



Environmental Science (ENSC) 530

Ecohydrological Modelling (Revision 1)

Status: Replaced with new revision, see the [course listing](#) for the current revision ❌

Delivery mode: [Individualized study online](#). Delivered via Brightspace.

Credits: 3

Area of study: Science

Prerequisite: [ENSC 510](#). If you are concerned about not meeting the prerequisite for this course, contact the course coordinator before registering.

Precluded: None

Faculty: [Faculty of Science and Technology](#)

Notes:

To take this graduate-level course, you must apply and be approved to one of the graduate programs or as a non-program [Centre for Science](#) graduate student. Minimum admission requirements must be met. Undergraduate students who do not meet the admission requirements will not normally be permitted to take this course.

Coordinator: [Dr. Junye Wang](#)

Overview

Ecohydrology is an interdisciplinary area of ecology and hydrology as an interface of ecology, hydrology, biogeochemistry, and geophysics, studying the interaction between soil, water, vegetation, organisms, atmosphere, and climate. Ecohydrological modelling provides a rigorous yet accessible description of the tools necessary for the mathematical modelling of water, energy, carbon, and nutrient transport within the soil–plant–atmosphere continuum. It explains the concept of the two-way interaction between the hydrological cycle, nutrient cycle, and ecosystems.

Environmental Science 530: Ecohydrological Modelling is an introduction to modelling of ecohydrological systems. It aims to provide understanding of the functioning of ecosystems related

the exchange of water between the soil, vegetation, and the atmosphere in a changing climate. Fundamental principles will be used for modelling hydrology and biogeochemistry, with a specific focus on evaluating various ecosystem functions and interactions between water and natural systems.

This course is aimed at graduate students, researchers, and professionals in hydrology, ecology, earth science, environmental engineering, environmental science, agronomy, and atmospheric science to answer specific questions regarding coupled water and nutrient cycles at scales ranging from a few metres to a watershed. This ecohydrological knowledge forms the basis for supporting decisions on sustainable land use from a water resources point of view. As such, limitations to ecosystem functioning posed by water availability in relation to evaporation and transpiration by different plant communities is a central theme in this course.

Outline



- Unit 1: Ecohydrology
- Unit 2: Hydrology and the Hydrological Cycle
- Unit 3: Hydrological Modelling
- Unit 4: Biogeochemistry
- Unit 5: Nutrient Cycles and Biogeochemical Modelling
- Unit 6: Ecohydrological Modelling

Learning outcomes

Upon successful completion of this course, you should be able to

- describe soil–water–plant–atmosphere interactions and ecosystems.
- identify and describe the main processes and challenges related to the ecohydrology model.
- explain the hydrology and hydrological cycle, and develop simple models that describe the soil/water balance at the watershed scale.
- describe biogeochemistry, the nutrient (carbon and nitrogen) cycle, and biogeochemical processes.
- describe how hydrological processes couple with biogeochemical processes and main drivers.
- detail and provide examples of capacities and limitation of ecohydrological models in analyzing ecohydrological problems.

Evaluation

To **receive credit**  for ENSC 530, you must achieve a grade of at least **B– (70 percent)**  on each assignment.

The weighting of the composite grade is as follows:

Activity	Weight
Assignment 1	20%
Assignment 2	25%
Assignment 3	25%

Activity	Weight
Assignment 4	30%
Total	100%

Materials

Digital course materials

Links to the following course materials will be made available in the course:

Porporato, A., & Yin, J. (2022). *Ecohydrology: Dynamics of life and water in the critical zone*. Cambridge University Press.

Important links

- › [Important Dates and Deadlines](#) 
- › [MSc ESS Contact Information](#) 
- › [MSc ESS Program Regulations](#) 

Athabasca University reserves the right to amend course outlines occasionally and without notice. Courses offered by other delivery modes may vary from their individualized study counterparts.

Opened in Revision 1, July 16, 2025

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