Department of Civil Engineering
University of Texas at El Paso

CE 4375/4376/4377/5302 - Groundwater Hydrology and Pollution
(Adv Topics in Civ Engr I/Adv Topics in Civ Engr II/Adv Topics in Civ Engr III/Grndwtr Hydro & Polltn)

Fall 2021
3.000 Credit hours
3.000 Lecture hours

Professor Alex Mayer
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Office Hours: Tuesday, Wednesday, Thursday 12-1pm, in person (Kelly Hall 204) or virtually via Zoom

COURSE VENUE
The course lectures will be held in Classroom Building C304 with a few exceptions, when the lectures are held by Zoom. The Zoom lectures will be announced in advance and a Zoom link will be sent to the students.

COURSE DESCRIPTION
This course is a general course in groundwater hydrology, emphasizing fundamental principles and their applications to practical problems. Topics included are hydrologic cycles, geologic environments and controls, unsaturated (vadose) and saturated zones, Darcy's law, continuity and energy principles, flow equations, steady and unsteady hydraulics, aquifer tests, pollutant transport, analytical and numerical models, and computer codes.

COURSE OBJECTIVES
At the end of this course, students will be able to:
- describe the characteristics of groundwater flow in aquifers
- identify and estimate aquifer properties and their effects on groundwater flow
- calculate groundwater recharge, flow and discharge
- use physics-based equations that describe flow in the saturated and unsaturated zone, around a pumping well, and contaminant transport and remediation.
- decide on appropriate qualitative and quantitative methods commonly used in physical hydrogeology (e.g. piezometric maps, conceptual and numerical models aquifers, analytical solutions for groundwater flow, interpretation of pumping tests)
- become an independent user of existing software for groundwater modelling
- understand the social, economic, political, and cultural complexity of groundwater systems

LEARNING MODULES
This course is designed on Blackboard using a modular format. Each week is packaged so that all the materials, lecture notes, homeworks, and project components are contained in one Blackboard module for a given week. Materials include the following.
- PowerPoint lectures
- Assignments: homeworks, labs

- Exam preparation materials: equation sheet, sample problems, list of topics
- Reference Book (Freeze and Cherry, 1979)

REQUIRED TEXT
There is no required text, but the following books have been placed on reserve in the UTEP library for supplemental reading.

Fetter, C. W., 1988. *Applied Hydrogeology*, Merrill Pub. Co, Columbus,OH, 2nd ed.

Freeze, R. Allan.; Cherry, John A. 1979. *Groundwater*, Prentice-Hall, Englewood Cliffs, N.J.

COURSE ASSIGNMENTS AND GRADING
The basis of grading for this course will consist of the following components with the indicated weights:

Midterm Exam 1	20%
Midterm Exam 2	20%
Final Exam	20%
Homework	40%

This course is a combined upper-level undergraduate and graduate course. All students will have the same assignments, but the assignment of final letter grades will be different. Letter grades for graduate students will be assigned as follows:

- A 90 - 100%
- B 80 - 89%
- C 70 - 79%
- D 60 - 69%
- F < 60%

Letter grades will be curved for undergraduate students.

Homework: The homework assignments will be assigned and due on according to dates posted in the "schedule" page of the course website or as modified from time to time by the instructor. Problem Set assignments usually consist of multiple, relatively short calculation problems. Each student will turn in the Problem Sets assignments on their own. The Problem Set assignments that you turn in are intended to represent your own work. I encourage you to work together in terms of understanding problems, and helping each other learn the material, but the actual work should be yours alone.

Practical Homework assignments usually consider a single, more in-depth problem with multiple parts. Students will work on the Practical Assignments in groups and will turn in assignments as groups.

Late homework assignments will be penalized 20% per day late. Once a homework assignment has been graded and returned, no further homework will be accepted for that assignment. Problem Set assignments will be graded based on solution procedure and numerical results. Practical Homework assignments will be graded according to rubrics that are available on the course Blackboard site.

The instructor may assign a failing grade to any student not turning in 75% of the homework assignments for this course. Homework assignments will be submitted for grading via Blackboard. I strongly suggest that you submit your work with plenty of time to spare in the event that you have a technical issue with the course website, network, and/or your computer. If you are experiencing difficulties submitting your work through the course website, please contact the UTEP Help Desk. You can email me your documents as a last resort.

