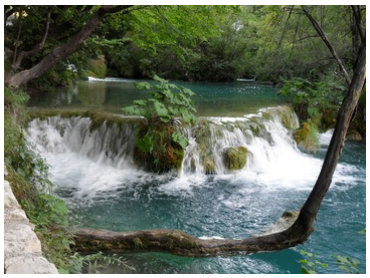
Fall 2024 Syllabus
EVSC 3600: Physical Hydrology





Instructor Details

Instructor:	Frederick Cheng (he/him)
Office:	Clark Hall 342
Office Hours:	Wednesday 10-11am, or by appointment
Email:	frederick.cheng@virginia.edu
	Please include EVSC 3600 in email subject

Teaching Assistant:	Hanne Borstlap
Office:	Clark Hall 194, Clark Hall 353 (conference room) for Thursday office hours
Office Hours:	Thursday 12:30-2pm, or by appointment (sign up via Calendly: https://calendly.com/hanne-borstlap/hydrology_officehours)
Email:	tpv4jw@virginia.edu

Course Information

M, W, F 9:00-9:50 AM John W. Warner Hall 104

The objective of this course is to introduce students to the principles governing the flow of water on and beneath the earth's surface. This includes concepts of fluid dynamics applied to open channel flow, groundwater flow, and dynamics of soil moisture. We will also explore human influences on the hydrologic environment.

Co-Requisite: EVSC 3601. The 1-unit laboratory portion of the course is a co-requisite for EVSC majors (but recommended for everyone else) and grades will be determined from evaluations of the laboratory reports, lab exercises and quizzes, and participation in lab. However, it is not required to take the lab during the same semester as the lecture. Students will receive a separate syllabus for the lab section.

What will you get out of this course?

Hydrology is a broad subject that requires you to connect theory and quantitative methods to real-world phenomena. By the end of this course, you will be able to:

1. explain the **physics of key hydrologic processes** and be able to distinguish and prioritize their role in distributing water on the land surface
2. formulate and apply **appropriate physical or statistical models of the water cycle for estimation of water budget components**, flow statistics, and design stream flows for natural watersheds
3. justify the **use of assumptions** used in hydrologic models
4. **interpret observation data** in conjunction with model results and critically evaluate model results subject to (often significant) uncertainty
5. **apply standard techniques** to delineate watersheds, interpolate precipitation, conduct flood frequency analyses, and other common tasks used in the practice of water resources science

TEXTS: **1)** ***ELEMENTS OF PHYSICAL HYDROLOGY***, 2nd Edition, Hornberger, Wiberg, Raffensperger, and D'Odorico, Johns Hopkins Press

2) ***EVSC 3600 COURSE NOTES***, on Canvas and released weekly

GRADING: The weighted numerical grade is based on homework (40%), mid-semester tests (30%), summative assignment (20%) and participation (10%). Letter grades will be based on the following scale:

A+	≥98%	B+	≥88%	C	≥70%
A	≥92%	B	≥82%	D	≥60%
A-	≥90%	B-	≥80%	F	<60%

Homework (10 assignments totaling 35%)
Homework assignments will be a mixture of hand calculations, data analysis from real hydrologic datasets, use of publicly available applications etc. to build on class material.

Homework should be turned in by *the beginning of class at 9am* uploaded online on Canvas. Uploaded assignments can be scans/pictures of your assignment, typed, or a combination of both. Please make sure that any scans/pictures are legible for us to read! Our team will return the graded homework as soon as possible.

Late homework will not be accepted, but the lowest homework grade will be dropped and not counted in the final course grade.

Mid-Semester Tests (2x20%)
The tests and final exam will cover multiple chapters/modules of class content. Questions will be a combination of multiple choice, short answers, and calculations.

Anyone who cannot take a test/exam at the scheduled time should contact me as soon as possible to arrange for a make-up exam. No make-up exams will be given without prior approval.

Summative Assignment (15%)
The summative assignment will be given around week 11 and due by the last day of lectures. This assignment can be completed alone or in pairs. The summative assignment will require you to apply concepts from the course on real world data to perform basic hydrologic tasks and analyze the results.

Participation (10%)
Participation grades are designed to give the instructor feedback for the course and/or to help you build on class content. They will be broken down into three groups:

1. Beginning and midterm feedback surveys (2x1%)
2. Question generator for term tests (2x1%)
3. Classroom activities (various, up to 8%)

Classroom activities will vary in format, but participation in an activity will score one point (1%), up to a total of 8% (yes, there is potential to exceed 10% for the participation component of your grade). There will be one activity each week that will be designated/announced at the beginning of the week that will be for credit. Activities may include written reflections, uploading study notes for a lecture, news + class content, etc.

Additional Class Information

Communication and Office Hours: I am available for questions and discussion about the course via email and during office hours. My office hours will be in person. Conversations about your academic programs, future goals, broader interests in hydrology and environmental sciences are welcome too! I will try my best to reply to your email within 24 hours during the regular work week.

