Water Science

(Bachelor of Science)

Overview of the Program

The UW-Green Bay Water Science program will be an integrated program designed to provide students with the tools necessary to solve the water related challenges of today and tomorrow. Students may complete program requirements in four years. The curriculum will be interdisciplinary, with a core set of courses drawn from geoscience, chemistry, environmental science, biology, physics, math and statistics, and public and environmental affairs. In addition, a diverse set of elective courses will allow students to focus on subdisciplines in water science that can meet their career needs and interests. The major requirements will be comprised of 71 credits, which will include 33 credits of supporting courses, 25 credits of upper level core courses, and 13 credits of upper level electives. The anticipated comprehensive major (71 credits) will have a principal focus on water's role in natural processes in Earth's systems. These skills include a solid understanding of the chemistry, surface water hydrology, groundwater, and biology of freshwater systems. UW-Green Bay Water Science majors will have opportunities to work as research assistants on faculty projects, develop internships, or to conduct their own independent projects. UW-Green Bay faculty members are very active in research on water and wastewater treatment, runoff pollution, stream hydrology, groundwater quality, limnology, and aquatic ecology.

Student Learning Outcomes and Program Objectives

1. Students will be able to describe the role water plays in the lithosphere, hydrosphere, cryosphere, atmosphere, and biosphere, with emphasis on interactions between these reservoirs.
2. Students will apply the scientific method to investigations of hydrologic processes, Earth systems, and interactions among the various physical and biological realms utilizing standard scientific field and laboratory methods.
3. Students will demonstrate an understanding of the hydrology of streams and lake systems and the role water has in landscape#forming processes that act on the Earth's surface.
4. Students will be able to describe the processes of and importance of groundwater flow and aquifer systems.
5. Students will be able to compare chemical interactions that occur in various hydrologic settings and their importance to water resources, geological and biological systems, and water/wastewater treatment.
6. Students will be able to describe the role water plays in atmospheric systems and the climate system.
7. Students will be able to describe the interactions between water systems and ecosystems.
8. Students will be able to describe the challenges of maintaining surface and ground water quality.
9. Students will apply their knowledge base and research skills to current issues pertaining to water resources, management, and remediation, with emphasis on related economic, social, and public policy dimensions.
10. Students will analyze, interpret, and report on laboratory and field findings using appropriate statistical techniques and computer applications.

Code	Title	Credits
Supporting Courses		33
WATER 201	Introduction to Water Science	
BIOLOGY 203 & BIOLOGY 204	Principles of Biology: Organisms, Ecology, and Evolution and Principles of Biology Lab: Organisms, Ecology, and Evolution	
GEOSCI 202	Physical Geology	
GEOSCI 222	Ocean of Air: Weather and Climate	
CHEM 211 & CHEM 213	Principles of Chemistry I and Principles of Chemistry I Laboratory	
CHEM 212 & CHEM 214	Principles of Chemistry II and Principles of Chemistry II Laboratory	
MATH 260	Introductory Statistics	
PHYSICS 103	Fundamentals of Physics I	
or PHYSICS 201	Principles of Physics I	
Upper-Level Required Courses		24
ENV SCI/ET 305	Environmental Systems	
ENV SCI 335/ET 331	Water and Waste Water Treatment	
ENV SCI 337	Environmental GIS	
ENV SCI/ET 330	Hydrology	
GEOSCI/ET/ENV SCI 432	Hydrogeology	
WATER/ET 444	Geochemistry of Natural Waters	
ENV SCI 401	Stream Ecology	

