

# WATER SCIENCE (WATS)

## WATS 281 Introduction to Water Science

**Crosslisted with:** GEOG 281, NRES 281

**Prerequisites:** High school chemistry or one semester college chemistry; one course in geology or physical geography or soil.

**Description:** Survey of the water science from the perspective of both natural and social sciences. Water budget, precipitation, evapotranspiration, runoff and stream flow, groundwater, water quality parameters, economics of water, water policy, water law and water politics.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded with Option

**Prerequisite for:** NRES 319; PLAS 361, GEOL 361, NRES 361, SOIL 361, WATS 361

## WATS 299 Career Experiences

**Prerequisites:** Permission and advanced approval of plan or work.

**Description:** Student participation in water science applications. May include participation in water resource management, water measurement, water quality monitoring, water supply, water administration; research in laboratories, green houses and fields; or preparation of educational materials.

**Credit Hours:** 1-5

**Min credits per semester:** 1

**Max credits per semester:** 5

**Max credits per degree:** 12

**Grading Option:** Graded with Option

## WATS 354 Soil Conservation and Watershed Management

**Crosslisted with:** AGST 354, SOIL 354

**Prerequisites:** PLAS/SOIL 153; and AGST 109 or PHYS 141 or PHYS 151 or PHYS 211

**Description:** Watershed hydrology, soil erosion, erosion control, water management, and land surveying and mapping. Includes rainfall-runoff relationships; determination of watershed characteristics; terraces, waterways, vegetative filters, and residue management; ponds, wetlands, non-point source pollution control, and water conservation; profile and topographic surveying.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded with Option

**Offered:** FALL

## WATS 361 Soils, Environment and Water Quality

**Crosslisted with:** PLAS 361, GEOL 361, NRES 361, SOIL 361

**Prerequisites:** PLAS/SOIL 153; MATH 102 or 103; two semesters chemistry (CHEM 105A and 105L, CHEM 106A and 106L, CHEM 109A and 109L, CHEM 110A and 110L) and WATS/GEOG/NRES 281

**Description:** Chemical and physical processes that influence the fate and transport of contaminants (inorganic, organic, microbial) in soil-water environments. Extent, fate, mitigation and impact of various sources of pollution. Remedial technologies used for environmental restoration of contaminated environments.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded with Option

**Prerequisite for:** PLAS 458, AGRO 858, NRES 458, NRES 858, SOIL 458

## WATS 408 Microclimate: The Biological Environment

**Crosslisted with:** PLAS 408, GEOG 408, METR 408, NRES 408, AGRO 808, GEOG 808, HORT 808, METR 808, NRES 808

**Prerequisites:** Junior standing, MATH 106 or equivalent, 5 hrs physics, major in any of the physical or biological sciences or engineering.

**Description:** Physical factors that create the biological environment.

Radiation and energy balances of earth's surfaces, terrestrial and marine. Temperature, humidity, and wind regimes near the surface. Control of the physical environment through irrigation, windbreaks, frost protection, manipulation of light, and radiation. Applications to air pollution research. Instruments for measuring environmental conditions and remote sensing of the environment.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded with Option

**Prerequisite for:** BSEN 954, NRES 954

## WATS 418 Chemistry of Natural Waters

**Crosslisted with:** GEOL 418, GEOL 818, NRES 419, NRES 819

**Prerequisites:** CHEM 109A/L and CHEM 110A/L, CHEM 113A/L and CHEM 114.

**Description:** Principles of water chemistry and their use in precipitation, surface water, and groundwater studies. Groundwater applications used to determine the time and source of groundwater recharge, estimate groundwater residence time, identify aquifer mineralogy, examine the degree of mixing between waters of various sources and evaluate what types of biological and chemical processes have occurred during the water's journey through the aquifer system.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded with Option

**Course and Laboratory Fee:** \$25

## WATS 452 Irrigation Systems Management

**Crosslisted with:** AGST 452, AGST 852, PLAS 452

**Prerequisites:** AGST 109 or PHYS 141 or PHYS 151 or PHYS 211

**Notes:** PLAS/SOIL 153 recommended.

**Description:** Irrigation management and the selection, evaluation, and improvement of irrigation systems. Includes soil-water measurement, crop water use, irrigation scheduling, irrigation efficiency, measurement of water flow, irrigation systems, groundwater and wells, pumping systems, applying chemicals with irrigation systems, and environmental and water resource considerations.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded with Option

**Offered:** FALL

**Prerequisite for:** AGEN 854, AGST 854; AGST 855

## WATS 457 Water Law

**Crosslisted with:** AECN 457, AECN 857, NREE 457

**Prerequisites:** AECN/NREE 357.

**Description:** Environmental impact review; public trust doctrine; endangered species; land use controls; wetlands regulation; surface and ground water rights; Indian and federal water rights; impact of water quality regulations on water allocation.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Grading Option:** Graded with Option

