N. Caroline St

Senior
NCS ES Simulation

SPRING 1999

EARTH SYSTEMS SIMULATION MODELLING

COURSE DESCRIPTION
MEA 400

CLASS:	MWF 1435 - 1525 (3 credits)
LAB:	Mon 1530 - 1700 (1 credit)
TEXT:	MEA 400 Course Pak available in Natural Resource Library
REFERENCE MATERIAL:	Reference Material reserved in the Natural Resources Library Class Web Page www2.ncsu.edu/unity/lockers/class/mea400/ EXTEND Modelling Software, Student Version available in laboratory session.
INSTRUCTOR:	Dr. Tom Hopkins 4146 Jordan Hall Tel: 515-7771 tom_hopkins@ncsu.edu
OFFICE HOURS:	MWF 3:30-5:00 pm

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A. JUSTIFICATION: Quantitative assessments of the impacts of anthropogenic stresses is increasingly needed to guide decision-making processes during the inevitable transition to a 'sustainable management' of our natural resources. Computer-based simulation models, involving the quantitative assessment of anthropogenic impact on natural systems, represent the most promising common language between the science and policy sectors of our society. Dynamic and graphic modelling software, that utilizes pre-programmed dynamical blocks to represent mass, energy and information exchange in a user-friendly way, is now being used in both the science and business communities. Students graduating in the Environmental Science (and Natural Resources) Curricula need to be proficient both in the design and application of this genre of simulation models: e.g., for those with scientific interests to improve the model dynamics and the quality of the data input, and for those with managerial interests to more accurately include resource degradation into decision making and cost/benefit analyses. Furthermore, the course offers an opportunity for students, from the different concentrations within the Environmental Curriculum, to work together on a quantitative assessment of real systems.

B. OBJECTIVES: The general objective of this course is to provide a learning opportunity for students through their participation in a multidisciplinary exercise of quantifying a major natural system with respect to its anthropogenic stresses. The student will:

1. Learn the procedures and rationale for constructing conceptual models of a complicated interactive systems.
2. Learn how to parameterize data input, formulate internal processes, utilize dimensional analysis, and validate model output.
3. Gain experience in applying EXTEND software in an application to a major watershed-estuary system.
4. Gain experience in designing simulations and in discussing their results both from the scientific and managerial points of view.
5. Have an opportunity, through a individual effort, to construct a more detailed, smaller-scaled model in the area of his/her expertise.

C. CATALOG DESCRIPTION: Conceptual ecosystems modelling, dynamics, parameterization, boundary conditions, data integration, validation, interactions between sub-systems, and anthropogenic-coupling. Construction of simulation models using programmable blocks for quantitative simulations. Class will focus on a watershed-river-