Biology 382, Spring 2015

Environmental Systems II

Course Overview: This course is the second in a sequence comprised of ENSCI 381 and ENSCI 382. This course builds upon the concepts covered in ENSCI 381. As with ENSCI 381 we will use a systems approach to characterize the structure of natural environmental systems, to analyze material and energy flows through these systems, and to understand major physical, chemical, and biological processes controlling system structure and function. Additionally, we will discuss and employ common tools and techniques used by environmental scientists to analyze system functioning and model system processes. A strong emphasis is placed on system conceptualization techniques, data assimilation and analysis tools and techniques, and scientific report writing. At the end of the course, you should be capable of applying the systems approach and the modeling tools and techniques reviewed to virtually any system with which you are sufficiently familiar.

Tentative Schedule

(The class schedule below may be adjusted based on our rate of progress and other factors.)

Weeks 1-5 **Review/Introduction to Environmental Modeling**

Introduction to Environmental Modeling: types of models, model fitting procedures, model calibration, goodness of fit, error analysis, model verification, using Excel for statistical/mathematical modeling

Advanced Excel Functions: advanced Excel functions, data assimilation and organization techniques.

Semester Project 1: Developing a dynamic model in STELLA, analyzing model performance over time, predicting model performance, error analysis

Weeks 6-15 **Modeling and Analysis of Environmental Systems**

Programming/Scripting in Excel: programming principles, data types, Excel VBA IDE, Excel object model, writing a subroutine, writing a function, error catching

Introduction to Basic Numerical Procedures: Time-stepping procedures in Excel, using built in functions for data analysis, programming a simple time-stepping routine

Semester Project 2: Developing a dynamic model in Excel, model analysis and testing

Semester Project 3: Application of model development and analysis techniques to a student selected real-world problem

Student Presentations

Your course grade will be based on a series of assignments and projects as indicated in the table below. Additional details and guidance on specific assignments, projects and your assembled portfolio will be provided separately. Attendance is required. If you must miss a class, let us know as soon as possible. Excessive absences can result in the loss of one or more letter grades and a requirement for comprehensive exams.
As with ENSCI 381, you will be expected to develop a course portfolio. The portfolio will be a document that is comprised of a written summary of topics and exercises covered in the course, and will, additionally, incorporate student semester project reports. Additional information regarding the contents and format of the portfolio will be provided at a later time.

Students with Disabilities: Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. All students requesting accommodations are required to meet with staff in Student Disability Resources (SDR) to establish eligibility. A Student Academic Accommodation Request (SAAR) form will be provided to eligible students. The provision of reasonable accommodations in this course will be arranged after timely delivery of the SAAR form to the instructor. Students are encouraged to deliver completed SAAR forms as early in the semester as possible. SDR, a unit in the Dean of Students Office, is located in room 1076, Student Services Building or online at www.dso.iastate.edu/dr/. Contact SDR by e-mail at disabilityresources@iastate.edu or by phone at 515-294-7220 for additional information.

Quizzes/Homework/Projects:

10% Attendance/Participation
20% In-lab Exercises and Quizzes
70% Portfolio
- (10%) Concepts and principles
  - Mathematical Modeling
  - Data Analysis Tools and Techniques
  - Numerical Analysis Techniques
  - Multi-compartmental Models
- (60%) Projects — Tentative Due Dates
  - Project 1 — Due Jan 30th
  - Project 2 — Due Feb 13th
  - Project 3 — Due Apr 17th
  - Student Presentations — Weeks of 4/27 and 5/4

100% Semester Total