Watershed Modeling with Soil Water Assessment Tool

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Course Description:
This course is intended to teach students modeling fundamentals to solve environmental change problems at watershed scale driven by (i) climate variability/change and (ii) land use/cover change. Problems will be tackled using the Soil Water Assessment Tool (SWAT) to predict streamflow and water quality and develop abatement strategies. Students taking the course must have a good understanding of hydrologic processes and should know ArcGIS well. We are going to cover advanced topics such as *sensitivity* and *uncertainty analysis* techniques, which are extremely important skills for modelers.

Course Objectives:
Students will

(i) Develop understanding of the hydrological and biogeochemical processes at watershed scale
(ii) Learn the importance of solving problems at watershed scale and delineate watersheds.
(iii) Learn how hydrologic and biogeochemical processes are impacted by changing land use/cover and climatic conditions
(iv) Develop skills to do sensitivity and uncertainty analysis
(v) Learn developing a SWAT project to solve an important environmental problem.

Course Content:

Day 1	• Introduction to Watersheds • Introduction to SWAT: Theory • ArcGIS interface (GIS) • Download and Install ArcSWAT • Folders and Files Structure
Day 2	• Getting Started - Set up the initial project, open/copy/delete SWAT projects • Watershed delineation • Landuse and soil overlay • HRU delineation • Weather and remaining inputs to develop the SWAT model (including point sources)
Day 3	• Input modifications: *Point Sources, inlet discharges, reservoirs* • Edit Parameters: Subwatershed level: *Soil, Weather Input, Subbasin, HRU, Channel, Groundwater, Water Use, Management, Chemical Input, Pond/wetland, Stream Water Quality Input, Septic Input* Watershed Level: *General parameters, Watershed water quality, land use updating* • Running SWAT • SWAT Output Files • Review of summary outputs • Setting default simulations, calibration simulations, etc.
Day 4	• Introduction of calibration and validation techniques (theory) • Review of model calibration through the model interface • Manual Calibration • Manual Sensitivity Analysis
Day 5	• Full Project

All the steps above will be simultaneously practiced with a sample dataset

Course duration/daily hours: 5 days (Monday to Friday); 3 hours per day (14:00 - 17:00).

Provisional date (1 week): September 16-20, 2024

Table 1. Week schedule

Time	AM (9:00 – 12:00)	PM (14:00 – 17:00)
Day 1 (Monday)	R	C
Day 2 (Tuesday)	IT	IT
Day 3 (Wednesday)	R	C
Day 4 (Thursday)	R	C
Day 5 (Friday)	R	C

C-Class; R-Research; IT-Invited talk.