Twin Cities Campus

Water Resources Science Minor

Water Resources Center
Graduate School

Link to a list of faculty for this program.

Contact Information:
Water Resources Science, 193 McNeal Hall, 1985 Buford Avenue, St. Paul MN 55108 (612-624-7456; fax: 612-625-1263)
Email: wrs@umn.edu
Website: http://wrs.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2016
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.
- University of Minnesota Duluth

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This cross-campus interdisciplinary program provides comprehensive training in water resources science, with integration across scientific disciplines. A structured interdisciplinary graduate curriculum is offered. The program includes a set of core courses plus electives in the following areas of emphasis at the M.S. and PhD levels: aquatic biology, environmental chemistry, hydrologic science, limnology, water management technology, water policy, water quality, and watershed science and management. Approximately 80 courses offered within 15 other graduate programs are available to students majoring in water resources science.

The goal of the program is to produce scientists with strong technical skills in disciplines relevant to water resources and a broad understanding of 1) the hydrologic cycle and associated ecosystems, 2) the interconnectedness of the sciences involved in managing aquatic resources, and 3) the interplay between the biophysical sciences and social sciences in developing and implementing public policies related to water.

Students in the program develop the breadth of scientific knowledge appropriate to understand the complicated aquatic ecosystems and watersheds on which they will work, as well as social dimensions of the topic, including the public policy and legal frameworks in which water resources are protected and managed.

The program involves faculty from the following departments on the Twin Cities campus: Applied Economics; Bioproducts and Biosystems Engineering; Civil Engineering; Earth Sciences; Ecology, Evolution, and Behavior; Entomology; Environmental and Occupational Health; Fisheries, Wildlife, and Conservation Biology; Forest Resources; Geography; Horticultural Science; Plant Biology; and Soil, Water, and Climate. It also involves faculty from the following departments on the Duluth campus: Biology; Chemical Engineering; Chemistry; Civil Engineering; Geography; Geological Sciences; and Physics; as well as the Large Lakes Observatory and the Natural Resources Research Institute in Duluth.

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission

The preferred undergraduate GPA for admittance to the program is 3.00.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Use of 4xxx courses towards program requirements is not permitted.

Required Course

WRS 5101 - Water Policy (3.0 cr)

© 2005 by the Regents of the University of Minnesota
The University of Minnesota is an equal opportunity educator and employer.

Program Sub-plans

Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Master's

Core Courses

Take 6 or more credit(s) from the following:

Hydrology Core Courses

- BBE 8513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
  or CEGE 4501 - Hydrologic Design (4.0 cr)
  or ESCI 4702 - General Hydrogeology (4.0 cr)
  or FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
  or FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)

•Environmental/Water Chemistry Core Courses

- CEGE 5541 - Environmental Water Chemistry (3.0 cr)
  or ESCI 4401 - Aqueous Environmental Geochemistry (3.0 cr)
  or LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
  or PUBH 6190 - Environmental Chemistry (3.0 cr)

•Limnology Core Courses

- EEB 5601 - Limnology (3.0 cr)
  or BBE 4523 - Ecological Engineering Design (3.0 cr)
  or BBE 5523 - Ecological Engineering Design (3.0 cr)
  or BBE 5513 - Watershed Engineering (3.0 cr)
  or BBE 5535 - Assessment and Diagnosis of Impaired Waters (3.0 cr)

Doctoral

Core Courses

Take 3 or more credit(s) from the following:

Hydrology Core Courses

- BBE 8513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
  or CEGE 4501 - Hydrologic Design (4.0 cr)
  or ESCI 4702 - General Hydrogeology (4.0 cr)
  or FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
  or FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)

•Environmental/Water Chemistry Core Courses

- CEGE 5541 - Environmental Water Chemistry (3.0 cr)
  or ESCI 4401 - Aqueous Environmental Geochemistry (3.0 cr)
  or LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
  or PUBH 6190 - Environmental Chemistry (3.0 cr)

