

Undergraduate Certificate in Groundwater Hydrology

Certificate Description and Purpose – The Groundwater Undergraduate Certificate indicates that a student has a basic understanding of hydrologic science with an emphasis in groundwater hydrology specifically. The purpose of this certificate is to demonstrate to potential employers that the individual understands principles of hydrology and has chosen to focus her/his studies on groundwater hydrology specifically.

Certificate Requirements

- a. Students must complete the following on-campus courses with a grade of “C” or higher:
- b. Courses include:
 - i. HWRS 250 *Principles of Hydrology* (in-person, 3 units)
OR HWRS 249a (online, 2 units) & 249b (in-person, 1 unit)
Although HWRS 249a is online, it is typically available only to on-campus students.
 - ii. HWRS 431 *Hydrogeology* (4 units)
 - iii. HWRS 482 *Applied Groundwater Modeling* (3 units)
 - iv. Then choose two classes from the following list:
 1. HWRS 405 *Vadose Zone Hydrology* (3 units)
 2. HWRS 518 *Fundamentals of Subsurface Hydrology* [for students who meet the qualifications] (3 units)
 3. HWRS 413A *Field Hydrology* (2 units)
 4. GEOS 302 *Stratigraphy and Sedimentology* (4 units) *OR*
GEOS 304 *Structural Geology* (4 units)

Total number of credits required to earn The Groundwater Undergraduate Certificate: 15-17 units

- c. In some circumstances, students may be allowed to substitute required and/or elective courses at the advisor’s discretion.

Student Admittance/Advising/Completion – a high school diploma or equivalent is required for admission to an undergraduate certificate.

- a. Prerequisites: Grade of “C” or higher in the following classes or equivalents:
 - i. MATH 129 *Calculus II*
 - ii. PHY 141 *Introduction to Mechanics*
 - iii. CHEM 152 *Fundamentals of Chemistry II*

- b. Concurrent enrollment in a degree program is allowed but not required.
- c. No more than 6 units may be transferred (courses taken at institutions other than the UA) and applied to the certificate.
- d. Student advising is provided by Dr. Martha P.L. Whitaker, Undergraduate Program Coordinator, Advisor, and Professor of Practice in the Department of Hydrology & Atmospheric Sciences.
- e. All units earned for the certificate may be applied to the Environmental Hydrology Bachelor of Science degree.
- f. Students are allowed to use all units taken in non-degree status to satisfy undergraduate certificate requirements.

Certificate and Student Outcomes

Student Learning Outcomes: Basic understanding of subsurface fluid flow, groundwater methods of data collection and analysis.

Measured by successful completion of:

- i) An aquifer test, and associated data analysis assignment(s) in HWRS 250, HWRS 431, HWRS 413A
- ii) Assignments that require analysis of unsaturated and/or groundwater flow data (e.g. flow nets) in HWRS 250, HWRS 405 HWRS 431, HWRS 482
- iii) Assignments or testing of ability to complete groundwater modeling assignments in HWRS 482

And successful testing re: knowledge of:

- Water budgets, water balance equation in HWRS 250, HWRS 413A