

University of Texas at El Paso  
School of Sciences  
Department of Earth, Environmental and Resource Sciences

## **HYDROLOGY – GEOL4315, ESCI4315, ESCI5315 FALL 2021 Syllabus**

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### **Instructor Information**

**Instructor:** Dr. Hernan A. Moreno  
**Classroom:** Geological Science Room 302  
**Meetings:** TR 10:30 AM – 11:50 AM  
**Office:** Geologic Sciences Building Suite 321 B  
**Office Hours (zoom):** MW 11:00 AM – 12:00 PM  
<https://utep-edu.zoom.us/j/89052203238?pwd=bzEvVDIVemh3QUZ5UzU4NDh4NTJJUT09>  
Meeting ID: 890 5220 3238  
Passcode: H7bS6gbD  
**E-mail:** moreno@utep.edu  
**Learning Management Site:** Blackboard  
**TA:** Lindsey Dacey (Irdacey@miners.utep.edu)  
**TA's Office Hours:** T 1-3 PM (Sega Lab)

### **Course Description**

Hydrology is the geoscience that describes and predicts the occurrence and circulation of the earth's fresh water. This course will help understanding the circulation of water on land in the context of the global hydrologic cycle, which includes the spatial and temporal variations of water substance in the oceanic, atmospheric and terrestrial compartments of the global water system.

### **Suggested Textbook & Course Materials**

- *Physical Hydrology (3<sup>rd</sup> Edition). S. Lawrence Dingman. Waveland Press. 2015.*
- The class materials can be found at blackboard. You will find my presentations, assignments, and additional information.

### **Additional Textbook References (not required)**

- Chow V.T. ed. (4<sup>th</sup> Edition), 1988. Applied Hydrology. New York. McGraw-Hill.
- Maidment, D.R. ed. 1992. Handbook of Hydrology. New York. McGraw-Hill.
- Brutsaert W. 2005. Hydrology: An Introduction. Cambridge University Press.
- Viessman, Lewis and Knapp (3<sup>rd</sup> Edition), 1989. Introduction to Hydrology. New York. Harper and Row Publishers.

### **Homework Assignments, GIS Labs and Tests**

Eight (8) homework (10% each for undergraduates; 5% each for graduates) and three (4) GIS laboratory assignments (10% each, only for graduate or GIS-certificate students) will be handed out throughout the semester to partially evaluate course chapters (no late homeworks or Labs accepted). Homeworks and GIS labs will cover

lecture material. A mid-term exam (10% value) and final exam (10% value) will be given covering all material up to the test period.

**Extra-credit Activity for Undergraduate Students**

Undergraduate students are welcome to develop all four GIS- and software application labs but only one could be submitted for a maximum of 5% extra-credit that would be added to the final course grade.

**Field Trip**

There will not be field trips this semester due to the restrictions on group traveling imposed by COVID19.

**Grading Policy**

Final grades will be based on performance in homeworks (80% for UG, 40% for G or GIS certificate students), GIS Labs (40% only for graduate and GIS certificate students), midterm test (10%), final test (10%). Attendance to lectures is highly recommended, as class participation will be assessed continuously. Graduate students will have additional, more advanced questions during some assignments and exams.

**Course syllabus**

<b>Week</b>	<b>Date</b>	<b>Topic</b>	<b>Reading</b>	<b>Assignment</b>
1	24 Aug (T)	<b>Introduction to Hydrology:</b> The global hydrologic cycle; storage and fluxes in the land phase; space and time scales in hydrology; dimensions and units; properties of water.	Ch. 1, App. A	
	26 Aug (R)	<b>Basic Hydrologic Concepts and Challenges:</b> Hydrologic systems; the conservation equation; the regional water balance; the watershed; statistics for hydrology. GIS Lab 1 Intro.	Ch. 1, App. A	
2	31 Aug (T)	<b>Basic Hydrologic Concepts and Challenges:</b> Reservoir and storage modeling; flow duration curve. <b>Energy Budget and the Green House Effect:</b> Radiant energy exchange; Earth's atmosphere.	Ch. 1, App. A Ch. 2, App B	
	2 Sep (R)	<b>Energy Budget and the Green House Effect:</b> The green house effect; global energy balance; net radiation at surface and components. <b>Hydrologic Seasonality, Climatic Variability and the Water Budget:</b> Effects of seasonality on Earth's climates	Ch. 2, App B	Homework 1 due

