BAEN 673
Modeling Small Watersheds
Course Description
Spring 2016

Instructor: Dr. Clyde Munster
Office: Room 127 Hobgood Building
Phone: 847-8793
Office Hours: MWF 10-11 am (or by appointment)
Email: c-munster@tamu.edu

Class Hours
Tuesday/Thursday 9:35 am - 10:50 am, Rm. 104 AEPM (lecture), Rm. 214 SCTS (computer lab)

Course Description
This course will simulate water movement and contaminate transport at the watershed scale using the Soil Water Assessment Tool (SWAT) model coupled with ArcGIS. SWAT is an environmental simulation model that is physically based. SWAT uses national geographical information system (GIS) databases to input land use / land cover, soil, topography, stream flow, water quality, and weather information into the model. The ArcGIS extension spatial analyst will be used to delineate watersheds and to establish stream networks using digital elevation maps (DEM’s). Watersheds will be divided into sub-basins based on the stream network. The SWAT model will be used to simulate the hydrologic cycle processes in each sub-basin. Runoff and groundwater discharge will be routed through the stream network in each sub-basin. Flow in upstream sub-basins will be routed through downstream sub-basins until stream flow is discharged at the watershed outlet.

Simulated stream flow and water quality parameters will be compared with measured values using statistical methods. Calibration methods will be used to adjust model parameters to achieve the best possible agreement between simulated and measure values. Simulated contaminate transport will focus on sediment, nutrients (nitrogen and phosphorus) and agricultural herbicides and pesticides.

Course Topics
- Hydrologic Unit Maps
- GIS basis
- National GIS databases
- Watershed delineation
- Introduction to the SWAT Model
- Hydrologic Processes
- Map Projections
- SCS Curve Number Method
- Open Channel Flow
- Land Management Operations in SWAT
- Model Calibration
- Weather Inputs for SWAT
- SWAT Input-Output Files
Nutrient Transport
- Pesticide Transport

**Learning Outcomes**
Upon completion of the course, students will have the following competencies.
1. Understand how to use the basic ArcGIS utilities
2. Have a good understanding of the components of the SWAT simulation model
3. Be able to utilize the national GIS databases (topography, soils, land use, stream flow, water quality, weather, etc) for watershed scale environmental analysis.
4. The use of the SWAT to model to simulate water movement and contaminate transport at the watershed scale using:
   A. Standard national GIS databases, and,
   B. Imported GIS databases with higher spatial resolution
5. Use statistical tools to compare measured parameters to simulated parameters
6. Perform an individual SWAT project to assess watershed scale hydrologic processes

**Pre-requisites**
Graduate student in an environmental engineering or hydrological science program with a background in hydrology and an interest in computer model simulations.

**References on 2-hr Reserve at Sterling C. Evans Library**


Other texts will be added as necessary.

**Course Evaluation**

**Homework Assignments**
- SWAT modeling
  - comparisons of measured and simulated values
  - validation/calibration procedures
  - simulations using high-resolution data

- 50%

Midterm Exam
- 25%

Individual Student Project
- reference material
- simulation methods
- validation/calibration procedures
- class presentation
- 25%
Letter grades will be based on the weighted average specified above and assigned as follows:

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<th>Grade</th>
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<td>A</td>
<td>90 - 100</td>
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**Scholastic Honesty**

"Aggies do not lie, cheat or steal nor do they tolerate those who do."

The Aggie Code of Honor states that students at Texas A&M University should value honesty and personal integrity. Therefore, it is the responsibility of students and faculty members to help maintain scholastic integrity at the University by refusing to participate in or tolerate scholastic dishonesty. In this course, it is permissible to discuss homework assignments and solutions. It is not permissible to copy homework solutions (including computer programs) from another student. It is not permissible to discuss any aspect of any test or examination until all students have completed the exam. The penalties for violating this policy will range from a ZERO on the assignment or test to an F in the course.

For complete information on the Honor Council Rules and Procedures go to: [http://aggiehonor.tamu.edu/](http://aggiehonor.tamu.edu/)

**Additional Accommodations**

If any student in this class requires accommodation related to a special circumstance, please make an appointment to see me as soon as possible. Appropriate arrangements will be made.

**Class Attendance / Late Homework**

Class attendance is required unless there is a university excused absence ([http://student-rules.tamu.edu/rule07](http://student-rules.tamu.edu/rule07)). Please contact me as soon as possible if an emergency requires a class absence. Late homework will be accepted but maximum credit will be half-credit.

**Americans with Disabilities Act (ADA) Policy Statement:**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit [http://disability.tamu.edu](http://disability.tamu.edu).