or ENV SCI 403	Limnology	
ENV SCI/ET 433	Ground Water: Resources and Regulations	
or PU EN AF 351	Water Resources Policy and Management	
Upper-Level Elective Courses: (Choose from the following)		13
BIOLOGY 322	Environmental Microbiology	
BIOLOGY 341	Ichthyology	
CHEM 311	Analytical Chemistry	
CHEM 413	Instrumental Analysis	
ECON 305/PU EN AF 305	Natural Resources Economic Policy	
ENV SCI/ET 320	The Soil Environment	
ENV SCI/ET 323	Pollution Prevention	
ENV SCI 338	Environmental Modeling	
ENV SCI 401	Stream Ecology	
ENV SCI 403	Limnology	
ENV SCI/ET 424	Hazardous and Toxic Materials	
ENV SCI 425	Global Climate Change	
ENV SCI/ET 433	Ground Water: Resources and Regulations	
ENV SCI 491	Senior Thesis/Research in Environmental Science	
ENV SCI 492	Practicum in Environmental Science	
GEOSCI 325	Regional Climatology	
PU EN AF 351	Water Resources Policy and Management	
PU EN AF 378	Environmental Law	
PU EN AF 379	Natural Resources Policy, Law, and Administration	
WATER 321	Stable Isotopes in the Environment	
WATER 491	Senior Thesis/Research in Water Science	
WATER 497	Internship	
WATER 498	Independent Study	
Freshwater University [1]		
Total Credits		70

[1] may use up to 8 credits of Specialty and Field Immersion Courses offered by Freshwater University

Course	Title	Credits
Freshman		
Fall		
WATER 201	Introduction to Water Science	3
	Credits	3
Spring		
add classes		
	Credits	0
Sophomore		
Fall		
add classes		
	Credits	0
Spring		
add classes		
	Credits	0
Junior		
Fall		
add classes		
	Credits	0
Spring		
add classes		
	Credits	0

Senior		
Fall		
add classes		
	Credits	0
Spring		
add classes		
	Credits	0
	Total Credits	3

John A Luczaj; Professor; Ph.D., Johns Hopkins University, chair*

Courses

WATER 201. Introduction to Water Science. 3 Credits.
Water Science is the interdisciplinary study of water and its interaction with solids, liquids, gases, and organisms in various Earth systems. Water is essential to life, and it plays a critical role in nearly every natural process in Earth's lithosphere, atmosphere, hydrosphere, biosphere, and cryosphere. The world faces significant challenges regarding water quantity, quality, and ecological function that are expected to worsen during the 21st century. It is rare to find a real-world system in which water does not play a significant role.
Fall Only.

WATER 321. Stable Isotopes in the Environment. 1 Credit.
Stable isotope analysis has become a standard tool in modern science. The natural variability in non-radioactive (stable) isotopes corresponds to specific physical and biological processes throughout the global Earth System. This course explores the basics of stable isotope chemistry, with most of the course dedicated to examples of their application across several scientific fields.
P: CHEM 211 or consent of instructor
Spring Odd.

WATER 444. Geochemistry of Natural Waters. 3 Credits.
This class will explore the theory and application of aqueous geochemistry principles to the study of surface and groundwater systems at low to moderate temperatures. The class will focus on inorganic processes including the hydrologic cycle, chemical weathering, chemical activities in natural waters, thermodynamics, kinetics, acid/base equilibria, carbonate chemistry, acid water systems, heavy metals, redox reactions, saline waters, and ancient fluids preserved in fluid inclusions.
P: GEOSCI 202, CHEM 211 & CHEM 212
Fall Even.

WATER 491. Senior Thesis/Research in Water Science. 3 Credits.
A project-based capstone experience where individual students address a specific aspect of water science through the use of scientific and mathematical skills.
P: Senior standing, Math 260 with C or better, instructor consent. REC: Geoscience/Env Sci 432, Water 330, or other appropriate course depending upon focus of thesis project
Fall and Spring.

WATER 497. Internship. 1-12 Credits.
Supervised practical experience in an organization or activity appropriate to a student's career and educational interests. Internships are supervised by faculty members and require periodic student/faculty meetings. All internships must be taken P-NC. Course is repeatable for credit.

WATER 498. Independent Study. 1-4 Credits.
Independent study is offered on an individual basis at the student's request and consists of a program of learning activities planned in consultation with a faculty member. A student wishing to study or conduct research in an area not represented in available scheduled courses should develop a preliminary proposal and seek the sponsorship of a faculty member. The student's advisor can direct him or her to instructors with appropriate interests. A written report or equivalent is required for evaluation, and a short title describing the program must be sent early in the semester to the registrar for entry on the student's transcript. Course is repeatable for credit.
P: fr or so st with cum gpa > or = 2.50; or jr or sr st with cum gpa > or = 2.00.
Fall and Spring.