Geography 246
Advanced Hydrologic Modeling
UCSB

Instructor: Hugo A. Loáiciga (hugo@geog.ucsb.edu); http://www.geog.ucsb.edu/~hugo
Time: Wednesday 5:00 – 6:50 pm, room 3620 Ellison Hall; Lab: Wed. 7:00-7:70 pm; room 3620 Ellison.
Office hours: Tuesday 11 am-12 noon; Thursday: 11 am-12 noon; or by appointment; room 3626 A Ellison Hall.

Objectives: Hydrology is the discipline concerned with the study of the storage, circulation, and physicochemical transformations of water in rivers, aquifers, lakes, the land surface, the atmosphere, and other terrestrial water reservoirs. The hydrologic cycle is a conceptual description of the storage, circulation, and transformations undergone by water. That description can be made over a wide range of spatial and temporal scales, among which the watershed scale is of particular interest. Hydrologic modeling concerns itself with the formulation of abstract representations of the hydrologic cycle or parts of it with the objective of understanding and making accurate predictions of hydrologic phenomena under actual and assumed conditions (past, present, and future). Geography 246 is an advanced course on hydrologic modeling. It relies on basic principles, empirical evidence, and statistical methods to construct mathematical models of hydrologic phenomena such as watershed response to precipitation or water and chemical transport among water reservoirs. This course strives to convey expertise about the formulation and analysis of hydrologic models. Issues concerning modeling calibration and validation are important topics examined in this course. Any student graduating from this course will gain an understanding of how and why hydrologic models can be used, but not blindly believed.

Prerequisites: physical geography, hydrology, groundwater hydrology, calculus, physics, meteorology.
Reader: papers will be distributed in class; no textbook is required.

CONTENTS

Calibration and validation
Examples

Dawdy and O'Donnell model: early hydrologic modeling
Amorocho and Brandstetter model: nonlinear hydrologic models
McMichael et al. model: watersheds impacted by vegetation fire

III. Models of hydrologic fluxes

Infiltration

Richards
Green and Ampt
Horton

Evapotranspiration

Interception/throughfall/stemflow/overland flow

Runoff

HEC-HMS model, HEC-RAS model
TR55 model

Ground water, heat, and chemical transport

MODFLOW; MT3D models
Ground Water Tracers

Regional scaling of climate change and watershed-scale hydrologic processes

Loáiciga et al., 2000

IV. Special Topics: to be developed in class, if time permits

GRADING

Assigned projects	90%
Final examination	10%