

CEES5020: Computational Hydrology and Water Resource System
College of Engineering, School of Civil Engineering and Environmental Sciences

Lecture Time: Tuesday 12:00-2:40pm (can be changed)

Lecture Location: National Weather Center 3620 or 2PP Geoinformatics Computer Lab

Instructor: Dr. Yang Hong, yanghong@ou.edu and <http://hydro.ou.edu>

Office Hour: TU 2:40 - 3:40 PM; Office: National Weather Center 4610

Pre-requisites: Senior or graduate students with good standing, or instructor's permission

Course Description:

This course is designed for senior or graduates level students who are interested in pursuing hydrology major/minor to understand the role of water in our environment. This course will cover fundamental theory and modeling of hydrological processes and basin-based water systems. Emphasis is placed on the application of quantitative methods to the analysis of interactions of hydrology, engineering, and socioeconomics in regional water resources systems. Users will learn how to solve a range of problems from simple linear hydrologic system, multi-objective optimization and distributed model calibration, to fairly complex energy flux and water balance in hydrology and water cycle. With a supplemental set of numerical recipe files, MATLAB is used for this course because it offers a set of mathematical and graphical tools to better understand and analyze numerical solutions for nonlinear hydrologic system.

Syllabus (subject to Minor change)

Week#	Subject	Reading	Homework
W01. 08/23	Intro-Hydrology and Water System	Ch1	
W02. 08/30	Computation and Visualization with MATLAB		HW1
W03. 09/06	Hydrologic Time Series and Random Variables	Time series, statistics toolbox	
W04. 09/13	Introduction: Hydrologic System Evaluation (Ebeth's paper) and Calibration (DRI lecture and reading materials)		HW2
W05. 09/20	Introduction to Hydrological Modeling (conceptual vs. physical; lumped vs. distributed; HyMOD vs. CREST) General Review of System Theory; Modeling Applications with HyMOD		
W06. 09/27	Manual Calibration (HyMOD): visual and objective measures of performance (Lab)	Matlab Optimization Toolbox	HW3
W07. 10/06	Calibration/Optimization: Uniform Random Search (RUS) vs. Single Objective Genetic Search Algorithm (SCE-UA)		
W08. 10/13	SCE-UA and Multi-objective MOCOM-UA (Pareto sorting or weighted multi-objectives)	SCE.m and MOCOM-UA.m readme	
W09. 10/20	Parameter Optimization in Hydrology using DREAM Automatic Calibration (HyMOD)	dream.code readme	
W10. 10/27	Mid-term Exam		
W11. 11/03	Distributed Hydrological Modeling: CREST and Term Project: Linking Parameter Estimation Tools with Hydrological Models		HW5
W12. 11/10	Term Project: Lumped or Distributed Hydrological Modeling using		

	Manual and Automated Calibration (Lab)		
W13. 11/17	Term Project: Distributed Hydrological Modeling using Manual and Automated Calibration (Lab)		HW6
W14. 11/24	Term Project: Distributed Hydrological Modeling using Manual and Automated Calibration (Lab)		
W15. 12/01	Term Project: Distributed Hydrological Modeling using Manual and Automated Calibration (Lab)		
W16. 12/08	AGU week/Team Project		
W17. 12/15	Term Project Presentation		presentation
W18. 12/20	Final Grades Due		

Textbook References (recommended; Instructor will hand out E-copy):

1. Numerical Methods in the Hydrological Sciences. by George Hornberger and Patricia Wiberg, the American Geophysical Union *Special Publications Series, Volume 57, 233 pages, e-book, 2006, ISBN 0-87590-725-1, AGU SP057F251*;
<https://www.associationsciences.org/agu/books.jsp>
2. Calibration of watershed models, Editors Duan, Q., Gupta, H. V., Sorooshian, S., Rousseau, A. N., Turcotte, R., 2004, American Geophysical Union
3. Data Analysis in the Earth Sciences Using MATLAB, by G.V. Middleton, ISBN: 0-13-393505-1
4. *Numerical Computing with MATLAB*, by C. Moler, Electronic edition: The MathWorks, Inc., Natick, MA, 2004. <http://www.mathworks.com/moler>; Print edition: SIAM, Philadelphia, 2004. <http://www.ec-securehost.com/SIAM/ot87.html>
5. Physical Hydrology, Dingman, S.L., 2nd Edition, Prentice Hall, 2002

Grading: Class Participation/Quiz (10%); homework (35%); Midterm Exam (20%); Final (20%); Team Project/Presentation (15%);

Grades: >90=A; 80-89=B; 70-79=C; 60-69=D; <60=F. The instructor may apply a curve to arrive at the final grade.

Homework: Topical assignments will be given out to the class approximately tri-weekly and due the following week. Late assignments are not acceptable!!!

Exams: One midterm and a final project/presentation are required. The exams will be a mix of theoretical concepts from the homework as well quantitative understanding of the topics discussed in lecture.

Academic Misconduct: Academic misconduct will not be tolerated and could lead to your dismissal. You must do your own work. Please visit the following link for information on your rights to appeal and responsibilities should there be evidence of academic misconduct. See the following links concerning academic integrity and rights: <http://www.ou.edu/provost/integrity-rights/>; <http://www.ou.edu/studentcode/>

Reasonable Accommodation: The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the professor as early in the semester as possible. Students with disabilities must be registered with the Office of Disability Services prior to receiving accommodations in this course. The Office of Disability Services is located in Goddard Health Center, Suite 166, phone 405/325-3852 or TDD only 405/325-4173.