College of Engineering Department of Civil Engineering



CE 526 Probability & Statistics in Hydrology

Credit and Contact hours	3 / 3 (Lectures), 0 (Tutorials), 0 (Laboratory)		
Required, or Elective	Elective		
Course Description	Statistical methods in hydrology, probability distribution of hydrologic variables, hypothesis testing and goodness of fit, flood frequency analysis, single and multiple regression analysis, classification of time series, characteristics of hydrologic time series, statistical principles and techniques for hydrologic time series modeling, time series modeling of annual and periodic hydrologic time series (including AR, ARMA, ARIMA, and DARMA models), multivariate modeling of hydrologic time series, practical considerations in time series modeling applications.		
Prerequisites or Co- requisites	None		
	Students completing this course successfully will be able to:		
Course Learning Outcomes	Course Learning Outcomes (CLOs)	Related Student Outcomes (SO)	
	CLO1. Identify sources of uncertainty in hydrologic models. K1	SO1	
	CLO2. Describe the basic concepts of probability theory and random functions. K1	SO1	
	CLO3. Apply the concept of probability theory and random functions to solve problems related to uncertainty analysis in hydrologic analysis, modeling, and forecasting. S1	SO2	
	CLO4. Develop a stochastic model using statistical models for analyzing water resource systems. S1	SO2	
	CLO5. Perform and demonstrate the application of a stochastic model on a study area. V1	SO6	
Student Outcomes related to this Course	 SO 1 Recognize advanced engineering knowledge, concepts, and techniques to identify, interpret, and analyze complex and real-life engineering problems. SO 2 Provide solutions for complex and real-life engineering problems through critical thinkin and the use of modern engineering tools, and identify their impact on social, global, cultural, environmental, safety, and economic factors. SO 6 Demonstrate scientific integrity, ethical responsibility, and academic values in scientific publications, research projects, and thesis work. 		

	List of Topics		Related CLOs
Topics Covered	1. Introduction, descriptive statistics, and random variables		CLO 1,2,4
	2. Independence and random functions		CLO 2
	3. Random functions, Moments of a distribution		CLO 1,2
	4. Random Variables and distributions		CLO 12,4
	5. Commonly used probability distributions		CLO 2
	6. Parameter estimation, Covariance and correlation		CLO 2,3
	7. Time Series Analysis: Realizations and En Autocorrelation and correlogram	sembles, Stationarity,	CLO 2,3,4
	 Time Series Analysis: Spectral density, tes removing periodicities 	st of significance,	CLO 2,3,4
	9. Time series Analysis: Spectral density, test of significance, removing		CLO 2,3,4
	10. Periodicities		CLO 2,3,4
	11. Time series Analysis: Partial Autocorrelation function,		CLO 2,3,4
	12. ARIMA/Box Jenkins models, and Identifying model structure		CLO 2,3,4
	13. Time Series Analysis: Parameter estimation and Calibration		CLO 2,3,4
	14. Guided Project Lab		CLO 5
	15. Time Series Analysis: Model Selection and	d Forecasting	CLO 4,5
	• Probability and Statistics in Hydrology, V. Yevjevich, Water Resources		
Textbook(s)	 Stochastic Processes in Hydrology, V. Yevjevich, Water Resources Publications, 1972. Stochastic Approaches to Water Resources, Vol. 1, H.W. Shen, 1976. 		
Required			
Material			
Tratter fur	 Statistical methods in Hydrology, C.T. 	Haan, Iowa State Pres	ss, 2002.
Grading System	Homework	25%	
	Lecture attendance		
	Project-report and presentation	35%	
	Final Exam	40%	
Instructors	Dr. Ali Alnahit		
Date of Review	March, 2025		