<b>Week</b>	<b>Date</b>	<b>Topic</b>	<b>Reading</b>	<b>Assignment</b>
3	7 Sep (T)	<b>Hydrologic Seasonality, Climatic Variability and the Water Budget:</b> General atmospheric circulation; large climatic variability and teleconnections; the components of the water balance across the planet.	Ch. 2, App B	
	9 Sep (R)	<b>Surface-Atmosphere Water and Energy Exchange.</b> Atmospheric pressure-temperature-density relations; phase diagram and triple point of water; water vapor, humidity and dew point; precipitable water.	Ch. 3	Homework 2 due
4	14 Sep (T)	<b>Surface-Atmosphere Water and Energy Exchange.</b> The evaporation process; The precipitation process; turbulent exchange of momentum, mass & energy. Vertical distribution of wind speed; adiabatic processes and atmospheric stability.	Ch. 3	
	16 Sep (R)	<b>Precipitation:</b> Atmospheric lifting mechanisms; moisture sources and precipitation recycling; precipitation measurement techniques.	Ch. 4	GIS-Lab#1 due
5	21 Sep (T)	<b>Precipitation:</b> Areal estimation from point measurements. GIS Lab 2 Intro.	Ch. 4	
	23 Sep (R)	<b>Precipitation:</b> Precipitation gauge networks; sampling errors; long term average precipitation and variability in the U.S.	Ch. 4	Homework 3 due
6	28 Sep (T)	<b>Precipitation:</b> Extreme rainfall and probable maximum precipitation; depth-duration-frequency; Intensity-Duration-Frequency (IDF); areal reduction factors.	Ch. 4	
	30 Sep (R)	<b>Snow and Snowmelt:</b> Hydrologic importance of snow; snow properties; snowpack metamorphism. ABC of snow terms; snow data sources; measurement of snow and snowmelt; distribution of snow.	Ch. 5	Homework 4 due
7	5 Oct (T)	<b>Snow and Snowmelt:</b> Snowmelt process; snowmelt runoff generation; snowmelt modeling and evaluation. <b>Interception and Interception Loss:</b> Definitions, measurements, modeling, evaporation of intercepted water, hydrologic importance of interception loss.	Ch. 5 and Ch. 6	
	7 Oct (R)	<b>Evapotranspiration:</b> Evaporation and heat exchange processes; Classification of evapotranspiration processes; free-water and lake Evaporation	Ch. 6	
8	12 Oct (T)	<b>Evapotranspiration:</b> Bare soil Evaporation; transpiration	Ch. 6	Homework 5 due
	14 Oct (R)	<b>Evapotranspiration:</b> Potential and reference-crop evapotranspiration; actual evapotranspiration.	Ch. 6	GIS-Lab#2 due
9	19 Oct (T)	<b>Midterm Exam</b>	Ch 1-6	

