FRESHWATER SCIENCES (FRSHWTR)

FRSHWTR 190 Topics in Freshwater Sciences: 1-3 cr. Undergraduate.
Current issues in freshwater sciences for undergraduates.
Prerequisites: none, except as may be required for specific topics.
Course Rules: May be retaken w/chg in topic to 9 cr max.
General Education Requirements: NS
Current Offerings: http://uwm.edu/schedule

FRSHWTR 191 Great Lakes Ecology 3 cr. Undergraduate.
A select history of Great Lakes ecosystem change.
Prerequisites: none.
Course Rules: Counts as repeat of Frshwr 190 with similar topic.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 461 Politics and Policy of Sustainability 3 cr. Undergraduate/Graduate.
Principles of environmental policy, governance, and management for global sustainability.
Prerequisites: jr st; CES 210(P) or cons instr.
Course Rules: CES 461, Frshwr 461, & Global 461 are jointly offered; they count as repeats of one another.
Last Taught: Spring 2015, Fall 2013.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 464 Chemical Hydrogeology 3 cr. Undergraduate/Graduate.
Natural chemical processes that occur in groundwater systems, how they are modified by human activity and contamination, and attempts to regulate them. Lec, lab.
Prerequisites: jr st; Chem 102(P)
Course Rules: Frshwr 464 & Geo Sci 464 are jointly offered; they count as repeats of one another.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 496 UROP Apprenticeship, Upper-Level 1-3 cr. Undergraduate.
Undergraduate research participation in a project developed with a supervising member of the faculty or staff. One credit for 45 hrs research.
Prerequisites: jr st; acceptance to UROP; prior or conc reg in UROP seminar.
Course Rules: May be retaken to 9 cr max in any combination of UROP apprenticeship courses.
Last Taught: Spring 2017, Fall 2013.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 497 Study Abroad: 1-12 cr. Undergraduate/Graduate.
Designed to enroll students in UWM sponsored program before course work level, content and credits are determined and/or in specially prepared program course work.
Prerequisites: jr st; acceptance for Study Abroad Prog.
Course Rules: May be retaken w/chg in topic.
Last Taught: UWinteriM 2012.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 498 Undergraduate Research 1-3 cr. Undergraduate.
Undergraduate research on faculty-supervised research projects.
Prerequisites: jr st; cons instr.
Course Rules: May be retaken to 6 cr max.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 502 Aquatic Ecosystem Dynamics 3 cr. Undergraduate/Graduate.
An interdisciplinary, quantitative approach to understanding large lake dynamic processes, including geological formation, hydrology, hydrodynamics, chemistry and the dynamics of plankton and fish communities.
Prerequisites: jr st; 1 sem calculus or algebra; 2 sem Physics, Chem, or Bio Sci; or cons instr.
Last Taught: Fall 2017, Fall 2016, Fall 2015, Fall 2014.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 504 Quantitative Freshwater Analysis 3 cr. Undergraduate/Graduate.
A fundamental set of tools for the quantitative analysis of environmental data sets, with an emphasis on the calculation of reservoirs, residence times and rates in aquatic systems.
Prerequisites: jr st; 1 sem calculus, Physics, Chem, & Bio Sci; or cons instr.
Last Taught: Spring 2018, Spring 2017, Fall 2015, Fall 2014.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 506 Environmental Health of Freshwater Ecosystems 3 cr. Undergraduate/Graduate.
The influences of human-induced environmental change on the health of freshwater ecosystems and humans who interact with these systems.
Prerequisites: jr st.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 508 Aquatic Technologies 3 cr. Undergraduate/Graduate.
Interdisciplinary perspective on the function, application and development of technologies used in the aquatic sciences.
Prerequisites: jr st.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 510 Economics, Policy and Management of Water 3 cr. Undergraduate/Graduate.
The impact of economics, policy and management decisions on our freshwater resources and how science and economics affect these decisions.
Prerequisites: jr st.
Last Taught: Fall 2017, Fall 2016, Spring 2016, Fall 2014.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 511 Ichthyology 3 cr. Undergraduate/Graduate.
The diverse biology of fishes focusing on behavioral, biomechanical, genetic, and physiological adaptions to diverse ecological systems.
Prerequisites: jr st; grade of C or better in Bio Sci 310(P); or cons instr.
Course Rules: Bio Sci 511 & Frshwr 511 are jointly offered; they count as repeats of one another.
Last Taught: Fall 2017, Fall 2016, Fall 2015, Fall 2014.
Current Offerings: http://uwm.edu/schedule
FRSHWTR 512 Freshwater Sciences Practicum:  
2-4 cr. Undergraduate/Graduate.  
Diverse opportunities for practical, hands-on experience in the practice  
of freshwater science with emphasis on team work, problem solving, field  
work, and dissemination of results.  
**Prerequisites:** jr st, Frshwtr 502(P) & 504(P); or cons instr.  
**Course Rules:** May be retaken w/chg in topic to 9 cr max.  
**Last Taught:** UWinteriM 2018, Fall 2017, Spring 2017, UWinteriM 2017.  
**Current Offerings:** [http://uwm.edu/schedule](http://uwm.edu/schedule)

