

# Course Syllabus

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## (Advanced) Field Methods in Hydrology - BSE 4224 / BSE 5224G

Site characterization: surveying, channel and floodplain mapping, land use, electronic data acquisition. Techniques for measuring surface and subsurface hydrological processes: water flow, hydrologic conductivity, precipitation, evaporation. Sampling techniques: surface water, groundwater, and soil pore water sampling. In-situ monitoring: automatic samplers, dataloggers, water quality sondes. Laboratory analyses: GLP practices, selection of analytical method, calibration, QA/QC. Pre: Graduate standing. (2H,3L, 3C).

**Credit hours:** 3

**Instructor:** Durelle Scott, [dscott@vt.edu \(mailto:dscott@vt.edu\)](mailto:dscott@vt.edu), Seitz 202a and Habb1 302k

### Contact information & office hours:

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### Email:

Email is best suited to quick communication regarding class attendance, questions regarding assignments, or minor concerns. For more substantive issues, please come to office hours. Please consult the following guidelines before sending me an email: <http://www.wikihow.com/Email-a-Professor> (<http://www.wikihow.com/Email-a-Professor>).

**Learning objectives:** Students completing this course successfully will be able to:

- Measure stream velocity and discharge, travel time, stream/hyporheic exchange, bankfull stage, hydrologic return intervals
- Measure stream and land slopes, areas; determine land cover
- Work safely in various field environments
- Develop and implement a quality assurance plan to insure collection of quality data
- Select, install, and operate hydrologic equipment and sensors (samplers, flow measurement systems, data sondes, meteorological equipment, soil moisture)
- Conduct basic laboratory analytical analyses (total suspended solids, dissolved and particulate nutrients, bacteria, total suspended sediment)
- Identify and deal with statistical outliers
- Interpret existing and measured data to characterize stream/watershed/aquatic system
- Plan and conduct a hydrologic and water quality field study
- Evaluate and critique hydrologic studies from published literature
- Create and demonstrate a standard operating procedure for measuring a specific hydrologic process by adapting an existing hydrologic technique

**Expectations:** Throughout the course, you'll be expected to perform the assigned readings prior to class. Your participation in class discussions is strongly encouraged (and is part of your grade). Participation and attendance is mandatory; please consult with me > 1 week should a conflict arise. The integrity of your work is of the utmost importance - please see the section on the honor code. In the field, I expect that you come prepared,

work safely and diligently, and listen to and respect your peers to promote an active and constructive dialogue / learning environment.

**Graduate students:** Students enrolled in the graduate level (5224G) will build on their undergraduate learning by developing critical analysis capabilities for graduate research. Graduate students will develop their ability to critically examine and synthesize new data by analyzing existing literature through literature critiques. Graduate students will also demonstrate their ability to adapt and share a field technique by (1) developing a standard operating procedure (SOP) of a hydrologic field technique, and (2) teaching the technique to the class (each presentation will include the theory, a simplified description of the approach, and finally an example of how the results are used in practice).

**Prerequisites:** Graduate standing; BSE 3305 or CEE 3314 or FOR 4354

**Gear:** Waders for stream work helpful. N° 550F Environmental 4 3/4 in x 7 1/2 in Rite in the Rain field notebook, *required*. One package of 3x5 index cards.

**Texts:** The course will use one suggested textbook, and electronically available U.S. Geological Survey reports on hydrologic techniques (available free online).

suggested textbook:

Li, Y. and K. Migliaccio (2011). Water Quality Concepts, Sampling, and Analyses. Boca Raton, FL: CRC Press. Pp. 333.

Online resources:

USGS Techniques of Water-Resources Investigations Reports, available electronically at no cost (<http://pubs.usgs.gov/twri/> (<http://pubs.usgs.gov/twri/>)):

U.S. Geological Survey (1995). Book 3, Section A: Surface Water Techniques. Techniques of Water Resources Investigations of the United States Geological Survey. Washington, D.C.: USGS.

U.S. Geological Survey (2002). Book 4, Section A: Statistical analysis. Techniques of Water Resources Investigations of the United States Geological Survey. Washington, D.C.: USGS.

U.S. Geological Survey (1973). Book 4, Section B: Surface Water. Techniques of Water Resources Investigations of the United States Geological Survey. Washington, D.C.: USGS.

U.S. Geological Survey (2004). Book 8, Section A: Instruments for measurement of water level. Techniques of Water Resources Investigations of the United States Geological Survey. Washington, D.C.: USGS.

U.S. Geological Survey (1999). Book 9, Section A: National Field Manual for the Collection of Water-Quality Data. Techniques of Water Resources Investigations of the United States Geological Survey. Washington, D.C.: USGS.

