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)

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

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<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Notes</th>
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<tbody>
<tr>
<td>W13. 11/17</td>
<td>Term Project: Distributed Hydrological Modeling using Manual and Automated Calibration (Lab)</td>
<td>HW6</td>
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<tr>
<td>W14. 11/24</td>
<td>Term Project: Distributed Hydrological Modeling using Manual and Automated Calibration (Lab)</td>
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<td>W15. 12/01</td>
<td>Term Project: Distributed Hydrological Modeling using Manual and Automated Calibration (Lab)</td>
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<td>W16. 12/08</td>
<td>AGU week/Team Project</td>
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<td>W17. 12/15</td>
<td>Term Project Presentation</td>
<td>presentation</td>
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<td>W18. 12/20</td>
<td>Final Grades Due</td>
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**Textbook References** (recommended; Instructor will hand out E-copy):

2. Calibration of watershed models, Editors Duan, Q., Gupta, H. V., Sorooshian, S., Rousseau, A. N., Turcotte, R., 2004, American Geophysical Union

**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/provost/integrity-rights/); [http://www.ou.edu/studentcode/](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.