

Course Description

- 01210211 Chemistry of Water and Wastewater 4(3-3-8)
prerequisite 01403114
Fundamental of environmental engineering calculations, chemistry of aquatic environment, mass balance, chemical kinetics, thermodynamics of chemical equilibrium, equilibrium constants, acid-base chemistry, oxidation-reduction reactions, particular chemical characteristics of water and wastewater, sample collections and preservations, water and wastewater analyses in laboratory, application of water quality data in environmental engineering practices.
- 01210212 Microorganisms in Water and Wastewater 3(2-3-6)
Cell and its structure, biochemical processes in cells, principles of bacteriology, catabolism and anabolism, microorganisms and classification of water borne microorganisms, distribution of microorganisms in water, growth and control of microorganism population, microbial water quality index, methods of collection and bacteriological examination of water and wastewater, roles of enzymes related to stabilization of organic matter, biodegradation of organic compounds, fundamental concepts of energy, food chain, productivity and limiting factors, biota dynamics in wastewater treatment environment, laboratory analysis.
- 01210213 Unit Operations and Process for Environmental Engineering I 3(3-0-6)
Mass balance and reactor, criteria for process selection in water and wastewater treatment, physical unit operation in water and wastewater treatment, gas transfer, flotation, equalization, aeration, chemical precipitation, coagulation and flocculation, mixing, sedimentation, filtration and membrane filtration, absorption and adsorption, ion exchange, disinfection.
- 01210214 Applied Mathematics in Environmental Engineering 3(3-0-6)
Differential equations, integral theorem, power series, finite difference method, weighted residual method, finite element method, applications for numerical methods in formulating mathematical models.

01210311 Unit Operations and Process for Environmental Engineering II 3(3-0-6)

Fundamental of process analysis, plug flow and continuously stirred tank reactors, chemical and biological wastewater treatment, aerobic and anaerobic treatment processes, neutralization, biological suspended-growth and attached growth systems, biochemical and growth kinetics, sludge treatment processes.

01210312 Building Sanitation 3(3-0-6)

Basic of building sanitations, law and regulation, design of cold water supply system, hot water supply system, soil, waste and vent pipe system, fire protection system and site drainage, design of wastewater treatment and solid waste management for individual building.

01210313 Design of Sewerage and Pumping System 3(2-3-6)

prerequisite 01209211

Design of hydraulics in sewerage system, estimation of design water quantity, design of wastewater collection and stormwater drainage system, components of drainage system, design of wastewater pumping system.

01210314 Environmental Engineering Laboratory 3(1-6-5)

The study of coagulation, filtration, chemical precipitation, chlorination, biological treatment processes by analysis in laboratory.

01210321 Air Pollution and Control 3(3-0-6)

Theory of combustion, exhaust gas and emission particle, chemical characteristics of emission, effects to health and environment, dispersion of air pollutants, sampling and analysis, control of particle emission and gas, control techniques of air pollution.

01210322 Solid Waste Engineering 3(3-0-6)

Physical and chemical characteristics of municipal solid waste, design of solid waste collection and transportation system, design of solid waste treatment processes, design of sanitary landfill, composting, incineration, solid waste reduction and recycling, biogas production from solid waste.

01210331	Environmental System Management	3(3-0-6)
	Environmental pollution problems and engineering ethics, organizations, laws and regulations related to environmental management, indication and indices, enforcement and economic aspects of environmental control, environmental management system, monitoring, analysis for decision making in environmental problem protection, environmental risk assessment, life cycle analysis, case study.	
01210332	Intellectual Property for Engineer	3(3-0-6)
	Introduction of intellectual property, types of intellectual property, the use of the patent information for research and commerce, protection, resources and searching techniques, case study.	
01210333	Computer Application and Software in Environmental Engineering	3(2-3-6)
	Computational aids in environmental engineering analysis, water management modeling, air pollution management and control modeling, groundwater modeling, applications of computer and software to analyze problems in environmental engineering.	
01210399	Internship	1
	Internship for environmental engineering in private enterprises, government agencies, government 14enterprises14 or academic places at least 240 hours and at least 30 workdays in order to get experiences from the assignment.	
01210411	Water Supply Engineering Design	3(2-3-6)
	prerequisite 01210213	
	Water quality standards, concepts for selection of water treatment processes, design of raw water conveyance systems, design of mixing tanks, flocculation tanks, sedimentation tanks, filtration tanks, chlorination systems, design of water distribution systems, design of utility system.	
01210412	Wastewater Engineering Design	3(2-3-6)

Effluent standards; characteristics of wastewater from different sources; criteria for selection of wastewater treatment system; design of screening, sedimentation tank, aeration tank, activated sludge process, aerated lagoon, trickling filter, waste stabilization pond, rotating biological contactor.