Exams: Two midterm exams will be given during class time and a final exam during final exam week. Exam dates are posted in the class schedule and will be announced in class. The exams will cover material from the lectures and homework assignments. You will be given equation sheets, lists of concepts, and sample problems related to each exam in advance of the exams. Exam grading will not be revised beyond one week after the graded homework is handed back. Students are responsible for informing the instructor of any conflict with the exam schedule so that, if possible, alternative dates can be agreed upon by the class. Makeup exams will only be given in the case of a documented emergency.

TECHNOLOGY REQUIREMENTS

A few times during the semester, the course content will be delivered via the Internet through the Blackboard learning management system and Zoom for class lectures and office hours. Ensure that your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Google Chrome and Mozilla Firefox are the best browsers for Blackboard; other browsers may cause complications. When having technical difficulties, update your browser, clear your cache, or try switching to another browser.

You will need to have access to a computer/laptop, scanner/phone camera, a webcam, and a microphone. You will need to download or update the following software: Microsoft Office and Adobe Acrobat Reader. Check that your computer hardware and software are up-to-date and able to access all parts of the course. You can download Microsoft Office programs (including Word, Excel, PowerPoint, Outlook and more) for free via UTEP's Microsoft Office Portal. Click the following link for more information about Microsoft Office 365 and follow the instructions.

If you encounter technical difficulties beyond your scope of troubleshooting, please contact the UTEP Help Desk as they are trained specifically in assisting with technological needs of students.

COURSE COMMUNICATION
- **Office Hours**: My office hours will be held Tuesday, Wednesday, and Thursday 12:00-1:00 in-person at my office or on Zoom using this link.
- **Email**: UTEP e-mail is the best way to contact me. I will make every attempt to respond to your e-mail within 24-48 hours of receipt. When e-mailing me, be sure to email from your UTEP student account and please put the course number in the subject line. In the body of your e-mail, clearly state your question.
- **Announcements**: Check the Blackboard announcements frequently for any updates, deadlines, or other important messages.

ATTENDANCE AND PARTICIPATION
Your participation in the course lectures is important not only for your learning and success but also to create a community of learners. As we know, sometimes communication can be challenging. It's possible to miscommunicate what we mean or to misunderstand what our classmates mean. Therefore, please keep these etiquette guidelines in mind. Failure to observe them may result in disciplinary action.
- Always consider audience. All communication should reflect polite consideration of other's ideas.
- Respect and courtesy must be provided to classmates and to the instructor at all times. No harassment or inappropriate postings will be tolerated.

- When reacting to someone else's comments or responses to questions, address the ideas, not the person. Post only what anyone would comfortably state in a face-to-face situation.
- Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professor only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space.

ACCOMMODATIONS POLICY

The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services (CASS). Contact the Center for Accommodations and Support Services at 915-747-5148, or email them at cass@utep.edu, or apply for accommodations online via the CASS portal.

SCHOLASTIC INTEGRITY

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) for possible disciplinary action. To learn more, please visit HOOP: Student Conduct and Discipline.

CLASS RECORDINGS

The use of recordings will enable you to access to class lectures. Our use of such technology is governed by the Federal Educational Rights and Privacy Act (FERPA) and UTEP's acceptable-use policy. A recording of class sessions will be kept and stored by UTEP, in accordance with FERPA and UTEP policies. Your instructor will not share the recordings of your class activities outside of course participants, which include your fellow students, teaching assistants, or graduate assistants, and any guest faculty or community-based learning partners with whom we may engage during a class session. **You may not share recordings outside of this course.** Doing so may result in disciplinary action.

COPYRIGHT STATEMENT FOR COURSE MATERIALS

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated.

COVID-19 PRECAUTIONS

Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, so that we can work on appropriate accommodations. If you have tested positive for COVID-19, you are encouraged to report your results to covidaction@utep.edu, so that the Dean of Students Office can provide you with support and help with communication with your professors. The Student Health Center is equipped to provide COVID-19 testing.

 The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that Miners can take care of Miners is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area, and will be available at no charge on campus during the first week of classes. For more information about the current rates, testing, and vaccinations, please visit epstrong.org.

UNIVERSITY RESOURCES

UTEP provides a variety of student services and support:
Technology Resources
- Help Desk: Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.

Academic Resources
- UTEP Library: Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- University Writing Center (UWC): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- Math Tutoring Center (MaRCS): Ask a tutor for help and explore other available math resources.
- History Tutoring Center (HTC): Receive assistance with writing history papers, get help from a tutor and explore other history resources.
- RefWorks: A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.

Individual Resources
- Military Student Success Center: Assists personnel in any branch of service to reach their educational goals.
- Center for Accommodations and Support Services: Assists students with ADA-related accommodations for coursework, housing, and internships.
- Counseling and Psychological Services: Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.