FLORIDA POLYTECHNIC UNIVERSITY

Syllabus: Groundwater Hydrology

Course Information

- **Course Number and Title**: CWR 4120 Groundwater Hydrology
- **Credit Hours:** 3 Lecture
- **Academic Term:** Spring 26

Instructor Information

- **Instructor:** Dr. Derek Henderson
- **Office Location:** BARC 2259
- **Office Hours**: M,T,R 11:00 – 1:00
- **Email address**: dhenderson@floridapoly.edu

Course Delivery and Course Description

- **Delivery Mode**: In-Class
- **Course Website**:
  - Principles and processes of subsurface hydrology; mechanics of groundwater movement, well hydraulics, water production, and aquifer monitoring; introduction to groundwater chemistry and contamination, solute fate and transport, phase transitions; remediation and management practices.
  - **Course Pre and/or Co-Requisites**: MAP 2302 - Differential Equations, EML 3015 - Fluid Mechanics and ENV 2003 - Introduction to Environmental Engineering
  - **Communication/Computation Skills Requirement (6A-10.030)**: None
- **Required Texts and Materials:**
  - **Equipment and Materials**: Applied Hydrogeology, 5th ed., Fetter and Kreamer, Waveland Pr Inc., 2022, ISBN: 1478646527

Course Objectives and Outcomes

- **Course Objectives**:
  - Introduce foundational concepts in subsurface hydrology
  - Discuss the impacts and importance of groundwater as a resource in society
  - Explore the groundwater water production and management strategies
  - Understand concepts involving contaminant migration and remediation practices across multiple phases.
- **Course Learning Outcomes**:
  - Understand the impact of groundwater resources on society
  - Demonstrate an ability to apply fluid mechanic principles related to subsurface hydraulic flow
  - Differentiate key concepts of well protection and management
  - Predict performance of hydraulic systems from aquifer testing practices and established well production methods
  - Understand future risk associated with contaminant migration and practices for risk mitigation and aquifer remediation.
- **Alignment with Program Outcomes**:

Course Learning Outcome	Learning Level	Program Learning Outcome (ABET)

	(Bloom's Assessment Example)	
Understand the impact of groundwater resources on society	**Understanding –** Make use of ideas and material communicated	**7 -** an ability to acquire and apply new knowledge as needed, using appropriate learning strategies
Demonstrate an ability to apply fluid mechanic principles related to subsurface hydraulic flow	**Apply -** Use of knowledge in specific situations	**6 -** an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
Differentiate key concepts of well protection and management	**Analysis –** Breakdown of material into constituent parts so that broader ideas are made clear.	**6 -** an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
Predict performance of hydraulic systems from aquifer testing practices and established well production methods	**Analysis –** Breakdown of material into constituent parts so that broader ideas are made clear. **Synthesis –** Assembly of constituent parts and ideas to form a whole.	**2 -** an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors **6 -** an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
Understand future risk associated with contaminant migration and practices for risk mitigation and aquifer remediation	**Apply -** Use of knowledge in specific situations	**6 -** an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

Academic Support Resources

- **Library**: Students can access the Florida Polytechnic University Library through the University website and Canvas, on and off campus. Students may direct questions to library@floridapoly.edu.
- **Peer Learning Strategists (PLS)**: Are specially trained student leaders who help their peers strategize approaches to course content and work through solution methods. PLS work in collaboration with the courses they support so the content and methods are aligned with your instructors' expectations. Students can meet with a PLS in The Learning Center, which is located on the first floor of the Innovation, Science and Technology (IST) building in room 1019.
- **Academic Success Coaches**: All students at Florida Poly are assigned an Academic Success Coach. Your Academic Success Coach can assist you with academic success strategies. Please visit the Student Success Center on the second floor of the IST building to meet with an Academic Success Coach.
- **Writing Center**: Located on the second floor of the IST (2059/2061), the Writing Center helps students to develop their writing and presentation skills. Consultations are available in person and virtually. For more detail, visit https://floridapoly.edu/writingcenter.

Civility and Collegiality

Faculty and students come to the university for the same reason, which is to participate in a highly professional educational environment. To that end, both students and faculty are expected to treat each other with mutual regard and civility. Communication, written, oral and behavioral, between faculty and students must remain respectful. Within and outside of the classroom, students must refrain from derogatory comments toward the faculty member and their fellow students, and faculty as well must refrain from derogatory comments toward their students. Faculty and students should address each other with respect, in accordance with the wishes of the faculty and the students: for example, no one should be addressed by their last name alone.

Faculty from the outset of a course can and should specify what constitutes activities and behavior that take away from, that diminish, the educational environment. An individual student's distracting behavior impedes the education of fellow students, which itself is a form of disrespect. Civility and collegiality also include respecting each other's time: for example, neither students nor faculty should arrive late to class (unless unforeseen, pressing circumstances prevail); faculty should be present at the posted office hours; and students and faculty should be punctual when meeting times are scheduled. In more general terms, collegiality means respecting the right of both faculty and students to participate fully and fairly in the educational enterprise.

Course Policies

Attendance

Students in **face-to-face (this includes labs and C-courses) courses** are expected "to attend all of their scheduled University classes and to satisfy all academic objectives as defined by the instructor" (University Policy, FPU-5.0010AP) and **required**.

