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 Frshwtr 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, Frshwtr 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 461G 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, Frshwtr 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.
Principles of environmental policy, governance, and management for global sustainability.
Prerequisites: jr st; Chem 102(P) or cons instr.
Course Rules: Frshwtr 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.
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.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 502G Aquatic Ecosystem Dynamics
3 cr. Undergraduate/Graduate.
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.
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.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 510G 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.
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 adaptations 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 & Frshwtr 511 are jointly offered; they count as repeats of one another.
Last Taught: Fall 2017, Fall 2016.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 511G Ichthyology
3 cr. Undergraduate/Graduate.
The diverse biology of fishes focusing on behavioral, biomechanical, genetic, and physiological adaptations 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 & Frshwtr 511 are jointly offered; they count as repeats of one another.
Last Taught: Fall 2017, Fall 2016.
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.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 512G 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.
Current Offerings: 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

FRSHWTR 513G 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

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

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

FRSHWTR 522G 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

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
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).
Current Offerings: 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.
Current Offerings: http://uwm.edu/schedule

FRSHWTR 563G 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.
Current Offerings: 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).
Current Offerings: 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).
Current Offerings: 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

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.
Current Offerings: 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

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

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.
Current Offerings: 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.
Current Offerings: http://uwm.edu/schedule
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
<th>Prerequisites</th>
<th>Course Rules</th>
<th>Last Taught</th>
<th>Current Offerings</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRSHWTR 695</td>
<td>Independent Study in Freshwater Sciences for Biological Sciences Students</td>
<td>1-3 cr</td>
<td>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.</td>
<td>grad st</td>
<td>Course Rules: May be retaken to 6 cr max.</td>
<td>Fall 2016, Spring 2016</td>
<td>Current Offerings: <a href="http://uwm.edu/schedule">http://uwm.edu/schedule</a></td>
</tr>
<tr>
<td>FRSHWTR 699</td>
<td>Independent Study for Undergraduates</td>
<td>1-3 cr</td>
<td>Independent study on a topic not available as a regular course; conducted under the supervision of a faculty member; requires approved study proposal.</td>
<td>jr st; cons instr.</td>
<td>Course Rules: May be retaken to 6 cr max.</td>
<td>Fall 2016, Fall 2016</td>
<td>Current Offerings: <a href="http://uwm.edu/schedule">http://uwm.edu/schedule</a></td>
</tr>
<tr>
<td>FRSHWTR 781</td>
<td>Water Law for Scientists and Policy Makers</td>
<td>3 cr</td>
<td>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.</td>
<td>grad st</td>
<td>Course Rules: May be retaken to 6 cr max.</td>
<td>Fall 2017, Fall 2016</td>
<td>Current Offerings: <a href="http://uwm.edu/schedule">http://uwm.edu/schedule</a></td>
</tr>
<tr>
