ADVANCED COMPUTER APPLICATIONS IN ENVIRONMENTAL SCIENCES

The University of Toledo Department of Environmental Sciences
EEES 2510-001 28944

Instructors:

Dr. Daryl Moorhead – dmoorhe@utnet.uetoledo.edu Office hours M 1 - 4pm, W 2 – 4pm in BO 3007F. 419-530-2017 Spring, 2015

Dr. Richard Becker – richard.becker@utoledo.edu Office hours W 9-12, 2-4 in BO 3007C. 419-530-4571

Dr. Don Stierman – dstierm@utnet.utoledo.edu Office hours W 11 – 2, R 11 – 1 in BO 3045A. 419-530-2860 Spring, 2015

Class Location: BO 1010

Class Day/Time: Thursday 2 – 5

Credit Hours: 2

COURSE/CATALOG DESCRIPTION: *Team taught. Collecting and analyzing spatial data, digital elevation models, mathematical modeling of natural processes and introduction to matrix operations in Excel. [Spring] Prerequisites EEES 2500.*

COURSE OVERVIEW: *Environmental science makes extensive use of mathematics and computers in the analysis and management of natural resources. The goals of this course are to familiarize you with*

some of these basic methods in (1) Process Modeling, (2) Analysis and Interpretation of Spatially Explicit Data, and (3) Field Surveying and Measurement.

STUDENT LEARNING OUTCOMES: This course targets outcomes specific to the three main course topics: 1) *For the section on Process Modeling students will learn the skills necessary to interpret and build process models, including model structure, equation selection, parameter estimates and sensitivity analysis; 2) For Analysis and Interpretation of Spatially Explicit Data students will demonstrate understanding of spatially explicit data outside of a GIS environment, and will use GIS tools to conduct simple manipulations and interpretations of sample data; and 3) For Field Surveying and Measurement, students will record field surveying measurements and process those measurements so that they are accurately placed on base maps or aerial photographs in a GIS.*

TEACHING STRATEGIES: This course utilizes learning strategies best suited to the three main course topics: 1) *For the section on Process Modeling, classes will blend short lectures on topical materials, workshops on methods and discussions of individual student projects, conducted in a computer-laboratory; 2) For Analysis and Interpretation of Spatially Explicit Data, classes will structured around a series of hands on and computer based lab exercises with supporting lecture material; and 3) For Field Surveying and Measurement, students will manipulate surveying instruments after a brief demonstration on how measurements are made while others record instrument readings. Data processing and analysis is guided by detailed written instructions. The instructor closely supervises both instrument use and data processing so that serious blunders are avoided.*

PREREQUISITES: *EEES 2500*

REQUIRED TEXTS AND ANCILLARY MATERIALS: The required materials for this course vary according to the three main coarse topics: 1) *For the section on Process Modeling, all materials will be provided on-line;*

2) for Spatial Data analysis, students will need a usb drive with at least 4GB of free space to store data offline, all other materials will be provided on-line; and 3) For Field Surveying, each student must have a field book in which to record data during field labs, all other materials will be provided.

TECHNOLOGY REQUIREMENTS: *Computers, software and technical equipment required by this class will be provided.*

COURSE EXPECTATIONS:

Attendance: *Attendance is required and your presence, absence or tardiness will impact your grade. Success in this course is strongly correlated with attendance. If you miss a class, it is your responsibility to obtain any class notes or pertinent information from a fellow student, as well as make an appointment to meet with your instructor of that class.*

Courtesy: *Please remember that all others in this classroom have paid for this time. Any distractions (conversations, cell phones, mp3 players, social media, shopping, etc.) deplete the value of the course to others, regardless of the distraction you cause for yourself. If you attend a class session, please plan to stay for the entire time period. If you must leave early, please be considerate of the others who have paid for this course and find a seat near the exit.*

Email: *All email correspondence will be sent to your UT account.*

Other: *Late assignments will NOT be accepted except in particularly unusual circumstances (at the discretion of the instructor for the tardy material). There are no opportunities for extra credit.*

GRADING: *Each of the three instructors for this course will provide one third of your final grade. For the section on Process Modeling, all students will be graded on attendance and class participation (5 classes at 20 pts = 100 pts) and homework assignments (5 assignments*

at 80 = 400 pts). For Analysis and Interpretation of Spatially Explicit Data, student will be graded on attendance and class participation (5 classes at 20 pts = 100 pts) and homework assignments (4 assignments at 100 = 400 pts). For Field Surveying and Measurement, 15 points may be earned for each of 3 field exercises based on assessment of participation and teamwork, 7.5 points for teamwork and participation during analysis, and 20 points for each of 2 brief written reports based processed data (100 pts total).

***Midterm Grades** will be provided at the end of section 1 (Process Modeling) and section 2 (Analysis and Interpretation of Spatially Explicit Data), calculated as a percentage of your scores earned in both sections (A, 100 – 93%; A-, 92 – 90%; B+, 89 – 87%; B, 86 – 83%; B-, 82 – 80%; etc.).*

***Final Grading** will be provided at the end of the semester, calculated as a percentage of your scores earned in all three sections (A, 100 – 93%; A-, 92 – 90%; B+, 89 – 87%; B, 86 – 83%; B-, 82 – 80%; etc.).*

COURSE SCHEDULE

***Part 1:** Dr. Moorhead: Process Modeling (computer labs)*
1/15: Introduction to process modeling
1/22: Parameter estimation
1/29: Exponential growth & decay
2/5: Saturated growth (rectangular hyperbolic & logistic functions)
2/12: Uncertainty and sensitivity

***Part 2:** Dr. Becker: 2/19, 2/16, 3/5, 3/19 & 3/26: Analysis and Interpretation of Spatially Explicit Data – a sequence of ArcGIS exercises on increasing sophistication. Computer labs.*

***Part 3:** Dr. Stierman: Surveying and Measurement (3 field labs with 2 computer lab follow-ups)*
4/2: The theodolite and angle measurements (field lab)
4/9: Pace and bearing mapping (field lab)

4/16: Solving triangles (computer lab)
4/23: Electronic distance meter and topographic mapping (field lab)
4/30: Matrix rotation and generating a contour map (computer lab)

UNIVERSITY POLICIES: *The University is an equal opportunity educational institution. Please read The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance.*

***Academic Accommodations*:** *The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course please contact the Student Disability Services Office.*

ACADEMIC POLICIES

Academic dishonesty: *Academic dishonesty of any kind is prohibited. Students who violate the University's policy should expect disciplinary action. University of Toledo's academic dishonesty policy statement can be viewed at http://www.utoledo.edu/dl/students/dishonesty.html*