(It will be applied from 2018-2019)

İZMİR INSTITUTE OF TECHNOLOGY
GRADUATE SCHOOL OF ENGINEERING AND SCIENCES
DEPARTMENT OF ENVIRONMENTAL ENGINEERING
CURRICULUM OF THE M.S. PROGRAM IN ENVIRONMENTAL ENGINEERING

The Environmental Engineering M.S. Program in is a jointly operated interdisciplinary program. The Curriculum is supported by the graduate courses available at the Departments of Civil Engineering, Chemical Engineering, Mechanical Engineering, Chemistry, Molecular Biology and Genetics and other departments as well as ENV coded courses.

Core Courses

CHE 533	Mass Transport in Environmental Engineering	(3-0)3 [7]
ENV 602	*Advanced Environmental Chemistry*	*(3-0)3 [8]*
ENV 603	*Environmental Statistics*	*(3-0)3 [8]*
ENV 500	M.S. Thesis	(0-1)NC [26]
ENV 591	Technical Writing, Research Methods, and Ethics	(0-2)NC [7]
ENV 598	Research Seminar*	(0-2)NC [7]
ENV 8XX	Special Studies	(8-0)NC [4]

*All M.S. students must register Research Seminar course until the beginning of their 4th semester.

Elective Courses

ENV 502	Environmental Biotechnology	(3-0)3 [7]
ENV 503	Sustainable Energy and Environment	(3-0)3 [7]
ENV 504	*Bioenergy Technologies*	*(3-0)3 [7]*
ENV 505	*Microalgal Biotechnology*	*(3-0)3 [7]*
ENV 506	*Environmental Exposure and Risk Assessment*	*(3-0)3 [7]*
ENV 507	*Indoor Air Pollution*	*(3-0)3 [7]*
ENV 508	*Air Pollution Control I*	*(3-0)3 [7]*
ENV 509	*Air Pollution Control II*	*(3-0)3 [7]*
ENV 580	Special Topics in Environmental Engineering	(3-0)3 [7]

In addition to ENV coded courses, elective courses are selected from related courses in other departments and other interdisciplinary graduate programs.

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

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COURSE DESCRIPTIONS

ENV 500 M.S. Thesis (0-1)NC [26]
A research topic which can be experimental and/or theoretical has to be pursued. It should fulfill the requirements set by the İzmir Institute of Technology Graduate Program.

ENV 502 Environmental Biotechnology (3-0)3 [7]
Microorganisms in the nature readily conduct many different types of conversion processes that are vital in the operation of biosphere. Environmental biotechnology is a rather new and very dynamic domain that aims at utilizing microbial processes for treatment purposes. In order to understand the microbial processes, one needs to deconstruct the microbial ecology responsible for those processes. At this point, the relationship between phylogeny and function within microbial community should be elucidated through employing recent advances in molecular techniques such as FISH, MAR, SIP, metagenomics, and proteomics. Moreover the means to manipulate microbial communities and pure cultures in order to conduct desired process (treatment, energy production) will be discussed.

ENV 503 Sustainable Energy and Environment (3-0)3 [7]
Estimation and evaluation of energy resources will be covered following the relationship between sustainable energy and sustainable development. Local, regional and global environmental effects of energy and sustainability metrics for energy systems will be investigated. Fossil fuels, nuclear power, and renewable energy resources will be addressed in terms of developed technology and sustainability metrics. Sustainability model applications will be discussed over current scientific literature.

ENV 504 Bioenergy Technologies (3-0)3 [7]
Bioenergy is the energy derived from non-fossilized biomass. Compared to consumption of fossil fuels, bioenergy offers advantages in environmental and economic sustainability thus is expected to be one of the primary alternative energy sources of the future. This course will instruct the students on (i) current conventional energy sources and their environmental impacts, (ii) major feedstocks that are being cultivated, researched and developed for the generation of biodiesel, bioethanol, and biogas, and (iii) biochemical and thermochemical conversion technologies used for biofuel generation. In addition, promising technologies such as microbial fuel cells and photosynthetic microorganism based systems will be presented. Environmental impacts of bioenergy technologies will be discussed.

ENV 505 Microalgal Biotechnology (3-0)3 [7]
Microalgae are photosynthetic single cellular microorganisms. The growth rate of these microorganisms can exceed those of most productive terrestrial plants by more than an order of magnitude with readily available inputs and without the requirement of critical resources such as cropping area and freshwater. More importantly, they can combine this fast-paced growth with wastewater treatment, CO2 capture and biosynthesis of high value metabolites. These unique features created such an interest in microalgae that they are referred to as "green gold". The main goals of this course will be to (i) explain the reasons behind the "green gold rush", (ii) point out opportunities offered by microalgae for solving today's world problems as well as their intrinsic limitations, (iii) present current cultivation systems and (iv) explain how these cultivation systems are designed and operated.

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ENV 506 Environmental Exposure and Risk Assessment ***(3-0)3 [7]***
Evaluation of toxicological data, Human exposure assessment, Carcinogenic risk Chronic-toxic risk, Human health risk characterization, Risk communication, Risk Management, Ecological risk assessment.

ENV 507 Indoor Air Pollution ***(3-0)3 [7]***
Indoor air quality, Problem identification techniques, Sources of pollution indoors, Sampling and analysis methods, Control systems and mitigation techniques, Health effects of indoor air pollution

ENV 508 Air Pollution Control I ***(3-0)3 [7]***
Principles and modern practices employed in the design of engineering systems for the removal of particulate matter in environmental engineering. Design of control devices based on particulate matter and waste gas stream characteristics. Properties of particles, particle behavior in fluids, theory of particle control mechanisms, cyclones, fabric filters, electrostatic precipitators, wet scrubbers, auxiliary equipment for the removal of particulate matter from waste streams.

ENV 509 Air Pollution Control II ***(3-0)3 [7]***
Principles and modern practices employed in the design of environmental engineering systems for the removal of gaseous pollutants from waste streams. The course content consists of properties of gases and vapors, Incineration, Absorption, Adsorption, Control of VOCs, Control of SOx, Control of NOx, Control of gaseous motor vehicle emissions.

ENV 580 Special Topics in Environmental Engineering (3-0)3 [7]
Directed group study of special topics in environmental engineering.

ENV 591 Technical Writing, Research Methods, and Ethics (0-2)NC [7]
Literature survey, critical review, research study design, conveying results of a study, research publication system, manuscript preparation, seminar preparation, ethical issues in research, ethical issues in publishing.

ENV 598 Research Seminar (0-2)NC [7]
A seminar must be given by each student on his/her research area which is graded by academic member of staff. The topic of the seminar can be decided by the student and his/her supervisor.

ENV 602 Advanced Environmental Chemistry ***(3-0)3 [8]***
Chemical processes in environmental systems, equilibrium conditions in aquatic systems and atmospheric reactions. Acid-base, dissolution-precipitation, air-water exchange, and oxidation-reduction reactions.

ENV 603 Environmental Statistics ***(3-0)3 [8]***
Numerical-Graphical Data Representation-Summary, Random Variables-Probability Distributions, Hypothesis Testing, Simple and Multiple Linear Regression, Nonparametric Tests, QA/QC Measures, Data Censoring.

CHE 533 Mass Transport in Environmental Engineering (3-0)3 [7]
Mass transport equations of environmental engineering processes. Equations of sorption kinetics in continuos flow reactors. Transport equations of fixed film exchange. Electrodialysis. Biological processes. Fixed culture processes and suspended culture processes.

ENV 8XX Special Studies (8-0)NC [4]
Graduate students supervised by the same faculty member study advanced topics under the guidance of their advisor.