•Limnology Core Courses

- EEB 5601 - Limnology (3.0 cr)
  or BBE 4523 - Ecological Engineering Design (3.0 cr)
  or BBE 5523 - Ecological Engineering Design (3.0 cr)
  or BBE 5513 - Watershed Engineering (3.0 cr)
  or BBE 5535 - Assessment and Diagnosis of Impaired Waters (3.0 cr)

Emphasis Courses

Take 6 or more credit(s) from the following:

Aquatic Biology Emphasis

- PMB 4121 - Microbial Ecology and Applied Microbiology (3.0 cr)
  or CEGE 5551 - Environmental Microbiology (3.0 cr)
  or EEB 5601 - Limnology (3.0 cr)
  or ENT 5081 *{Inactive}*(3.0 cr)
  or ENT 4361 - Aquatic Insects (3.0 cr)
  or ESPM 5575 - Wetlands (3.0 cr)
  or FW 4136 - Ichthyology (4.0 cr)
  or FW 5604W *{Inactive}*[WI] (3.0 cr)
  or FW 8459 - Stream and River Ecology (3.0 cr)
  or FW 8465 - Fish Habitats and Restoration (3.0 cr)
  or HORT 5071 - Ecological Restoration (4.0 cr)

•Environmental Emphasis

- CEGE 5541 - Environmental Water Chemistry (3.0 cr)
  or CEGE 5542 - Experimental Methods in Environmental Engineering (3.0 cr)
  or CEGE 8542 - Chemistry of Organic Pollutants in Environmental Systems (3.0 cr)
  or ESCI 4401 - Aqueous Environmental Geochemistry (3.0 cr)

© 2005 by the Regents of the University of Minnesota
The University of Minnesota is an equal opportunity educator and employer.
Information current as of March 29, 2024

or ESCI 4402 - Biogeochemical Cycles in the Ocean (3.0 cr)
or ESPM 4216 - Contaminant Hydrology (3.0 cr)
or LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
or PUBH 6190 - Environmental Chemistry (3.0 cr)

•Hydrology Emphasis (Climatology)
•ESPM 5402 - Biometeorology (3.0 cr)
or GEOG 5426 - Climatic Variations (3.0 cr)

•Hydrology Emphasis (Groundwater)
•CEGE 4351 - Groundwater Mechanics (3.0 cr)
or CEGE 4352 - Groundwater Modeling (3.0 cr)
or ESCI 4702 - General Hydrogeology (4.0 cr)
or ESCI 5971 - Field Hydrogeology (2.0 cr)

•Hydrology Emphasis (Surface Water)
•BBE 5513 - Watershed Engineering (3.0 cr)
or BBE 8513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
or CEGE 4501 - Hydrologic Design (4.0 cr)
or CEGE 8506 - Stochastic Hydrology (4.0 cr)
or CEGE 8507 - Advanced Methods in Hydrology (4.0 cr)
or CEGE 8572 - Computational Environmental Fluid Dynamics (4.0 cr)
or ESCI 8601 - Introduction to Stream Restoration (3.0 cr)
or CEGE 8601 - Introduction to Stream Restoration (3.0 cr)
or EEB 8601 - Introduction to Stream Restoration (3.0 cr)
or ESCI 8602 - Stream Restoration Practice (2.0 cr)
or CEGE 8602 - Stream Restoration Practice (2.0 cr)
or EEB 8602 - Stream Restoration Practice (2.0 cr)
or ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
or ESPM 5555 - Wetland Soils (3.0 cr)
or SOIL 5555 - Wetland Soils (3.0 cr)
or FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
or FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
or SOIL 5232 - Vadose Zone Hydrology (3.0 cr)