**WATS 459 Limnology****Crosslisted with:** BIOS 459, BIOS 859, NRES 459, NRES 859**Prerequisites:** BIOS 207 or NRES 220; CHEM 106A & CHEM 106L or CHEM 110A & CHEM 110L**Description:** Physical, chemical, and biological processes that occur in fresh water. Organisms occurring in fresh water and their ecology; biological productivity of water and its causative factors; eutrophication and its effects.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Graded with Option**Offered:** SPRING**ACE:** ACE 10 Integrated Product**Course and Laboratory Fee:** \$25**WATS 461 Soil Physics****Crosslisted with:** PLAS 461, NRES 461, SOIL 461, AGRO 861, NRES 861**Prerequisites:** PLAS/SOIL 153; PHYS 141 or equivalent, one semester of calculus.**Description:** Principles of soil physics. Movement of water, air, heat, and solutes in soils. Water retention and movement, including infiltration and field water regime. Movement of chemicals in soils.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**WATS 465 Resource and Environmental Economics II****Crosslisted with:** AECN 465, AECN 865, NRES 465**Prerequisites:** MATH 104 and one course in statistics.**Description:** Application of resource economics concepts and empirical tools to resource management problems. Public policy issues involving environmental quality, land and water management.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** AECN 868**WATS 468 Wetlands****Crosslisted with:** BIOS 458, NRES 468, NRES 868, BSEN 468, BSEN 868**Prerequisites:** CHEM 109A and 109L and CHEM 110A and 110L, or CHEM 105A and 105L and CHEM 106A and 106L; Junior or Senior Standing.**Notes:** Offered even-numbered calendar years.**Description:** Physical, chemical and biological processes that occur in wetlands; the hydrology and soils of wetland systems; organisms occurring in wetlands and their ecology wetland creation, delineation, management and ecotoxicology.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Graded with Option**Course and Laboratory Fee:** \$40**WATS 472 Applied Soil Physics****Crosslisted with:** PLAS 472, AGRO 872, NRES 472, NRES 872, SOIL 472**Prerequisites:** PLAS/SOIL 153; MATH 102 or MATH 104 or MATH 106.**Description:** Emphasis on applied soil physics. Discussion of theoretical principles followed by field and laboratory exercises and applications. Fluxes of water, solutes, air, and heat through the soil. Emphasis on water infiltration, water retention, other soil hydraulic properties. Components of soil water balance. Management of soil water.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Offered:** FALL**WATS 475 Water Quality Strategy****Crosslisted with:** NRES 475, NRES 875, SOIL 475, PLAS 475, AGRO 875, CIVE 475, CIVE 875, CRPL 475, CRPL 875, GEOL 475, GEOL 875, AGST 475, AGST 875, POLS 475, POLS 875**Prerequisites:** Senior standing.**Notes:** Capstone course.**Description:** Holistic approach to the selection and analysis of planning strategies for protecting water quality from nonpoint sources of contamination. Introduction to the use of methods of analyzing the impact of strategies on whole systems and subsystems; for selecting strategies; and for evaluating present strategies.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**ACE:** ACE 10 Integrated Product**WATS 479 Hydroclimatology****Crosslisted with:** NRES 479, METR 479, BSEN 479, NRES 879, METR 879, BSEN 879**Prerequisites:** NRES 208 or METR 100 or METR/NRES 370.**Notes:** Offered spring semester of even-numbered calendar years.**Description:** Interaction between earth's climate and the hydrologic cycle. Energy and water fluxes at the land-atmosphere interface. Atmospheric moisture transport, precipitation, evaporation, snowmelt, and runoff. Impacts of climate variability and change on the hydrologic cycle.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**WATS 481 Stream and River Ecology****Crosslisted with:** WATS 881, BIOS 481, NRES 481**Prerequisites:** NRES 222 or equivalent**Description:** Fundamental physical drivers operating in stream and river ecosystems and how those vary in space and time. Major classes of organisms associated with stream ecosystems and their functional roles. Fundamental controls on biotic diversity in stream and river ecosystems and its variance. Major aspects of stream ecosystem function including energy flow and nutrient cycling. Ecosystem services provided by stream and river ecosystems and causes and consequences of human impacts on streams and rivers. Underlying principles of bioassessment and current methods of stream restoration.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Graded**Course and Laboratory Fee:** \$20

**WATS 484 Water Resources Seminar**

**Crosslisted with:** PLAS 484, GEOG 484, GEOL 484, NRES 484, NRES 884, AGRO 884, GEOG 884, GEOL 884, WATS 884

**Prerequisites:** Junior or above standing

**Description:** Seminar on current water resources research and issues in Nebraska and the region.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 1

**Grading Option:** Graded with Option

**WATS 496 Principles and Problems in Water Science**

**Prerequisites:** 15 hours in water science or closely related areas.

**Description:** Individual or group projects in research, literature review, or extension of course work under the supervision and evaluation of a water science faculty member.

**Credit Hours:** 1-5

**Min credits per semester:** 1

**Max credits per semester:** 5

**Max credits per degree:** 12

**Grading Option:** Graded with Option

**WATS 498A Senior Project I**

**Prerequisites:** Senior standing

**Notes:** First course of a two-semester sequence of courses consisting of WATS 498A and WATS 498B.

**Description:** Work as individual or as a team member to develop solutions to water resource problems. Problem involves multi-disciplinary features. Requires independent research, proposal preparation and presentation.

**Credit Hours:** 2

**Max credits per semester:** 2

**Max credits per degree:** 2

**Grading Option:** Graded with Option

**Prerequisite for:** WATS 498B

**ACE:** ACE 10 Integrated Product

**Course and Laboratory Fee:** \$30

**WATS 498B Senior Project II**

**Prerequisites:** WATS 498A

**Notes:** Second course of a two-semester sequence of courses consisting of WATS 498A and WATS 498B.

**Description:** Continuation of WATS 498A. Carry out proposal and present findings orally and in writing.

**Credit Hours:** 2

**Max credits per semester:** 2

**Max credits per degree:** 2

**Grading Option:** Graded with Option

**ACE:** ACE 10 Integrated Product

**Course and Laboratory Fee:** \$30

**WATS 499H Honors Thesis**

**Prerequisites:** Admission to the University Honors Program and permission

**Notes:** AGRI 299H recommended

**Description:** Conduct a scholarly research project and write a University Honors Program or undergraduate thesis.

**Credit Hours:** 3-6

**Min credits per semester:** 3

**Max credits per semester:** 6

**Max credits per degree:** 6

**Grading Option:** Graded

**ACE:** ACE 10 Integrated Product