

HYDROLOGIC SCIENCES - GRADUATE CERTIFICATE

The hydrologic sciences graduate program focuses on quantitative studies of water in the environment including its role in geologic and biogeochemical processes, ecosystem functions and global elemental cycling. The program is interdisciplinary, interdepartmental and designed to encourage students with a variety of academic backgrounds to enter the field. It is intended for science and engineering graduate students, allowing them to obtain recognition for their accomplishments in hydrologic sciences and to demonstrate the quantitative multidisciplinary education desired by many prospective employers.

All hydrologic sciences graduate program students are admitted through one of the participating departments: Atmospheric and Oceanic Sciences (ATOC) (<https://www.colorado.edu/atoc/academics/prospective-graduate-students/>); Civil, Environmental and Architectural Engineering (CEAE) (<https://www.colorado.edu/ceae/prospective-students/graduate-studies/>); Ecology and Evolutionary Biology (EBIO) (<https://www.colorado.edu/ebio/graduate-overview/>); Environmental Studies (ENVS) (<https://www.colorado.edu/envs/graduate-studies/>); Geography (GEOG) (<https://www.colorado.edu/geography/grad-program/graduate-curriculum/>); or Geological Sciences (GEOL) (<https://www.colorado.edu/geologicalsciences/academic/graduate-degree-programs/>). Graduate students may apply for admission (<https://www.colorado.edu/program/hydrosociences/academics/admissions/>) to hydrologic sciences after admission to one of these departments.

The program offers a certificate in hydrologic sciences to research-oriented graduate students in the participating departments. PhD students in ATOC, ENVS, GEOG and GEOL may enroll in the hydrologic sciences PhD subplan or the certificate. Course requirements are identical for the subplan and certificate.

Hydrologic sciences students conduct research within participating departments, research institutes and centers (e.g., INSTAAR (<https://instaar.colorado.edu/>)), or partnering government agency labs in the Boulder area (e.g., USGS (<https://www.usgs.gov/>), NOAA (<https://www.noaa.gov/>)). Primary supervision of the student's research may be provided by any faculty member approved by their department, though the hydrologic sciences program requires representation from program faculty on students' comprehensive exam and defense committees.

For additional information, please visit the program webpage (<https://www.colorado.edu/program/hydrosociences/>) or contact the Graduate Coordinator (hydrogrd@colorado.edu).

Requirements

- Completion of all hydrologic sciences program courses with a grade of B or better.
- Completion of degree requirements for graduate degree within the student's home department.
- For the graduate certificate: The thesis topic includes substantial use of hydrologic science and the thesis committee includes at least one Hydrologic Sciences Program faculty member (<https://www.colorado.edu/program/hydrosociences/people/faculty/>).
- For the PhD subplan: The dissertation topic is approved by Hydrologic Sciences Program co-director and the dissertation committee includes at least two Hydrologic Sciences Program faculty member (<https://www.colorado.edu/program/hydrosociences/people/>).

faculty/)s (<https://www.colorado.edu/program/hydrosociences/people/faculty/>).

Students are referred to their home department (ATOC, CEAE, EBIO, ENVS, GEOG or GEOL) and the University Catalog for general information on requirements for their degree. In case of a conflict between those documents and the requirements stated here, the rules of the Graduate School apply.

Research Supervision

Primary supervision of the student's research may be provided by any faculty member approved by the student's home department.

Course Prerequisites

All students entering the program are expected to have advanced-level knowledge of mathematics: a full year of college level calculus including differential and integral calculus. (Linear algebra and differential equations are strongly encouraged.) Students are expected to have completed one semester of college-level physics (mechanics).

In addition, students are encouraged to work with their advisors and committees to identify and fulfill any other specialized degree and/or research-related required courses. For example, students interested in the physical aspects of hydrologic sciences are expected to have advanced-level knowledge of physics (mechanics and thermodynamics) and fluid mechanics. Similarly, students interested in the chemical aspects of hydrologic sciences may be expected to have advanced-level knowledge of organic and/or physical chemistry, students interested in the biological or ecological aspects of hydrologic sciences are expected to have an advanced-level knowledge of biology and/or ecology.

