# Environmental Engineering - Joint (ENVJ)

## Environmental Engineering - Joint (ENVJ) Courses

**ENVJ 5001 [0.5 credit] (EVG 5001)**
**Biofilm Processes in Wastewater Treatment**

**ENVJ 5105 [0.5 credit] (CHG 8132)**
**Adsorption Separation Process**
Microporous materials and molecular sieves as adsorbents. Adsorption equilibrium and adsorption kinetics. Equilibrium adsorption of single fluids and mixtures. Diffusion in porous media and rate processes in adsorbers. Adsorber dynamics: bed profiles and breakthrough curves. Cyclic fluid separation processes. Pressure swing adsorption.

**ENVJ 5182 [0.5 credit] (EVG 5182)**
**Water Resources Management**
Global water supply and demand, integrated water resources management, modelling and optimization of water resources systems, reservoir management, uncertainty modelling, climate change and water, decision under uncertainty.
Also listed as CIVJ 5182.

**ENVJ 5183 [0.5 credit] (EVG 5183)**
**Mixing and Transport in Water Bodies**
Water resources systems models: rivers, lakes, estuaries; water quality parameters, conservative and non-conservative parameters, laminar and turbulent flows, dispersion, pollution sources; modelling: simplified, dilution, three-dimensional; advection-diffusion equation, analytical solution, numerical solution, non-conservative transport and multi-component systems.

**ENVJ 5212 [0.5 credit] (EVG 5212)**
**Climate Change Impacts on Water Resources**
Spatiotemporal distribution of water and its impact on human activities, including domestic and municipal consumption, hydropower generation, rain-fed and irrigated agriculture, design and operation of sewer systems, floodplain zoning, navigation, etc. Critical assessment of methodologies for climate change impacts estimation.
Also listed as CIVJ 5212.
Prerequisite(s): Theoretical knowledge and hands-on application experience needed to perform climate change analysis on a water resources system.

**ENVJ 5301 [0.5 credit] (EVG 5301)**
**Soil and Water Conservation Engineering**
Design, water quality and climate change impacts of soil and water conservation systems. Topics include: urban storm water management (including LID) erosion control practices, subsurface and surface drainage systems and irrigation technologies.

**ENVJ 5302 [0.5 credit] (EVG 5302)**
**Decentralized Wastewater Management**
Fundamental principles and practical design applications of decentralized wastewater treatment for domestic and industrial sources. Management of decentralized wastewater systems, pre-treatment systems, soil infiltration systems, advanced onsite technologies, constructed wetlands, alternative collection systems, wastewater reuse and septage management.
Also listed as CIVJ 5181.

**ENVJ 5333 [0.5 credit] (EVG 5333)**
**Research Methodology**
Key components and strategies required to build a robust scientific research program in environmental engineering including research questions, literature review, experiment design, data interpretation, scientific manuscripts, public speaking, ethics, and plagiarism.
Also listed as CIVJ 5333.

**ENVJ 5502 [0.5 credit] (CHG 8192)**
**Membranes in Clean Processes**
Membrane separations as clean and cleaning technologies. Reverse osmosis, ultrafiltration, vapour permeation and pervaporation to the treatment of industrial process and waste streams. Nanostructured membrane materials. Membrane fouling models, foulant-membrane material interactions, solvent resistant membranes, aqueous and non-aqueous separations.

**ENVJ 5504 [0.5 credit] (CHG 8194)**
**Membrane Liquid Separation Processes and Materials**

**ENVJ 5505 [0.5 credit] (CHG 8195)**
**Advanced Numerical Methods in Chemical and Biological Engineering**

**ENVJ 5507 [0.5 credit] (CHG 8196)**
**Interfacial Phenomena in Engineering**

**ENVJ 5700 [0.5 credit] (EVG 5139)**
**Environmental Assessment of Civil Engineering Projects**
Procedures and methods for systematic evaluation of the environmental impact of civil engineering projects including wastewater disposal systems, solid waste disposal systems, and water resource development systems.

**ENVJ 5900 [0.5 credit] (EVG 5130)**
**Wastewater Treatment Process Design**
The physical, chemical and biological processes involved in the treatment of domestic and industrial wastes. Waste characteristics, stream assimilation, biological oxidation, aeration, sedimentation, anaerobic digestion, sludge disposal.

**ENVJ 5901 [0.5 credit] (EVG 5132)**
**Unit Operations of Water Treatment**
Unit operations and unit processes involved in the treatment of a water supply for various uses. Topics included are water quality, water microbiology, sedimentation, chemical treatment, disinfection, water chemistry, flocculation.

**ENVJ 5902 [0.5 credit] (EVG 5138)**
**Advanced Water Treatment**
Scope, limitations and design procedures for water treatment processes for removal of toxic and non-standard contaminants. Water treatment problems and regulations, activated carbon treatment, ion exchange, disinfection practices and oxidation via advanced oxidation processes, iron and manganese removal, recent developments in coagulation, membranes, air stripping.

**ENVJ 5905 [0.5 credit] (EVG 5137)**
**Water and Wastewater Treatment Process Analysis**
Mass balancing in complex systems. Reaction kinetics and kinetic data analysis: classical and computer based methods. Reactor design: ideal reactors and real reactors. Analysis of tracer tests. Interfacial mass transfer: common theories. Mass transfer models.

**ENVJ 5906 [0.5 credit] (EVG 5133)**
**Solid Waste Management**
Collection and disposal of solid wastes. Sanitary landfill, composting, incineration and other methods of disposal. Material and energy recovery.

**ENVJ 5907 [0.5 credit] (EVG 5134)**
**Chemistry for Environmental Engineering**
Dilute aqueous solution chemistry of water and wastewater treatment. Chemical kinetics and equilibrium. Carbonate, phosphate and chlorine chemistry. Precipitation and complex formation. Corrosion. Analytical techniques and applications.

**ENVJ 5908 [0.5 credit] (EVG 5179)**
**Anaerobic Digestion**
Design and application of anaerobic processes used for treatment of municipal and industrial wastewaters. Microbiology and biochemistry fundamentals, techniques for monitoring anaerobic digestion performance, municipal sludge stabilization, anaerobic composting, anoxic/anaerobic bioremediation, Andrew's dynamic model. Design of two-phase digestion; DSFF reactors; UASB; UBF, ASB reactors.

**ENVJ 6300 [0.5 credit] (EVG 6300)**
**Special Topics in Environmental Engineering**

**ENVJ 6301 [0.5 credit] (EVG 6301)**
**Special Topics in Environmental Engineering**

**ENVJ 6302 [0.5 credit] (EVG 6302)**
**Special Topics in Environmental Engineering**

**ENVJ 6303 [0.5 credit] (EVG 6303)**
**Special Topics in Environmental Engineering**

**ENVJ 6304 [0.5 credit] (EVG 6304)**
**Special Topics in Environmental Engineering**

**ENVJ 8191 [0.5 credit] (CHG 8191)**
**Selected Topics in Chemical Engineering**