•Limnology Emphasis
•EEB 4611 - Biogeochemical Processes (3.0 cr)
or EEB 5601 - Limnology (3.0 cr)
or ESCI 4402 - Biogeochemical Cycles in the Ocean (3.0 cr)
or ESCI 5705 - Limnogeology and Paleoenvironment (3.0 cr)
or FW 5604W *{Inactive}*[WI] (3.0 cr)
or FW 8459 - Stream and River Ecology (3.0 cr)
or FW 8465 - Fish Habitats and Restoration (3.0 cr)
or PUBH 6190 - Environmental Chemistry (3.0 cr)

•Limnology/Oceanography Emphasis
•EEB 4611 - Biogeochemical Processes (3.0 cr)
or EEB 5601 - Limnology (3.0 cr)
or EEB 5605 *{Inactive}*(2.0 cr)
or ESCI 4402 - Biogeochemical Cycles in the Ocean (3.0 cr)
or ESCI 5705 - Limnogeology and Paleoenvironment (3.0 cr)
or FW 5604W *{Inactive}*[WI] (3.0 cr)
or FW 8459 - Stream and River Ecology (3.0 cr)
or FW 8465 - Fish Habitats and Restoration (3.0 cr)
or PUBH 6190 - Environmental Chemistry (3.0 cr)

•Water Management Technology Emphasis
•BBE 4523 - Ecological Engineering Design (3.0 cr)
or CEGE 4502 - Water and Wastewater Treatment (3.0 cr)
or CEGE 4511 - Hydraulic Structures (3.0 cr)
or CEGE 4512 - Open Channel Hydraulics (3.0 cr)
or CEGE 4562 - Environmental Remediation Technologies (3.0 cr)
or CEGE 8504 - Theory of Unit Operations (4.0 cr)
or CEGE 8505 - Biological Processes (3.0 cr)
or CEGE 8511 - Mechanics of Sediment Transport (3.0 cr)
or ESCI 8511 - Mechanics of Sediment Transport (3.0 cr)

•Water Policy Emphasis
•APEC 5651 *{Inactive}*(3.0 cr)
or CONS 8004 - Economic and Social Aspects of Conservation Biology (3.0 cr)
or ESPM 5256 - Natural Resource Law and the Management of Public Lands and Waters (3.0 cr)

•Water Quality Emphasis
•BBE 5535 - Assessment and Diagnosis of Impaired Waters (3.0 cr)

© 2005 by the Regents of the University of Minnesota
The University of Minnesota is an equal opportunity educator and employer.

or CEGE 4502 - Water and Wastewater Treatment (3.0 cr)
or CEGE 8542 - Chemistry of Organic Pollutants in Environmental Systems (3.0 cr)
or ENT 5081 *{Inactive}*(3.0 cr)
or ESPM 5061 - Water Quality and Natural Resources (3.0 cr)
or ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
or ESPM 5575 - Wetlands (3.0 cr)

- **Watershed Science and Management Emphasis**
  - BBE 5513 - Watershed Engineering (3.0 cr)

or BBE 8513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
or CEGE 4501 - Hydrologic Design (4.0 cr)
or ESCI 8601 - Introduction to Stream Restoration (3.0 cr)
or CEGE 8601 - Introduction to Stream Restoration (3.0 cr)
or EEB 8601 - Introduction to Stream Restoration (3.0 cr)
or ESCI 8602 - Stream Restoration Practice (2.0 cr)
or CEGE 8602 - Stream Restoration Practice (2.0 cr)
or EEB 8602 - Stream Restoration Practice (2.0 cr)
or ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
or ESPM 5575 - Wetlands (3.0 cr)
or ESPM 5703 *{Inactive}*(3.0 cr)
or ESPM 5555 - Wetland Soils (3.0 cr)
or SOIL 5555 - Wetland Soils (3.0 cr)
or FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
or FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
or HORT 5071 - Ecological Restoration (4.0 cr)
or WRS 5050 - Special Topics in Water Resources Science (1.0 - 3.0 cr)

© 2005 by the Regents of the University of Minnesota
The University of Minnesota is an equal opportunity educator and employer.