Week	Date	Topic	Reading	Assignment
	21 Oct (R)	<b>Subsurface flow:</b> Principles of subsurface flow; material properties of porous media; soil moisture measurement methods.	Ch. 7	
10	26 Oct (T)	<b>Subsurface flow:</b> Principles of saturated sub-surface flow. General saturated flow equation.	Ch. 7	
	28 Oct (R)	<b>Subsurface flow:</b> Principles of unsaturated flow. <b>Infiltration and water movement in soils:</b> Water conditions in soils.	Ch. 8	Homework 6 due
12	2 Nov (T)	<b>Infiltration and water movement in soils:</b> The infiltration process and the Richards equation; measurement of infiltration.	Ch. 8	
	4 Nov (R)	<b>Infiltration and water movement in soils:</b> Quantitative modeling of infiltration at a point: the Phillips and Green Ampt methods	Ch. 8	
13	9 Nov (T)	<b>Runoff and Streamflow:</b> Watershed and stream network; stream gauging methods; general characteristics of stream response. GIS Lab 3 Intro	Ch. 10	
	11 Nov (R)	<b>Runoff and Streamflow:</b> General characteristics of stream response; rainfall-runoff methods.	Ch. 10	Homework 7 due
14	16 Nov (T)	<b>Runoff and Streamflow:</b> rainfall-runoff methods: Rational method, SCS.	Ch. 10	
	18 Nov (R)	<b>Runoff and Streamflow:</b> Unit hydrograph.	Ch. 10	GIS-Lab#3 due
15	23 Nov (T)	<b>Runoff and Streamflow:</b> Hydrologic Routing: Convex and Muskingum routing. Rainfall-runoff modeling software: VIC, Topmodel, HEC-HMS, Kineros, tRIBS.	Ch. 10	
	25 Nov (R)	No class – Thanks Giving Break		
16	30 Nov (T)	<b>Runoff and Streamflow:</b> Channel processes, hydraulic relations, basic equations processes, uniform flow. flood-wave velocity.	Ch. 10	Homework 8 due
	2 Dec (R)	<b>Runoff and Streamflow:</b> identification of runoff sources. Event-flow-generation processes.	Ch. 10	GIS-Lab#4 due
	9 Dec (R) 10-12:45 PM	<b>Final Exam Period</b> (10:00 AM – 12:45 PM) <a href="https://www.utep.edu/student-affairs/registrar/Scheduling/Final%20Exams%20Schedule/FinalExamScheduleFall2021.pdf">https://www.utep.edu/student-affairs/registrar/Scheduling/Final%20Exams%20Schedule/FinalExamScheduleFall2021.pdf</a>	Ch 7, 8 and 10	

### My expectations of You

- You will read materials for a particular class period before the start of class.

- Per the nationwide standard for university scholarship, you will study (read, review, reflect, practice, do homework) at least two hours for every hour you are in lecture.
- You will turn off your cellphone. You will not text message, social network, or web surf during class, unless I approve you do so. If you cannot do so, then do not come to class, as these actions distract others from learning.

## Graded Course Activities

Description	No	Value for UG	Value for G
Homework Assignments	8	10 % each for 80% total	5 % each for 40% total
GIS Labs	4	Optional – One Lab can be submitted for a 5% additional to final grade	10% each for 40% total
Exams	2	10% each for a total of 20%	10% for a total of 20%
Total Possible Points		105%	100%

### Final grade table

Percent grades will be rounded to one decimal place and letter grades will have the following equivalence. No extra-credit activities (besides the 5% optional GIS lab) will be assigned to increase final grades:

Letter Grade	Grade Point	Percentage
A	4.0	89.5 to 100
B	3.3	79.5 to 89.4
C	2.0	69.5 to 79.4
D	1.0	59.5 to 69.4
F	0.0	59.4 to 0

## Course and University Policies

- Should you decide to drop this course for whatever reason, you must submit the relevant forms to the Office of the Registrar by the appropriate date. Failing to do so will result in an F grade for the course. If at the time you withdraw from the course you are scoring a failing grade, you will receive an F grade. If not, you will receive a W for withdrawn.
- It is the policy of the University to excuse absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required classwork that may fall on religious holidays. Please contact me as soon as possible to make appropriate arrangements for classroom or rescheduling of exams.
- The University is committed to providing reasonable accommodations for all students with disabilities. If you have a disability that may prevent you from fully demonstrating your abilities, contact me and your TA directly as soon as possible so that accommodations can be made. Students must be registered with the Center for Accommodations and Support Services <https://www.utep.edu/student-affairs/cass/> prior to receiving accommodations in this course. You are expected to be familiar with and abide by the UTEP Academic

Misconduct Code at <https://www.utep.edu/student-affairs/osccr/student-conduct/academic-integrity.html>

- Anything that appears to be cheating, plagiarism, or other forms of academic misconduct will not be tolerated. Apparent misconduct will be dealt with by immediate referral of the circumstances through the regular university channels.
- I have the right to institute new policies during the semester to ensure safety and positive learning environment for all students.

## COVID STATEMENT

### COVID-19 PRECAUTION STATEMENT

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](mailto: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](http://epstrong.org).

## Course Resources: Where you can go for assistance

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.
- [Counseling and Psychological Services](#): Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.