FRSHWTR 513 Field Experimentation and Analysis in Freshwater Sciences  
3 cr. Undergraduate/Graduate.  
Student acquisition of comprehensive investigative procedures  
in freshwater ecology focusing on field and laboratory interactive  
assignments.  
**Prerequisites:** jr st; Bio Sci 152(P); Chem 104(P); or grad st.  
**Last Taught:** Fall 2017.  
**Current Offerings:** [http://uwm.edu/schedule](http://uwm.edu/schedule)

FRSHWTR 514 Analytical Techniques in Freshwater Sciences  
3 cr. Undergraduate/Graduate.  
Modern analytical techniques and genomics principles and methods in  
freshwater sciences.  
**Prerequisites:** jr st; Bio Sci 152(P); Chem 104(P); or grad st.  
**Course Rules:** Counts as repeat of Frshwtr 650 w/same topic.  
**Last Taught:** Spring 2018.  
**Current Offerings:** [http://uwm.edu/schedule](http://uwm.edu/schedule)

FRSHWTR 522 Aquatic Organic Biogeochemistry  
3 cr. Undergraduate/Graduate.  
Fluxes and biogeochemical cycling pathways of dissolved, colloidal and  
particulate organic matter across interfaces in aquatic systems.  
**Prerequisites:** jr st & 1 sem Chem; or cons instr.  
**Last Taught:** Fall 2017, Fall 2015.  
**Current Offerings:** [http://uwm.edu/schedule](http://uwm.edu/schedule)

FRSHWTR 524 Aquatic Isotope Biogeochemistry  
3 cr. Undergraduate/Graduate.  
Principles and applications of stable and radioactive isotopes and other  
biogeochemical tracers in aquatic environments.  
**Prerequisites:** jr st.  
**Last Taught:** Fall 2016.  
**Current Offerings:** [http://uwm.edu/schedule](http://uwm.edu/schedule)

FRSHWTR 562 Principles of Aquaculture Systems  
3 cr. Undergraduate/Graduate.  
Physical and chemical aspects of intensive & recirculating operations of  
aquaculture production systems.  
**Prerequisites:** jr st, BioSci 152 (P); Chem 104(P); Math 116(P).  
**Last Taught:** Spring 2018, Spring 2017, Spring 2016, Spring 2015.  
**Current Offerings:** [http://uwm.edu/schedule](http://uwm.edu/schedule)

FRSHWTR 563 Finfish Aquaculture and Nutrition Principles  
3 cr. Undergraduate/Graduate.  
Principles of aquaculture and fish nutrition; emphasis on Great Lakes;  
future challenges to aquaculture development in North America.  
**Prerequisites:** jr st, Bio Sci 152(P); Chem 104(P).  
**Last Taught:** Fall 2016, Fall 2015, Spring 2015.  
**Current Offerings:** [http://uwm.edu/schedule](http://uwm.edu/schedule)