Students may also need to complete other specific undergraduate prerequisites required by their home department.

Required Courses and Credits

Five courses are required for the Hydrologic Sciences Certificate and PhD Subplan. The number of courses is intentionally kept low, so that the student is free to design an overall academic program that meets their needs in terms of specialized scholarly interests. Hydrologic sciences courses are included in the minimum semester hours required for all graduate students. The coursework is designed to assure competency in appropriate subject matter at the graduate level.

The five courses are required, as follows:

- One course from List A
- One course from List A or B
- Three elective courses

Code	Title	Credit Hours
<i>List A</i>		
ATOC 5050	Atmospheric Thermodynamics and Dynamics	3
ATOC 5060	Dynamics of the Atmosphere and Oceans	3
CVEN 5313	Environmental Fluid Mechanics	3
CVEN 5353	Groundwater Hydrology	3
GEOL 5110	Geomechanics	3
<i>List B</i>		
ATOC 5051	Introduction to Physical Oceanography	3
ATOC 5061	Advanced Ocean Dynamics and Air-Sea Coupled ENSO Mechanisms	3

CVEN 5333	Physical Hydrology	3
CVEN 5404	Water Chemistry	3
GEOG 5321	Snow Hydrology	3-4
GEOL 5080	Advanced Hydrogeology and Modeling Concepts	3

Electives

Code	Title	Credit Hours
ATOC 5235	Introduction to Atmospheric Radiative Transfer and Remote Sensing	3
ATOC 5500	Special Topics in Atmospheric and Oceanic Sciences (Field Observations and Measurements)	1-3
ATOC 5550	Mountain Meteorology	3
ATOC 5600	Physics and Chemistry of Clouds and Aerosols	3
ATOC 5730	Physical Oceanography and Climate	3
ATOC 5750	Desert Meteorology and Climate	3
ATOC 5780	Ice Sheets and Climate	3
ATOC 5850	Numerical Methods Laboratory	3
CHEM 5141	Environmental Water and Soil Chemistry	3
CVEN 5323	Applied Stream Ecology	3
CVEN 5343	Transport and Dispersion in Surface Water	3
CVEN 5363	Modeling of Hydrologic Systems	3
CVEN 5383	Applied Groundwater Modeling	3
CVEN 5404	Water Chemistry	3
CVEN 5454	Statistical Methods for Natural and Engineered Systems	3
CVEN 5833	Special Topics (Analysis of Urban Water Systems)	1-3
CVEN 5537	Numerical Methods in Civil Engineering	3
CVEN 5833	Special Topics (Environmental Transport and Dispersion Processes)	1-3
CVEN 6383	Flow and Transport through Porous Media	3
CVEN 6414	Aquatic Surfaces and Particles	3
EBIO 5030	Limnology	3
ENVS 5840	Global Biogeochemical Cycles	3
GEOG 5023	Advanced Quantitative Methods for Spatial Data	4
GEOG 5093	Remote Sensing of the Environment	4
GEOG 5241	Topics in Physical Geography (Watershed Biogeochemistry)	1-3
GEOG 5241	Topics in Physical Geography (Fluvial Geomorphology)	1-3
GEOG 5251	River Systems and Landforms	4
GEOG 5271	The Arctic Climate System	3
GEOG 5303	Geographic Information Science: Spatial Programming	4
GEOL 5060	Oceanography	4
GEOL 5093	Remote Sensing of the Environment	4
GEOL 5270	Marine Chemistry and Geochemistry	3

GEOL 5280	Aqueous and Environmental Geochemistry	3
GEOL 5305	Global Biogeochemical Cycles	3
GEOL 5430	Paleoceanography and Paleoclimatology	3
GEOL 5700	Geological Topics Seminar (Terrestrial Hydrology)	3-4
GEOL 5700	Geological Topics Seminar (Sedimentary Modeling)	1-4