREA:
Treatment and disposal of sludge, Wastewater treatment, Management of solid and hazardous wastes

PUBLICATIONS:

• Akdag, A. S., Atak O., Atimtay, A., Sanin, F. D. (2018) "Co-combustion of sewage sludge from different treatment processes and a lignite coal in a laboratory scale combustor" Energy, v.158, 417-426.
• Kaya, D., Imamoglu,I., Sanin, F. D., Payne, R. B., Sowers, K. R. (2017) "Potential risk reduction of Aroclor 1254 by microbial dechlorination in anaerobic Grasse River sediment microcosms" J of Hazardous Materials, v. 321, 879-887.
• Ömeroğlu, S., Sanin, F. D. (2016) "Bioelectricity Generation From Wastewater Sludge Using Microbial Fuel Cells: A Critical Review" Clean-Soil Air Water, v. 44, n. 9, 1225-1233.



Kahraman Ünlü

Professor of Environmental Engineering

Post-doc: Land, Air and Water Resources University of California at Davis, USA 1989-1990
Ph.D: Land, Air and Water Resources University of California at Davis, USA 1989
M.S: Agronomy Iowa State University, USA 1984
B.S: Agricultural Engineering Ankara University 1977

RESEARCH AREA:
Development, numerical implementation and application of mathematical models for flow and contaminant transport in subsurface and waste disposal systems, Management of solid and hazardous wastes, Groundwater risk assessment, Contam inated site (soil and groundwater) remediation, Flow and contaminant fate and transport in the subsurface environment

PUBLICATIONS:

• Polat, ., A. Aksoy and K. Ünlü. 2015. A fuzzy rule based remedial priority ranking system for contaminated sites, Groundwater. 53(2):317-327.
• engör, S.S. and K. Ünlü. 2013. Modeling groundwater contaminant transport and remediation at an acrylonitrile spill site in Turkey, Journal of Contaminant Hydrology. 150(2013):
-
• Çelik, B., S. Girgin, A. Yazıcı, and K. Ünlü, 2010. A Decision Support System for Assessing Landfill Performance, Waste Management, 30(1); 72-81.

Faculty

Ülkü Yetiş

Professor of Environmental Engineering

Post-doc: Environmental Engineering, METU 1990
Ph.D: Ph.D: Middle East Technical University Dept. of Environmental Engineering, 1988
M.S: Chemical Engineering University of Pittsburgh, USA 1982
B.S: Chemical Engineering METU 1981

RESEARCH AREA:
Physiochemical operations in water, Wastewater and hazardous waste treatment systems,Hazardous waste management, Applications of membranes processes for drinking water treatment and industrial wastewater treatment/reclamation, Integrated pollution prevention and control, Understanding õf disinfection by-product formation in water treatment

PUBLICATIONS:
• Yilmaz, O., Kara, B.Y., Yetis, U., Hazardous waste management system design under population and environmental impact considerations, Journal of Environmental Management, 203, December 2017, 720-731.
• Erkanlı, M., Yilmaz L., Yetis, U., Emecen-Culfaz, Z., Brackish water recovery from reactive dyeing wastewater via ultrafiltration, Journal of Cleaner Production, 165, November 2017,1204-1214.
• Olmez, G.M., Dilek, F.B., Karanfil, T., Yetis, U., The environmental impacts of iron and steel industry: a life cycle assessment study, Journal of Cleaner Production, 130, 1 September 2016, 195-201.

Emre Alp

Assoc. Professor of Environmental Engineering

Post-doc: Civil and Environmental Engineering Marquette University, USA 2007-2008
Ph.D: Civil and Environmental Engineering Marquette University, USA 2006
M.S: Civil and Environmental Engineering Marquette University, USA 2002
M.S: Environmental Engineering METU 1999
B.S: Environmental Engineering METU 1997

RESEARCH AREA:

Water-energy-food nexus, Watershed management, Environmental management and policy, Energy policy Environmental economics, Diffuse pollution, Water quality modeling, GIS and RS in watershed management,

PUBLICATIONS:
• Özcan Z., Kentel, E. and Alp, E., 2017, Evaluation of the Best Management Practices in a Semi-Arid Region with High Agricultural Activity, Agricultural Water Management, Vol. 540, 40-49.
• Özcan Z., Başkan O., Düzgün, H.B, Kentel, E., and Alp, E., 2017, A pollution fate and transport model application in a semi-arid region: Is some number better than no number? Science of the Total Environment, Vol. 595, 425–440.
• Özcan Z., Kentel, E. and Alp, E., 2016, Determination of unit nutrient loads for different land uses in wet periods through modelling and optimization for a semi-arid region, Journal of Hydrology, Vol. 540, 40-49.

Tuba Hande Ergüder Bayramoğlu

Assoc. Professor of Environmental Engineering

Post-Doc: Biochemical and Microbial Technology Ghent University, Belgium 2007-2008
Post-Doc.: Environmental Engineering METU 2005-2007
Ph.D: Environmental Engineering METU 2005
M.S: Environmental Engineering METU 2000
B.S: Environmental Engineering METU 1998

RESEARCH AREA:
Anaerobic biotechnology, Renewable energy and bio-based products, Bio-granulation, Agro-industrial waste treatment, Removal of chlorinated compounds, Biological nitrogen removal

PUBLICATIONS:
• Akman M.C., Erguder T.H., Gunduz U., Eroglu İ., 2015. Investigation of the effects of the initial substrate and biomass concentrations and the light intensity on photofermentative hydrogen gas production by response surface methodology. Intern. J. Hydrogen Energy, 40(15), 5042-5049.
• Erşan ÇY, Erguder TH. 2013. The effects of aerobic / anoxic period sequence on aerobic granulation and COD/N treatment efficiency. Biores. Technol., 148:149-156.
• Erguder T.H., Wittebolle L., Marzorati M., Boon N., Verstraete W., 2009. Environmental factors shaping the ecological niches of ammonia-oxidizing archaea. FEMS Microbiology Reviews, 33 (5), 855-869.

