COURSE OUTLINE
CIVE 520 – Physical Hydrology

Credits: 3
Term(s) to be offered: Fall

Prerequisite: CIVE 322/ENVE 322, Basic Hydrology

Catalog description: Hydrologic, atmospheric processes in the water cycle; linear systems, hydrologic response; geomorphologic description of hydrologic processes, response.

Instructor: Jorge A. Ramírez, A222 Eng., 491-7621

Text: Course handouts are provided to cover the required material in the course.

The following additional reference material has been placed on reserve at the Morgan Library.

1. *Hydrology, an Introduction to Hydrologic Science* by R. L. Bras. Addison Wesley, 1990.
2. *Dynamic Hydrology* by Peter S. Eagleson. McGraw Hill, 1970.
3. *Physical Hydrology* by L. S. Dingman. Upper Saddle River, N.J.: Prentice Hall, 1994.
4. *Applied Hydrology* by V. T. Chow, D. Maidment, and L. W. Mays. McGraw Hill, 1988.
5. *Atmospheric Science, an Introductory Survey* by J. Wallace and P. Hobbs. Academic Press, 1977.
6. *Physical Climatology* by W. D. Sellers. The University of Chicago Press, 1974.
7. *Hydraulics of Groundwater* by J. Bear. McGraw Hill, 1979.
8. *Introduction to Hydrology* by W. Viessman, J. Knapp, G. Lewis, T. Harbaugh. Crowell, Harper and Row, 1977.
9. *Hydrology for Engineers* by R. Linsley, M. Kohler, and J. Paulhus. McGraw Hill, 1975.
10. Class handouts.

Course Objectives: This course emphasizes process understanding from a physical point of view. Interdisciplinary aspects of hydrologic science are presented in a unified framework. Earth's energy budget: radiation physics, short wave and long wave radiation. Earth/Atmosphere system: atmospheric composition and structure; atmospheric moist thermodynamics. Hydrologic cycle: Precipitation, evaporation/transpiration, unsaturated flow and infiltration, snow hydrology, and surface and groundwater runoff. Geomorphology and hydrologic response. Global and large-scale hydrology.

Upon successful completion of this course, the student will be able to:

- Describe the fundamental physical, dynamical and thermodynamical laws governing the behavior of hydrologic processes including precipitation, evaporation, transpiration, infiltration, soil moisture redistribution, and runoff
- Describe the basic vertical structure of the atmosphere and the physical, radiative and thermodynamical processes leading to that structure
- Describe the mechanisms generating convective and stratiform precipitation and use that understanding to model and predict precipitation
- Describe and model the infiltration and exfiltration processes
- Describe and model percolation and groundwater flow
- Describe and model transpiration, including stomatal control of leaf capillary potential
- Use concepts from geomorphology to derive geomorphologic instantaneous unit hydrographs and to use them to predict hydrologic basin response

- Describe, model, and predict the temporal evolution of the snowpack.

Course Topics/Weekly Schedule:

Week	**Topic**
1.	Hydrologic cycle, water and energy balances
2.	Climate, radiation balance, temperature
3.	Climate, pressure, humidity
4.	Precipitation, adiabatic lifting, condensation
5.	Precipitation, storm modeling, radar estimation
6.	Evapotranspiration, energy methods
7.	Snow, ocean and pan evaporation
8.	Transpiration
9.	Snowmelt, properties, modeling
10.	Infiltration and runoff, unsaturated flow
11.	Infiltration, solutions for deep soil
12.	Infiltration, Green & Ampt methods, runoff mechanisms
13.	Subsurface flow
14.	Streamflow, linear system model, geomorphic approach
15.	Streamflow, equations, flow routing

Instructional Methodology: Three lectures per week.

Mode of Delivery: Traditional lectures in class and via the course website for distance students. .

Methods of Evaluation: The course grade will be based on the following distribution:

Homework and term Paper	25%
Two Mid-term Exams	50%
Three Exams	25%
Total	100%