Attendance demonstrates your interest and seriousness as a student. If you have to miss a class, you should inform the instructor **by e-mail before the class and get approval**. Late e-mail is not acceptable. Students must assume full responsibility for work missed when they are absent.

Participation

Students are expected to participate in the classroom experience. The use of earbuds/headphones during class is specifically not allowed and students who engage in this behavior may be asked to leave the class for the day (noting exceptions for authorized accommodations). In addition, students who routinely do not bring materials to class that are required for participation, will not be given credit for class attendance, and if this becomes a pattern of behavior, may be asked to leave the class for the day. Persistent problems with participation may result in a code of conduct referral.

Late Work/Make-up work

Late work will result in a 10% penalty per day.

Grading Scale

Grade	Percentage
A	93-100
A-	90-92
B+	86-89
B	83-85
B-	80-82
C+	76-79
C	70-75
D	60-69
F	0-59

Assignment/Evaluation Methods

- Homework (25% of the total grade)

  Homework assignments will be provided generally on a weekly basis with a due date of one week.

- Design Projects (20% of the total grade)

  This class will include one cumulative term design project. Students will be expected to use elements practiced throughout the course to design, build, and evaluate their assigned projects. A design report will accompany the design project in addition to a team presentation.

- Exams (40% of the total grade)

  Understanding of subject matter will be primarily evaluated through two midterm exams and one final exam.

- Quizzes (15% of the total grade week)

  In-class (and potentially take-home) quizzes will be assigned to students to provide a metric for on-going understanding of the lecture material. These assignments are to be done individually unless otherwise noted.

University Policies

Reasonable Accommodations

The University is committed to ensuring equal access to all educational opportunities. The University, through the Office of Disability Services (ODS), facilitates reasonable accommodations for students with disabilities and documented eligibility. It is the student's responsibility to self-identify as a student with disabilities and register with ODS to request accommodations.

If you have already registered with ODS, please ensure that you have requested an accommodation letter for this course through the ODS student portal and communicate with your instructor about your approved accommodations as soon as possible. Arrangements for testing accommodations must be made in advance. Accommodations are not retroactive.
If you are not registered with ODS but believe you have a temporary health condition or permanent disability requiring an accommodation, please contact ODS as soon as possible.

The Office of Disability Services (ODS):
DisabilityServices@floridapoly.edu
(863) 874-8770
The Access Point
ODS website: www.floridapoly.edy/disability

Accommodations for Religious Observances, Practices and Beliefs

The University will reasonably accommodate the religious observances, practices, and beliefs of individuals in regard to admissions, class attendance, and the scheduling of examinations and work assignments. (See University Policy.)

Title IX

Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence and stalking. Resources are available if you or someone you know needs assistance. You may speak to your professor, but your professors have an obligation to report the incident to the Title IX Coordinator. Please know, however, that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University Ombuds Office, BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at Peace River Center, 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment. The Title IX Coordinator is available for any questions to discussion resources and options available.

Academic Integrity

The faculty and administration take academic integrity very seriously. Violations of academic integrity regulation include actions such as cheating, plagiarism, use of unauthorized resources (including but not limited to use of

Artificial Intelligence tools), illegal use of intellectual property, and inappropriately aiding other students. Such actions undermine the central mission of the university and negatively impact the value of your Florida Poly degree. Suspected violations will be fully investigated, possibly resulting in an academic integrity hearing and sanctions against the accused student if found in violation. Sanctions range from receiving a zero on the exam or assignment, to expulsion from the university. Repeat offenders are subject to more severe sanctions and penalties.

Any "special" instructions that are appropriate for academic integrity and the course should go here.
(It is essential that a heading and a statement on what constitutes, includes, academic integrity be included in the syllabus, and that the students be made aware of academic integrity at the beginning of a course.)

Recording Lectures

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. Recordings may not be used as a substitute for class participation or class attendance. Recordings may not be published or shared in any way, either intentionally or accidently, without the written consent of the faculty member. Failure to adhere to these requirements is a violation of state law (subject to civil penalty) and the student code of conduct (subject to disciplinary action).

Recording class activities other than class lectures, including but not limited to lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), and invited guest speakers is ***prohibited****.*

Course Schedule

- Note that this schedule is always tentative, and circumstances may require a rescheduling of some planned events.
- Important Dates: https://floridapoly.edu/academics/academic-calendar/index.php

Week	Topic
1	Concepts of Subsurface Hydrology
1	Groundwater as a Resource in Society
2	Subsurface Hydrology within the Hydraulic Cycle
2	Porous Media and Aquifer Properties
3	Hydraulic Conductivity
3	Effective Stress and Aquifer Compression
4	Principles of Groundwater Flow
4	Steady-State Flow in Aquifers
5	Review and Exam 1
6	Well Flow Mechanics
6	Drawdown Mechanics for Steady and Transient States
7	Pump Tests, Slug Tests, and Transmissivity
7	Porosity and Capillarity
8	Soil Moisture and Pore Tension in the Vadose Zone
8	Water-Table Recharge
9	Regional Groundwater Flows
9	Case Studies of Flow Systems
10	Review and Exam 2
11	Effects of Geology
11	Water Chemistry
12	Water Quality and Contamination
12	Mass Transport and Phase Interactions

13	Groundwater Remediation and Risk-Based Actions
13	Groundwater Management, Protection, and Law
14	Groundwater Models
14	Term Design Project
15	Review and Final Exam