FRSHWTR 564 Water Quality in Aquaculture  
3 cr. Undergraduate/Graduate.  
Principles of water chemistry & microbial conversion of nutrients;  
microorganisms that impact fish health; for successful operation of  
intensive aquaculture operations.  
**Prerequisites:** jr st; Bio Sci 152(P); Chem 104(P).  
**Last Taught:** Spring 2017, Spring 2016, Spring 2015.  
**Current Offerings:** [http://uwm.edu/schedule](http://uwm.edu/schedule)

FRSHWTR 565 Fish Health  
3 cr. Undergraduate/Graduate.  
Overview of current and emerging fish diseases and treatment strategies to  
diagnose and identify pathogens and disease to mitigate spread of  
disease.  
**Prerequisites:** jr st; Bio Sci 152(P); Chem 104(P).  
**Last Taught:** Spring 2018, Spring 2017, Spring 2016, Spring 2015.  
**Current Offerings:** [http://uwm.edu/schedule](http://uwm.edu/schedule)

FRSHWTR 584 Aquatic Ecosystem Services Valuation  
3 cr. Undergraduate/Graduate.  
Economic theory and methods in valuing aquatic and related terrestrial  
ecosystems.  
**Prerequisites:** jr st.  
**Course Rules:** Counts as repeat of Frshwtr 650 with same topic.  
**Current Offerings:** [http://uwm.edu/schedule](http://uwm.edu/schedule)

FRSHWTR 621 Benthic Ecology  
3 cr. Undergraduate/Graduate.  
Chemophysical and biological interactions in freshwater and marine  
systems. Emphasis on invertebrate ecology. 2 hrs lec, 4 hrs lab.  
**Prerequisites:** sr st & cons instr; or grad st.  
**Course Rules:** Req’d field work for which fee is assessed.  
**Last Taught:** Spring 2014, Fall 2012, Fall 2004, Fall 1997.  
**Current Offerings:** [http://uwm.edu/schedule](http://uwm.edu/schedule)

FRSHWTR 630 Leadership in Science: Tackling Wicked Problems  
3 cr. Undergraduate/Graduate.  
Extends learning and practice into the role and relationships with  
individuals and groups in the leadership process in the context of wicked  
problems.  
**Prerequisites:** jr st. or higher.  
**Course Rules:** Counts as repeat of Frshwtr 650 with similar topic.  
**Current Offerings:** [http://uwm.edu/schedule](http://uwm.edu/schedule)

FRSHWTR 640 Sequence Analysis  
3 cr. Undergraduate/Graduate.  
Molecular biology underlying nucleic and amino acid analyses and the  
tools available to conduct comparative sequence analysis.  
**Prerequisites:** jr st; BIO SCI 152(P), BIO SCI 325(P), & CHEM 104(P); or  
grad st.  
**Course Rules:** Counts as repeat of Frshwtr 512 with similar topic.  
**Current Offerings:** [http://uwm.edu/schedule](http://uwm.edu/schedule)

