University of California, Merced

ENVE 110
Hydrology and Climate
Fall 2018

Lecture: Monday and Wednesday, 2:30 pm – 4:20 pm, Kolligian Library 217

Instructor: Mohammad (Safeeq) Safeeq (msafeeq@ucmerced.edu)
Office hours: Office hours SE2 377: Wednesday 10 am -12 noon or by appointment

Textbooks: Physical Hydrology, 3rd edition, Dingman

Course Description
Basics of the Global Climate, Hydrologic Cycle, and Critical Zone; Fundamentals of Surface-Atmosphere Water and Energy Exchange in the form of Precipitation, Snow, Evaporation, and Transpiration; Principles of Surface and Subsurface Flow, Statistical and Probabilistic Methods, Unit Hydrograph, and Flood Frequency Analysis & Flood Routing.

Course Topics
1. Introduction to Hydrologic Science;
2. Basic Hydrologic Concepts;
3. Climate, Hydrology, and Critical Zone: a global overview;
4. Precipitation;
5. Snow and Snowmelt;
6. Evapotranspiration;
7. Principles of Subsurface Flow;
8. Infiltration and Water Movement in Soils;
9. Groundwater in the Hydrologic Cycle;
10. Runoff Generation and Streamflow;
11. Statistical Methods in Hydrology;
12. Hydrology in Design
13. Hydrologic Simulation Modeling;
14. Hydrologic Measurements and Data Sources

Course Goals and Outcomes
This course is an introduction to climate and hydrology and is intended for students to understand how our global, continental, regional, and local climates are invariably linked to the water cycle.

- Apply the conservation equations of mass and energy to control volume analysis to describe quantitatively and qualitatively the connections between the atmosphere and the terrestrial hydrologic cycle.
- Describe quantitatively and qualitatively the interaction between surface and groundwater processes like infiltration, evapotranspiration, groundwater recharge,

and partitioning, and the response of these processes within the watershed to meteorological and climate events.

- Calculate how essential hydrological processes like snowmelt, groundwater and streamflow respond to perturbations like climate and land-use changes.
- Apply physical equations to describe quantitatively and qualitatively the processes of water partitioning and movement through porous media, including unsaturated (vadose) and saturated zones.
- Develop skills and tools to effectively communicate, synthesize, and comprehend scientific data quantitatively and qualitatively, as well as skills to solve real-world hydrologic problems.
- Develop skills for evaluating structures for safe and effective passage of floods, understanding of design storm hydrograph and learning methods for estimating probable maximum precipitation (PMP) and probable maximum flood (PMF).
- Propose and defend water allocation decisions that are grounded in scientifically-based hydrological concepts (pure hydrology) and related knowledge of climate-hydrologic interactions emphasizing surface and groundwater processes and watershed responses.

Program Learning Outcomes

1. An ability to apply knowledge of mathematics, science, and engineering
2. An ability to design and conduct experiments, as well as to analyze and interpret data
3. An ability to identify, formulate, and solve engineering problems
4. An understanding of professional and ethical responsibility
5. An ability to communicate effectively
6. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
7. A knowledge of contemporary issues
8. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

P**rofessional Component**

Engineering Science: 80%
Engineering Design: 20%

Course Structure

Lectures: Prepare for each lecture by reading the assigned chapters and come to class prepared to participate in discussion and in-class exercises. Attendance is expected and **UNANNOUNCED** quizzes or in-class exercises will be collected to form part of your grade. An announcement will be posted on the **CatCourses** site when computers are required for the class. All class presentations will be posted on the **CatCourses** site before the corresponding lecture.

Homeworks: Weekly homework assignments will be posted on **CatCourses** every week, and will be due at the beginning of the class in the following week. No late homeworks will be accepted and there will be no make-up quizzes unless you notify

the instructor about an absence in advance. Please, remember that academic integrity rules apply so you may work with classmates on your homework, but the product that you hand in should be the result of your own work. Solutions to the weekly homework will be posted on **CatCourses** in a timely manner.

Late penalty of -10% per day for turning in after due date

Academic Dishonesty Statement

a. Each student in this course is expected to abide by the University of California, Merced's Academic Honesty Policy. Any work submitted by a student in this course for academic credit will be the student's own work.

b. You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an email, an email attachment file, a diskette, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action.

c. During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

Disability Statement

Accommodations for Students with Disabilities: The University of California Merced is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design and diversity. I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances. Students are encouraged to register with Disability Services Center to verify their eligibility for appropriate accommodations.

Grades

The final grade will be the result of a weighted average of exams, homeworks, quizzes and in-class assignments, and a class project as follows:

Mid-term exam	20 %
Final exam	30 %
Homeworks	15 %
Quizzes and in-class work	15 %
Class project	20 %

The final grade will be based on the following total point score for the class:

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

Final Exam: Wednesday December 13th from 8 am to 11 am, Kolligian Library 217

Hydrology and Climate
Tentative Weekly Schedule

This schedule is subject to change. Any changes to it will be announced in class and will be posted on the **CatCourses** site.

Week	Date	DoW	Topic / Event
1	08/23/17	Wed	Introduction
2	08/28/17	Mo	Hydrology: Basic Concepts and Challenges [Ch 1; App A and B]
	08/30/17	Wed	
3	**09/04/17**	**Mo**	**No class: Labor Day Holiday**
	09/06/17	Wed	The Global Context: Climate, Hydrology, and Critical Zone [Ch 2]
4	09/11/17	Mo	
	09/13/17	Wed	Surface-Atmosphere Water and Energy Exchange: Principles and Processes [Ch 3]
5	09/18/17	Mo	Surface-Atmosphere Water and Energy Exchange: Precipitation [Ch 4]
	09/20/17	Wed	
6	09/25/17	Mo	Surface-Atmosphere Water and Energy Exchange: Precipitation [Ch 4]
	09/27/17	Wed	Surface-Atmosphere Water and Energy Exchange: Snow and Snowmelt [Ch 5; App D]; **Project assignment**
7	10/02/17	Mo	Surface-Atmosphere Water and Energy Exchange: Snow and Snowmelt [Ch 5; App D]
	10/04/17	Wed	Surface-Atmosphere Water and Energy Exchange: Evapotranspiration [Ch 6; App D]
8	10/09/17	Mo	Mid-term review
	10/11/17	**Wed**	**Mid-term Exam**
9	10/16/17	Mo	Surface-Atmosphere Water and Energy Exchange: Evapotranspiration [Ch 6; App D]
	10/18/17	Wed	Water Movement on the Land: Principles of Subsurface Flow [Ch 7]
10	**10/23/17**	**Mo**	**Project work day**
	10/25/17	Wed	Water Movement on the Land: Principles of Subsurface Flow [Ch 7]
11	10/30/17	Mo	Water Movement on the Land: Infiltration and Water Movement in Soils [Ch 8]
	11/01/17	Wed	
12	11/06/17	Mo	Runoff Generation and Streamflow [Ch 10, Ap E]
	11/08/17	Wed	
13	11/13/17	Mo	Runoff Generation and Streamflow [Ch 10, Ap E]
	11/15/17	**Wed**	**Project work day**
14	11/20/17	Mo	Groundwater [Ch 9]
	11/22/17	**Wed**	**Non-Instructional Day**
15	11/27/17	Mo	Groundwater [Ch 9]
	11/29/17	Wed	Statistical Methods in Hydrology [App C]
16	**12/04/17**	**Mo**	Hydrologic Simulation Modeling; **Class Project Due**
	12/06/17	Wed	Exam review session
NA	**12/13/17**	**Wed**	**Final Exam**