SOIL 7230 Topics in Landscape Characterization and Processes I (3)
SOIL 7240 Topics in Landscape Characterization and Processes II (3)

An examination of methods of landscape characterization and of landscape processes, their impacts, interactions and modeling. Prerequisite: SOIL 3600 (formerly 040-350) or consent of the instructor.

Course Instructor(s)
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Course Objectives
The objectives of SOIL 7230 and SOIL 7240 are to provide students with comprehensive knowledge of landscape characterization and processes at an advanced level. Topics include: topographic analyses; geostatistical analyses; soil erosion processes and their impacts, interactions and modeling; and hydrology of landscapes.

Course Content
Three modules must be successfully completed for each of SOIL 7230 and SOIL 7240. Modules include:

Module A  Topographic Analysis
- Datums and coordinates
- Methods of collecting of topographic data (theodolites to GPS to image analysis)
- Accuracy, precision, reliability of topographic data
- Topographic analyses (e.g. gradients, curvatures, convergence, source area)
- Landform classification

Module B  Geostatistical Analysis
- Spatial description (e.g. moving-window statistics)
- Spatial continuity (e.g. variograms)
- Point estimation (e.g. inverse distance)
- Kriging, block kriging, cokriging

Module C  Impacts and Assessment of Soil Erosion and Sedimentation
- Indicators of soil erosion (e.g. radioisotopes)
- Impacts on biophysical processes (e.g. crop growth, GHG emissions)
- Issues of scale
Applications of GIS

Module D  Wind and Water Erosion
- Fluid mechanics and erosion
- Factors affecting wind and water erosion
- Interactions with other landscape processes
- Experimental materials and methods

Module E  Tillage Erosion
- Mechanics of soil movement by tillage
- Factors affecting tillage erosion
- Interactions with other landscape processes
- Experimental materials and methods

Module F  Landscape Hydrology
- Movement of water into, through and over the landscape
- Factors affecting water movement
- Interaction with landscape processes

Module G  Formation and Evolution of Soils and Landscapes
- Origin of soil and landscapes and their modification through natural processes and human activities
- Soil geomorphology: the relationships between soils and landscapes

Module H  Modelling
- Modelling approaches (e.g. conceptual, numerical and analytical, physical and stochastic)
- Model development, including verification techniques
- Data sources and quality (e.g. reliability, continuity, consistency)
- Model evaluation using sensitivity analysis and validation
- Interpretation of model output (e.g. uncertainty analyses)

Selection of Modules
The modules to be delivered in each offering of SOIL 7230 and SOIL 7240 will be selected by the instructor. This selection will be based on the interests and needs of the students wishing to take this course.

Course Delivery
The course consists of one introductory session, three 4-week modules, and one concluding session. Each module consists of one 3-hour session per week for four weeks. Each session includes a lecture from the instructor, discussion of readings, and discussion of assignments and course project.

Course Work
Multiple assignments will be executed in each module. These assignments include written reviews of readings, quantitative exercises, and oral presentations. Each student will submit a written report at the end of the course, and this report will demonstrate the student’s understanding of the information and
techniques covered in the course. The topic of each student’s report will be selected by the instructor and student and should apply to the student’s thesis project.

**Course Evaluation**

Students will be graded on: 1) their preparation for and participation in class discussions of readings; 2) their performance on module assignments; and 3) their performance on the course report. Each of these three areas will be weighted equally in assessing the student’s grade.

**Supporting Materials**

Selected documents will be given to students as required readings. No textbook is required.