- 01210413 Design of Environmental Engineering System 3(2-3-6)
Design of electrical system in treatment facilities, reinforced concrete work, instrument and mechanical machine in treatment facilities, instrumentation, regulations and details of 15 facilities design, cost estimation, project in environmental engineering system in laboratory.
- 01210414 Decentralized and Onsite Wastewater Treatment 3(3-0-6)
prerequisite 01210213
Principles of design, control, and maintenance of decentralized and onsite wastewater treatment. Principles of decentralized and onsite wastewater treatment system management in sustainable technology fields. Case studies.
- 01210421 Hazardous Waste Engineering 3(2-3-6)
Types and characteristics of hazardous wastes, storage and transportation, emergency response, laws and regulations, toxicology and quantitative risk assessment, design and operation of physical and chemical treatment processes, stabilization and solidification, incineration, landfill, radioactive waste management, and waste extraction, experiments on Darcy's law, assessment of groundwater flow direction, and subsurface contaminant transport.
- 01210422 Industrial Pollution and Safety 3(3-0-6)
Production processes of major industries and their wastewater characteristics, industrial pollution problems, air quality and industrial effluent standards, design criteria for water and air pollution control system, toxic substance and hazardous waste management, wastewater treatment processes for industries, safety in industry, case study.

- 01210423 Noise and Vibration Control 3(3-0-6)
 Behavior of acoustic waves, instrumentation and criteria in measurement of noise and vibration, impact of noise and vibration on human and environment, laws and regulations for control of noise and vibration, use of adsorption materials and barriers.
- 01210431 Environmental Impact Assessment 3(3-0-6)
 Guidelines for environmental impact assessment, social impact assessment and health impact assessment, processes in environmental, social and health study and impact assessment, mitigation measures and monitoring programs, case study.
- 01210432 Water Quality Management 3(3-0-6)
 Effect of wastewater disposal on aquatic ecosystem and water quality, relation between water quality and land uses, prediction of pollutants dispersion by using by mathematical models, concepts of water quality control and management, water quality management by using on optimization method.
- 01210433 Ecological Engineering 3(3-0-6)
 Principle of ecological engineering for environmental pollution management, terrestrial and aquatic ecosystems, artificial ecosystems for waste treatment and remediation, types of treatable wastes by ecological engineering, natural waste treatment systems.
- 01210434 Pollution Prevention 3(3-0-6)
 Laws and regulations regarding industrial wastes, approaches for waste minimization, waste recycling and reuse, clean technology application, materials life cycle assessment, evaluation of economic benefit from pollution prevention.
- 01210435 Soil and Groundwater Remediation 3(3-0-6)
 Characteristics and properties of soil and groundwater, soil microorganism, sources of pollution in soil and groundwater, laws and regulations regarding soil and groundwater contamination, contaminated site investigation, sampling, sample analysis, in situ and ex situ remedial methods, soil chemistry, case study.

01210436	Environmental Health Engineering	3(3-0-6)
	Principles of environmental health engineering, community and occupational environments, environmental health standards and requirements, health impact assessment, health risk assessment, application of engineering principle in environmental health protection, safety and emergency response.	
01210437	Industrial Safety Management	3(3-0-6)
	Hazard and accidental occurrences in industry, theory, accident cause analysis, accident occurrence prevention in industry, principle of safety management, industrial safety standards, management to control loss due to accidents, planning and design for safety, case study.	
01210438	Recycling System Design	3(3-0-6)
	Principle of fluid mechanics and thermodynamics, concept and criteria of waste recycling, advantages - disadvantages and benefit of recycling, case study.	
01210439	Integrated Environmental Management Tool	3(3-0-6)
	Overview of environmental management, main concept of environmental management, integration of environmental equipment, clean development mechanism, eco-design, clean technology and ecological footprints, relationship and the use of environmental management tools.	
01210490	Co-operative Education	6
	On the job training as a temporary employee in order to get experiences from the assignment for environmental engineering.	
01210495	Environmental Engineering Project Preparation	1(0-3-2)
	Study on environmental engineering project, literature review, preliminary testing, presentation of environmental engineering project proposal.	
01210496	Selected Topics in Environmental Engineering	1-3

Selected topics in environmental engineering at the bachelor's degree level.
Topics are subject to change each semester.

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| 01210497 | Seminar | 1 |
| | Presentation and discussion on current interesting topics in environmental engineering at the bachelor's degree level. | |
| 01210498 | Special Problems | 1-3 |
| | Study and research in environmental engineering at the bachelor's degree level and compile into a written report. | |
| 01210499 | Environmental Engineering Project | 2(0-6-3) |
| | Interesting projects in environmental engineering. | |