

# Syllabus for Special Topics class on Crop Modeling

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## 1 Basics

- Location: Agronomy Hall 1581
- Time: Fri 1:10-3:10pm
- Instructor: Fernando E. Miguez (femiguez@iastate.edu)
- Web: <http://www.agron.iastate.edu/miguezlab/teaching/crop-soil-model.html>
- Phone: 515-294-5980 (discouraged)
- Office: 1206
- Office hours: by appointment only.

## 2 Course Description

This course will concentrate on introducing the idea of models as used in crop and soil research. The emphasis will be on applying and developing simple models and the methods for evaluating their effectiveness. Some mathematical background (algebra or calculus) is recommended. Knowledge of statistics would be highly beneficial. Background in soil and crop or plant sciences is also strongly recommended.

### 3 Course topics

- Intro to Crop Models
- Simple example of a dynamic model (Monteith)
- Simple examples of linear models
- Simple examples of non-linear models
- Evaluating crop models
- Uncertainty and sensitivity analysis
- Parameter estimation, optimization
- Bayesian methods
- Data assimilation

### 4 Software

I will be using mainly R ([www.r-project.org](http://www.r-project.org)) to illustrate examples. I recommend that you study R on your own. I will only provide a short introduction to using the software.

In this special topics class other tools might be more appropriate and I will consider these as needed for each student. No background in programming is needed.

### 5 Grading

This is a graded course. The grade will have three components.

- Problem sets (1/3 of the grade).
- Special project (1/3 of the grade).
- Oral presentation (1/3 of the grade).

## 5.1 Problem sets

The problem sets will be based on the material presented in lecture and will have as their main objective to reinforce the skill needed to approach problems using quantitative skills. The problem sets will not be graded by me, but each student (at random) will be required to present the answers to the rest of the class. It does not matter if the answer is not correct. You will be graded based on participation. You can work in groups to solve them, but at least make sure you understand the answer in case you need to present.

## 5.2 Special Project

The special project will have a format similar to a scientific publication, but with more emphasis on clearly defining the problems and the challenges. It will be shorter in length than a typical scientific publication and will need to have an appendix with the equations and code relevant to the methods used. More details about this will be given later in the semester.

## 5.3 Oral Presentation

The oral presentation will be based on the Special Project and will be your opportunity to share with the rest of the class your work. More details about this will be given later in the semester.

## 5.4 Dates

First portion of the project Oct 1<sup>st</sup>

Second portion of the project Nov 5<sup>th</sup>

Final project deadline Dec 10<sup>th</sup>. (The week of final exams is 13-17)