FRSHWTR 650 Topics in Freshwater Sciences:  
1-3 cr. Undergraduate/Graduate.  
Current issues in freshwater sciences.  
**Prerequisites:** jr st.  
**Course Rules:** May be retaken w/chg in topic to 9 cr max.  
**Last Taught:** Spring 2018, Fall 2017, Spring 2017, Summer 2016.  
**Current Offerings:** [http://uwm.edu/schedule](http://uwm.edu/schedule)
FRSHWTR 690 Undergraduate Seminar in Freshwater Sciences:
1-3 cr. Undergraduate.
Seminar on topics of current interest in freshwater sciences.
Prerequisites: jr st.
Course Rules: May be retaken w/chg in topic to 9 cr max.
Last Taught: Spring 2018, Fall 2017, Fall 2016, Fall 2015.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 695 Independent Study in Freshwater Sciences for Biological Sciences Students
1-3 cr. Undergraduate.
Independent and original research on a topic not available as a regular course; conducted under the direction of faculty or staff scientist from the School of Freshwater Science.
Prerequisites: jr st; Bio Sci 325 (P); one of Bio Sci 310(P), 315(P)/316(P), or 383(P); 2.500 GPA; writ cons instr, dept chair, & asst dean for SAS.
Course Rules: Bio Sci 695 & Frshwr 695 are jointly offered; w/ same subject, they count as repeats of one another. May be retaken to 6 cr max. Satisfies Bio Sci research req; does not count as a Bio Sci lab course.
Last Taught: Fall 2016, Spring 2016.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 699 Independent Study for Undergraduates
1-3 cr. Undergraduate.
Independent study on a topic not available as a regular course; conducted under the supervision of a faculty member; requires approved study proposal.
Prerequisites: jr st; cons instr.
Course Rules: May be retaken to 6 cr max.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 781 Water Law for Scientists and Policy Makers
3 cr. Graduate.
The course is formatted to provide five (5) classes each on the Clean Water Act and basic common law concepts of Water Law; The Great Lakes Compact; and Wisconsin’s Groundwater Protection Act. Counts as repeat of Frsh Wtr 650 with similar topic.
Prerequisites: grad st.
Last Taught: Fall 2017, Fall 2016, Fall 2015.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 782 Water Resources Planning
3 cr. Graduate.
Emphasis on planning for water across the water cycle (surface, groundwater, wetlands, etc.), integrating non-water resources (habitat, energy, GHG emissions, etc.) in an urban context.
Prerequisites: grad st.
Course Rules: Jointly offered with & counts as repeat of UrbPlan 782.
Last Taught: Fall 2014.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 790 Freshwater Policy and Governance
3 cr. Graduate.
The main theoretical frameworks used in public policy to study environmental problems.
Prerequisites: grad st.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 810 Professional Development for Water Leaders
3 cr. Graduate.
Exploration of skill set needed for lifelong career development: research ethics, communications, teamwork, interpersonal relationships, administration, entrepreneurship, project management, and leadership.
Prerequisites: Counts as repeat of FrshWtr 650 with similar topic. Prereq grad st.
Last Taught: Fall 2017, Fall 2016, Fall 2015.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 822 Molecular & Cellular Basis of Environmental Disease
3 cr. Graduate.
Examines how environmental agents cause changes in gene expression, structure, and activity leading to disease; and resulting alterations in normal cellular processes and physiological consequences.
Prerequisites: grad st
Course Rules: Frshwr 822 & EOH 822 are jointly-offered; they count as repeats of one another.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 888 Candidate for Degree
0 cr. Graduate.
Available for grad students who must meet minimum credit load requirement. Fee for 1 credit assessed.
Prerequisites: grad st; cons instr.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 900 Colloquium in Freshwater Sciences
1 cr. Graduate.
Lectures by staff and visitors on research in various areas of freshwater sciences.
Prerequisites: grad st.
Course Rules: Retakable up to 2 cr.
Last Taught: Spring 2018.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 901 Seminar in Freshwater Sciences:
1-3 cr. Graduate.
Seminar on topics of current interest in freshwater sciences.
Prerequisites: grad st.
Course Rules: May be repeated w/ chg in topic to 9 cr max.
Last Taught: Spring 2018, Fall 2017, Spring 2017, Fall 2016.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 980 Graduate Internship
1-3 cr. Graduate.
Students earn credits for serving in an internship that involves work related to freshwater sciences disciplines. They must prepare a report based on the internship. Retakable w/chg in topic to 6 cr max. Satisfactory/Unsatisfactory only.
Prerequisites: grad st; cons instr.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 985 Master's Research and Thesis
1-6 cr. Graduate.
Research and writing of the master's thesis under the supervision of the major professor.
Prerequisites: grad st; cons instr.
Current Offerings: http://uwm.edu/schedule
FRSHWTR 990 Doctoral Research and Dissertation
1-9 cr. Graduate.
Research and writing of the doctoral dissertation under the supervision of the major professor.

**Prerequisites:** grad st; cons instr.
**Last Taught:** Summer 2018, Spring 2018, Fall 2017, Spring 2017.
**Current Offerings:** http://uwm.edu/schedule

FRSHWTR 999 Independent Study
1-3 cr. Graduate.
For graduate students unable to secure needed content in regular courses.

**Prerequisites:** grad st; cons instr.
**Course Rules:** Retakable w/ chg in topic to 6 cr max.
**Last Taught:** Spring 2018, Fall 2017, Spring 2017, Spring 2016.
**Current Offerings:** http://uwm.edu/schedule