

CIVE 522 ENGINEERING HYDROLOGY

INSTRUCTOR

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Office Hours: MWF 1:00 - 2:00 PM – A222 Engineering Bldg.

TEXTBOOKS AND REFERENCES

The following books and references have been placed on reserve at the Morgan Library.

1. *Applied Hydrology* by Ven Te Chow, David Maidment, and Larry W. Mays. McGraw Hill, 1988.
2. *Hydrology, An Introduction* by Wifried Brutsaert. Cambridge University Press, 2005
3. *Dynamic Hydrology* by Peter S. Eagleson. McGraw Hill, 1970.
4. *Kinematic Wave Modeling in Water Resources* by Vijay P. Singh. John Wiley and Sons, Inc. 1996.
5. *Probability, Statistics, and Decision for Civil Engineers*, by Jack R. Benjamin and C. Allin Cornell. McGraw Hill, 1970.
6. *Hydrology, an Introduction to Hydrologic Science* by Rafael L. Bras. Addison Wesley, 1990.
7. *Introduction to Hydrology* by Warren Viessman, John Knapp, Gary Lewis, Terence Harbaugh. Crowell, Harper and Row, 1977.
8. Class handouts.
9. http://www.engr.colostate.edu/~ramirez/ce_old/classes/ce522_ramirez/CE522-new.htm

COURSE OBJECTIVES

This course emphasizes engineering applications of hydrologic science. Rainfall-runoff analysis. Lumped and distributed flow routing. Reservoir and river flood routing. Kinematic, diffusive and dynamic waves. Precipitation data analysis and optimal interpolation. Hydrologic design: risk analysis, hydro-economic analysis, and analysis of uncertainty. Bayesian decision analysis. Design storms. Design flows. Hydrologic reservoir design. Watershed modeling applied to hydrologic design.

COURSE EVALUATION

Homework

3 Exams

SCHEDULE

Lecture MWF 10:00 - 10:50 AM – Room BSB 103

ACADEMIC INTEGRITY AND HONOR PLEDGE

This course will adhere to the Academic Integrity Policy of the Colorado State University General Catalog and the Student Conduct Code. Accordingly, we will use an honor pledge as indicated below.

The honor pledge will be:

“I pledge that I have not given, received, or used any unauthorized assistance.”

“I pledge that I will not give, receive, or use any unauthorized assistance.”

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COURSE OUTLINE

TOPIC

Linear System Theory and Rainfall-Runoff Analysis

- Unit hydrograph theory
- Instantaneous unit hydrograph (IUH)
- IUH analysis methods: Harmonic analysis
 - Fourier transforms
 - Laplace transforms

- Linear channel
- Linear reservoir
- Nash model

River and Reservoir Flood Routing

- Flood Routing
- Reservoir flood routing methods:
 - Mass curve method
 - Storage indication method
 - Puls method
 - Goodrich method
 - Coefficient method
 - Woodward method
 - Others
- Linear Muskingum method:
 - Analytical Solution
 - Hydraulic analogy
 - Parameter estimation procedures.
- Multiple reach Muskingum method
- Nonlinear Muskingum method:
- Muskingum-Cunge method
- Distributed flow routing - Wave motion
 - Kinematic wave and Overland Flow
 - Analytical solution - Overland flow problem
 - Linear and non-linear numerical solutions
 - Overland Flow with spatially variable infiltration
 - Routing of diffusive and dynamic waves

Hydrologic Design

- Design scale
- Design Level
 - Risk Analysis
 - Hydroeconomic Analysis
- First Order Analysis of uncertainty
- Composite Risk Analysis
- Risk Analysis of safety factors and safety margins
- Hydrologic design under natural and parameter uncertainty
 - Bayes risk
 - Opportunity Losses
 - Value of Sample Information

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COURSE OUTLINE

TOPIC

Precipitation data analysis.

Data analysis

Modeling

Mean Areal Precipitation: Thiessen polygons - Isohyets - IWD Methods

Kriging

Kriging with covariances

Kriging with semivariograms

Kriging with generalized covariances

Co-Kriging

Orographic Influences and their analysis

Design Storms

Design precipitation depth

Point precipitation

Areal precipitation

Intensity-Duration-Frequency (IDF) Curves

Design Hyetographs

Storm event-based analysis

IDF-based analysis

Estimated Limiting Storms

Frequency analysis