Faculty

Zöhre Kurt

Assistant Professor of Environmental Engineering

Post-doc: Civil and Environmental Engineering
Georgia Institute of Technology, USA 2013-2015
Ph.D: Environmental Engineering
Georgia Institute of Technology, USA 2012
M.S: Chemical and Biomolecular Engineering
Georgia Institute of Technology, USA 2011
M.S: Environmental Engineering
Georgia Institute of Technology, USA 2008
B.S: Chemical Engineering METU 2007
B.S: Environmental Engineering METU 2006

RESEARCH AREA:
Assessment of microbial processes, Establishing biodegradation pathways of contaminants, Environmental biochemistry, microbiology and genomics of environmentally relevant microbes, Computational approaches to determine microbial functions and microbial adaptation, Evaluation and improvement of natural attenuation, biotransformation, bioremediation and bioaugmentation,

PUBLICATIONS:
• Kurt, Z., Minoia, M., & Spain, J. C. Resveratrol as a growth substrate for bacteria from the rhizosphere. Applied and environmental microbiology, 2018, 84, 00104-18.
• Z. Kurt, E. Erin Mack, J. C. Spain. Natural Attenuation of Nonvolatile Contaminants in the Capillary Fringe. Environmental Science and Technology. 2016, 50, (18), 10172-10178.

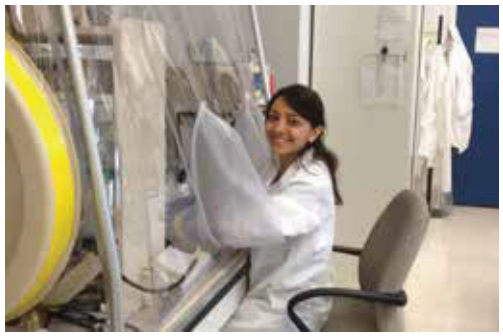
Sema Sevinç Şengör

Assistant Professor of Environmental Engineering

Post-doc: Civil and Environmental Engineering
University of California-Davis, CA USA 2008-2011
Ph.D: Civil and Environmental Engineering
University of California-Davis, CA USA 2007
M.S: Environmental Engineering METU 2009
B.S: Environmental Engineering METU 2002
B.S: Environmental Engineering METU 1999

RESEARCH AREA:
Biogeochemical processes, Multi-component reactive transport modeling for contaminant transport in subsurface enviro ments, Multi-scale modeling of hydrologic processes, mathematical modeling of groundwater flow, Uranium biogeochemistry, fate and transport, Sustainable food-water-energy systems

PUBLICATIONS:
• Li J., Cheng Y., Arora B., Şengör, S. S., Druhan J.L., Wanner C., van Breukelen B.M., Steefel C.I. Microbially Mediated Kinetic Sulfur Isotope Fractionation: Reactive Transport Modeling Benchmark. Computational Geosciences
•Li, J., & Şengör, S. S. (2020). Biogeochemical cycling of heavy metals in lake sediments: impact of multispecies diffusion and electrostatic effects. Computational Geosciences, 24(4), 1463-1482.
•Şengör SS., Gikas P., Moberly, J. 2019. Single and joint effects of Zn and Cu to ATP pool and microbial recovery in continuous growth systems. Chem Technol Biotechnol vol 94: 892–899



Yasemin Dilşad Yılmazel Tokel

Assistant Professor of Environmental Engineering

Post-doc: Civil and Environmental Engineering
Pennsylvania State University, USA 2014-2016
Ph.D: Civil and Environmental Engineering
Villanova University, USA 2014
M.S: Environmental Engineering METU 2009
B.S: Chemical Engineering METU 2008
B.S: Environmental Engineering METU 2007

RESEARCH AREA:
Microbial electrochemical processes, Biohydrogen production, Environmental microbiology and biotechnology, Hyperthermophilic microorganisms, Wastewater engineering, Nutrient removal and recovery,

PUBLICATIONS:
• Yilmazel Y.D., Holmes D., Zhu X., Kim K. and Logan B.E., (2018) "Electrical current generation in microbial electrolysis cells by hyperthermophilic Archaea Ferroglobus placidus and Geoglobus ahangari", 2018, Bioelectrochemistry, 119, 142-149.
• LaBarge N., Yilmazel Y.D., Hong P. and Logan B.E., (2017) "Effect of pre-acclimation of granular activated carbon on microbial electrolysis cell startup and performance" Bioelectrochemistry, 113, 20-25.
• LaBarge N., Ye Y., Kim K., Yilmazel Y.D., Hong P., Saikaly P.E., and Logan B.E., (2016) "Impact of Acclimation Methods on Microbial Communities and Performance of Anaerobic Fluidized Bed Membrane Bioreactors" Environmental Science: Water Research & Technology, 2 (6), 1041-1048.

ENVIRONMENTAL
ENGINEERING

METU Environmental Eng. Dept.
Dumlupinar Bulvari, 06800
Ankara-Turkey

enve.metu.edu.tr
Phone: +90-312-210 5875
Fax: +90-312-210 2646