# Applied Surface Water Modeling

UT-Dallas GEOS-5313, Spring 2021

Dr. T. Brikowski
Geosciences Dept., UTD

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Learn how to make detailed quantitative analysis and prediction of watershed response to precipitation, including surface water runoff, flood routing and storm hydrograph analysis/prediction, and stormwater quality modeling. This course is light on theory, and heavy on application of the most widely used surface water modeling programs (e.g. *HEC-HMS, TR-20, TR-55*). In general theoretical topics will be covered in the first meeting each week, followed by hands-on application of these concepts in the second meeting. McCuen (2004) will serve as the recommended text for theory, the Watershed Modeling System interface (*WMS*, Fig. 1) will serve as the platform for practical applications. Students will recieve temporary copies of *WMS* for home use. GIS topics related to model parameterization will also be covered. A useful text on GIS and watershed modeling is Maidment (2002) and Arc Hydro.

This course is intended to provide the basic skills and experience needed to perform surface water modeling studies in hydrology. In this class, you will learn how to generate valid watershed delineations, and apply the most common streamflow (*HEC-1, and TR20 or TR55*) and water quality/transport models (*HSPF*) and to make meaningful analyses of the results. Laboratory exercises will provide hands-on experience using the *WMS* modeling software to explore issues raised in the lectures. Temporary student copies of WMS will be available, so most mod-

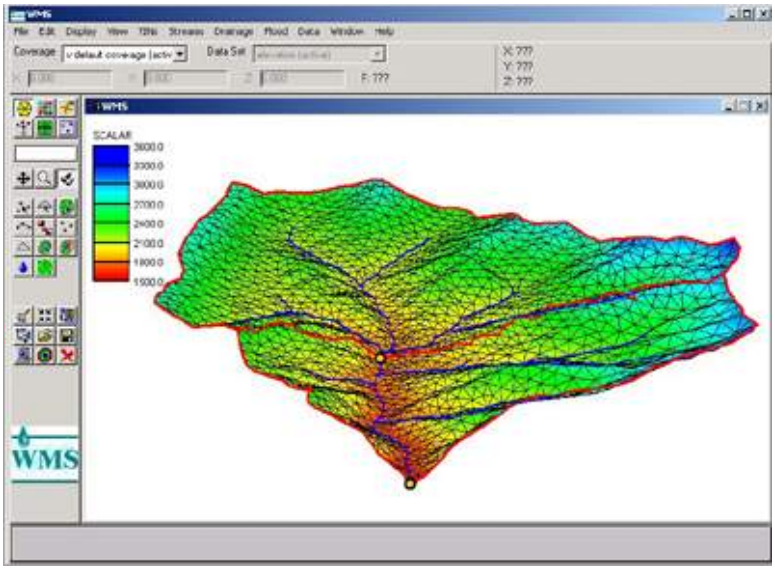


Figure 1: WMS model development and interpretation software interface.

Table 1: Course Syllabus. "T#" denotes textbook chapter number. Tutorial text and input files available from WMS Learning webpage, advanced topics will be under "Hydrology" or other tabs.

| Week | Dates | Chapters | Lecture | Lab |
|---|---|---|---|---|
| 1 | Jan. 19 | | Organizational Meeting, Introduction to Surface Water Modeling | |
| 2 | Jan. 26 | | Watershed Characteristics | |
| 3 | Feb.2 | T3 | Watershed Definitions/Parameters | Introduction to *WMS*, DEM Manipulation in *WMS* |
| 4 | Feb. 9 | T3 | Calculating Watershed Parameters: Travel Time | Time of Concentration and Composite CN with TR-55 |
| 5 | Feb. 16 | T4 | Precipitation/Rainfall Characterization | Storm Event Specification |
| 6 | Feb. 23 | T7,9 | Hydrographs | Unit Hydrograph |
| 7 | Mar. 2 | T5 | Rational Method | Rational Method |
| 8 | Mar. 9 | T5 | | Midterm Project, |
| - | Mar. 16 | Spring Break | | |
| 9 | Mar. 23 | T10-11 | Stream and Reservoir Routing | HEC-1 Reservoir Routing |
| 10 | Mar. 30 | T9 | TR-20 Modeling | WMS 6.1 Tutorial, Chp. 19, pg. 213-223 |
| 11 | Apr. 6 | | TR-55 Modeling | WMS Tutorial p. 121-135 |
| 12 | Apr. 13 | W11 | HEC-1/HEC-HMS Modeling | HEC-1 Tutorial |
| 13 | Apr. 21 | | Distributed Parameter Modeling: GSSHA | Upgrading HEC-HMS Model to a GSSHA Model |
| 14 | Apr. 27 | | Long-Term Simulations: GSSHA | GSSHA Long-Term Simulations Tutorial |
| 15 | May 4 | | Continuous Modeling-Climate Change | GSSHA Initial Setup Tutorial |
| - | May 11 | | Class final project presentations | |