**Percent distribution:**

| Category                        | 5224G | 4224 |
|---------------------------------|-------|------|
| lab reports                     | 32    | 40   |
| out of class participation      | 16    | 20   |
| in-class participation          | 16    | 20   |
| lab notebooks / lab preparation | 4     | 5    |
| SOP                             | 16    | -    |
| critiques                       | 4     | -    |
| project                         | 12    | 15   |

**Topics:**Site characterization

- Basic surveying
- Cross-sections
- Field notes
- Using existing digital data for site characterization
- Collection and application of historical data (e.g. USGS discharge)
- Managing collected data in databases

Surface water

- Basic channel assessment and geomorphology; Surveying
- Stream discharge measurements
- Working with data loggers
- Stream tracer approaches

Groundwater

- Piezometer installation & long-term water level collection
- Hydraulic conductivity measurements via slug tests
- Lysimeter installation & collection

Meteorology

- Basic weather measurements
- Collection and use of weather data
- Dataloggers

Water quality

- Primer to temporal and spatial variability
- Basic measurements: pH, temperature, conductivity, oxygen
- Datasonde interpretation
- Sample collection

Analytical laboratory procedures

- Quality control and calibration approaches
- Specific measurements: Nutrients, anions, isotopes

**Special Needs:**

If you need adaptations or accommodations because of a disability (learning disability, attention deficit disorder, psychological, physical, etc.), if you have emergency medical information to share with us, or if you need special arrangements in case the building must be evacuated, please meet with me as soon as possible. If you have an accommodation now, I request that you meet with me during the first 2 weeks of class.

**Lab attendance:**

Lab attendance is mandatory. The instructor must be notified of any anticipated absences at least one week in advance of the lab that will be missed. A letter or note from a valid source (e.g., Schiffert Health Center, Dean's office) must be provided within one week of the absence for any unanticipated absences and must include the date of the missed class and the reason for the absence or the authority to excuse the student. It is at the discretion of the instructor to allow the student to make up the lab for either anticipated or unanticipated absences.

**Honor Code:**

"The Virginia Tech Honor code will be strictly enforced in this course. All assignments

submitted shall be considered graded work, unless otherwise noted. All aspects of your course work are covered by the honor system. Any suspected violations of the honor code will be promptly reported to the honor system. Honesty in your academic work will develop into professional integrity. The faculty and students of Virginia Tech will not tolerate any form of academic dishonesty."

Your attendance at a test or your submittal of any written or electronic materials shall be your pledge that you subscribe to and accept the Virginia Tech honor code and honor system. You are expected to abide by the hoo code.

Commission of any of the following acts shall constitute academic misconduct. This listing is not, however, exclusive of other acts that may reasonably be said to constitute academic misconduct. Clarification is provided for each definition with some examples of prohibited behaviors in the Undergraduate Honor Code Manual located at <https://www.honorsystem.vt.edu/>

1. CHEATING Cheating includes the intentional use of unauthorized materials, information, notes, study aids or other devices or materials in any academic exercise, or attempts thereof.
2. PLAGIARISM Plagiarism includes the copying of the language, structure, programming, computer code, ideas, and/or thoughts of another and passing off the same as one's own original work, or attempts thereof.
3. FALSIFICATION Falsification includes the statement of any untruth, either verbally or in writing, with respect to any element of one's academic work, or attempts thereof.
4. FABRICATION Fabrication includes making up data and results, and recording or reporting them, or submitting fabricated documents, or attempts thereof.
5. MULTIPLE SUBMISSION Multiple submission involves the submission for credit—without authorization of the instructor receiving the work—of substantial portions of any work (including oral reports) previously submitted for credit at any academic institution, or attempts thereof.
6. COMPLICITY Complicity includes intentionally helping another to engage in an act of academic misconduct, or attempts thereof.
7. VIOLATION OF UNIVERSITY, COLLEGE, DEPARTMENTAL, PROGRAM, COURSE, OR FACULTY RULES The violation of any University, College, Departmental, Program, Course, or Faculty Rules relating to academic matters that may lead to an unfair academic advantage by the student violating the rule(s)."

#### **Late assignments:**

Assignments are due on their due date. Late assignments are not accepted.

#### **Principle of community**

Virginia Tech is a public land-grant university, committed to teaching and learning, research, and outreach to the Commonwealth of Virginia, the nation, and the world community. Learning from the experiences that shape Virginia Tech as an institution, we acknowledge those aspects of our legacy that reflected bias and exclusion. Therefore, we adopt and practice the following principles as fundamental to our on-going efforts to increase access and inclusion and to create a community that nurtures learning and growth for all of its members:

- We affirm the inherent dignity and value of every person and strive to maintain a climate for work and learning based on mutual respect and understanding.
- We affirm the right of each person to express thoughts and opinions freely. We encourage open expression within a climate of civility, sensitivity, and mutual respect.
- We affirm the value of human diversity because it enriches our lives and the University. We acknowledge and respect our differences while affirming our common humanity.
- We reject all forms of prejudice and discrimination, including those based on age, color, disability, gender, national origin, political affiliation,

race, religion, sexual orientation, and veteran status. We take individual and collective responsibility for helping to eliminate bias and discrimination and for increasing our own understanding of these issues through education, training, and interaction with others.

- We pledge our collective commitment to these principles in the spirit of the Virginia Tech motto of Ut Prosim (That I May Serve)."

**Other class policies**

1. It is expected that students will not disturb or distract others or in any way interfere with the ability of other students to learn the course material. If your actions (e.g. using social media) are distracting other students, you'll be asked to stop. Let's work collectively on creating an atmosphere focussed on learning the material at hand.
2. Lab protocols: You are expected to come to lab prepared by (1) having a printout of the lab, (2) performing pre-lab assignments, and (3) have the required PPE (personal protective equipment).
3. Any dispute over grading, beyond a simple mathematical error, must be submitted to the instructor in writing, with a copy of the graded work contested, within one week of its return.