Inclusive Teaching Philosophy: Factors such as social identities, visible and invisible disabilities, family circumstances, physical location, mental health, access to the internet all influence the experiences that everyone can have in my courses this and every semester. I am committed to building an environment so that you will be successful and supported. Students requiring accommodations for university-sanctioned events, religious observances, learning needs should provide documentation as soon as possible so that we can discuss alternate options.

Generative AI: Tools such as ChatGPT and Claude are powerful and exciting. Both students and faculty have been experimenting with their use in academic settings. While these tools have applications that foster student learning and understanding, these tools can also be used in ways that bypass key learning objectives. I will strive to be clear about course/assignment learning objectives so that we can understand the underlying reasons for doing tasks yourself, or if AI tools can be used to assist in learning. *For this course*, we will consider generative AI analogously to assistance from another person. In particular, using generative AI tools to substantially complete an assignment or exam (e.g. by entering exam or assignment questions) is not permitted. If you're unsure if using generative AI aligns with the course learning objectives or is a permissible usage, please ask me and we can have a discussion. In general, students should acknowledge the use of generative AI (other than incidental use) and default to disclosing such assistance when in doubt.

Honor Policy: Given the availability of old exams, worked problem sets, and laboratory exercises that are increasingly becoming available from third-party venues, the Environmental Sciences Department considers student access of these materials for Environmental Sciences courses, without explicit instructor permission, to be a violation of the UVA Honor Code. Uploading class materials such as lecture slide, assignments/questions, exams to online repositories or generative AI platforms from this course is not prohibited.

Mental Health and Well-being: If you are feeling overwhelmed, stressed, or isolated, there are many individuals here to help. The Student Health and Wellness Center offers Counseling and Psychological Services (CAPS) for its students; call 434-243-5150 to speak with an on-call counselor and/or schedule an appointment. If you prefer to speak anonymously, you can call Madison House's HELP Line at any hour of any day: 434-295-TALK. Alternatively, you can call or text the Disaster Distress Helpline (1-800-985-5990, or text TalkWithUs to 66746) to connect with a trained crisis counselor; this is toll free, multilingual, and confidential, available to all residents in the US and its territories. For information on CARES Act Student Emergency Funding, Bridge Scholarships, and Emergency Loans, please visit Student Financial Services Operational Updates. You might also be eligible for an Honor Loan.

!! Instructions for Getting to Know You Survey !! Good job reading up until no: To show that you've looked through the syllabus to some degree, answer question 6 of your survey with your favourite colour rather than yes/no to get credit for the survey.

Department of Environmental Sciences University of Virginia

Course Schedule

Below is a tentative schedule of topics to be taught in class. **Note:** All homeworks will be due at the beginning of class (9am) on Canvas on the day indicated below. Please check with 3601 syllabus for lab deadlines and up-to-date schedule for your own section.

Week	Monday	Wednesday	Friday	Lab (Tentative)
W1 Aug 26		Course Intro	The water budget and hydrologic units Survey: Getting to know you	No Labs
W2 Sep 2	Precipitation: Concepts	Precipitation: Measurements	Statistics & Frequency HW1 due: Unit Conversion practice	Lab 1: Catchment Hydrology I
W3 Sep 9	Frequency Analysis	Rainfall-Runoff Partitioning	Rainfall-Runoff Partitioning HW2 due: Precipitation + Frequency analysis	Lab 2: Catchment Hydrology II
W4 Sep 16	Vegetation Dynamics	Evapotranspiration	Evapotranspiration HW3 due: Frequency Analysis	Lab 3: Surface Flow I
W5 Sep 23	Vadose Zone/Soil: Processes	Vadose Zone/Soil: Calculations	Groundwater: Aquifer properties HW4 due: Land Use Effects	Lab 4: Surface Flow II
W6 Sep 30	Groundwater: Concepts	Groundwater: Calculations	Groundwater: Calculations HW5 due: ET	Lab 5: Subsurface Flow I
W7 Oct 7	Groundwater	Exam Review	**Exam 1 (W1-6)**	No Labs
W8 Oct 14	***No class – Reading Day***	Fluid dynamics: Hydrostatics	The Bernoulli Equation HW6 due: Soil Moisture	No Labs
W9 Oct 21	The Bernoulli Equation	Channel Flow: Specific Energy	Channel Flow: Roughness	Lab 6: Subsurface Flow II
W10 Oct 28	Flood Routing Summative PRJ Opens HW7 due: Groundwater	Fluvial Geomorphology PRJ Groups Due	Fluvial Geomorphology HW8 due: Fluid Dynamics	Lab 7: Fluid Dynamics I
W11 Nov 4	Hydrologic Signatures	Hydrologic Modelling: Concepts	Model Inputs HW9 due: Open Channel Flow	Lab 8: Fluid Dynamics II
W12 Nov 11	Model Development and Usage	Model Post-Processing	Work Period	Lab 9: Applied Hydrology I
W13 Nov 18	Exam Review	**Exam 2 (W8-12)**	Special Topics HW10 due: Hydrologic Model Analysis	Lab 10: Applied Hydrology II
W14 Nov 25	Work Period	***No class – Thanksgiving***	***No class – Thanksgiving***	No Labs
W15 Dec 2	Special Topics	Special Topics	Special Topics/Course Wrap-Up Summative PRJ due	No Labs