<td>FRSHWTR 782</td>
<td>Water Resources Planning</td>
<td>3 cr</td>
<td>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.</td>
<td>grad st</td>
<td>Course Rules: Jointly offered with &amp; counts as repeat of UrbPlan 782.</td>
<td>Fall 2014</td>
<td>Current Offerings: <a href="http://uwm.edu/schedule">http://uwm.edu/schedule</a></td>
</tr>
<tr>
<td>FRSHWTR 790</td>
<td>Freshwater Policy and Governance</td>
<td>3 cr</td>
<td>The main theoretical frameworks used in public policy to study environmental problems.</td>
<td>grad st</td>
<td>Course Rules: May be repeated w/ chg in topic to 9 cr max.</td>
<td>Summer 2018, Fall 2018, Fall 2017</td>
<td>Current Offerings: <a href="http://uwm.edu/schedule">http://uwm.edu/schedule</a></td>
</tr>
<tr>
<td>FRSHWTR 810</td>
<td>Professional Development for Water Leaders</td>
<td>3 cr</td>
<td>Exploration of skill set needed for lifelong career development: research ethics, communications, teamwork, interpersonal relationships, administration, entrepreneurship, project management, and leadership.</td>
<td>grad st</td>
<td>Course Rules: May be repeated w/ chg in topic to 6 cr max.</td>
<td>Fall 2017, Fall 2016, Fall 2015</td>
<td>Current Offerings: <a href="http://uwm.edu/schedule">http://uwm.edu/schedule</a></td>
</tr>
<tr>
<td>FRSHWTR 822</td>
<td>Molecular &amp; Cellular Basis of Environmental Disease</td>
<td>3 cr</td>
<td>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.</td>
<td>grad st</td>
<td>Course Rules: May be repeated w/ chg in topic to 6 cr max.</td>
<td>Fall 2016, Spring 2014, Spring 2013, Spring 2012</td>
<td>Current Offerings: <a href="http://uwm.edu/schedule">http://uwm.edu/schedule</a></td>
</tr>
<tr>
<td>FRSHWTR 888</td>
<td>Candidate for Degree</td>
<td>0 cr</td>
<td>Available for grad students who must meet minimum credit load requirement. Fee for 1 credit assessed.</td>
<td>grad st</td>
<td>Course Rules: May be repeated w/ chg in topic to 6 cr max.</td>
<td>Spring 2018</td>
<td>Current Offerings: <a href="http://uwm.edu/schedule">http://uwm.edu/schedule</a></td>
</tr>
<tr>
<td>FRSHWTR 900</td>
<td>Colloquium in Freshwater Sciences</td>
<td>1 cr</td>
<td>Lectures by staff and visitors on research in various areas of freshwater sciences.</td>
<td>grad st</td>
<td>Course Rules: May be repeated w/ chg in topic to 9 cr max.</td>
<td>Spring 2018</td>
<td>Current Offerings: <a href="http://uwm.edu/schedule">http://uwm.edu/schedule</a></td>
</tr>
<tr>
<td>FRSHWTR 901</td>
<td>Seminar in Freshwater Sciences</td>
<td>1-3 cr</td>
<td>Seminar on topics of current interest in freshwater sciences.</td>
<td>grad st</td>
<td>Course Rules: May be repeated w/ chg in topic to 9 cr max.</td>
<td>Spring 2018, Fall 2017, Fall 2017</td>
<td>Current Offerings: <a href="http://uwm.edu/schedule">http://uwm.edu/schedule</a></td>
</tr>
<tr>
<td>FRSHWTR 980</td>
<td>Graduate Internship</td>
<td>1-3 cr</td>
<td>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. May be repeated up to 2 cr.</td>
<td>grad st</td>
<td>Course Rules: May be repeated w/ chg in topic to 6 cr max.</td>
<td>Summer 2018, Summer 2018, Fall 2017, Spring 2017, Fall 2016</td>
<td>Current Offerings: <a href="http://uwm.edu/schedule">http://uwm.edu/schedule</a></td>
</tr>
<tr>
<td>FRSHWTR 985</td>
<td>Master's Research and Thesis</td>
<td>1-6 cr</td>
<td>Research and writing of the master's thesis under the supervision of the major professor.</td>
<td>grad st</td>
<td>Course Rules: May be repeated w/ chg in topic to 6 cr max.</td>
<td>Summer 2018, Spring 2018, Fall 2017, Spring 2017</td>
<td>Current Offerings: <a href="http://uwm.edu/schedule">http://uwm.edu/schedule</a></td>
</tr>
<tr>
<td>FRSHWTR 990</td>
<td>Doctoral Research and Dissertation</td>
<td>1-9 cr</td>
<td>Research and writing of the doctoral dissertation under the supervision of the major professor.</td>
<td>grad st</td>
<td>Course Rules: May be repeated w/ chg in topic to 6 cr max.</td>
<td>Summer 2018, Spring 2018, Fall 2017, Spring 2017</td>
<td>Current Offerings: <a href="http://uwm.edu/schedule">http://uwm.edu/schedule</a></td>
</tr>
</tbody>
</table>

For more details, visit [http://uwm.edu/schedule](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.
Current Offerings: http://uwm.edu/schedule