ABE 5646 – Simulation of Agricultural & Biological Systems
ROG 283, Periods 2-3
Section 4162
Spring Semester 2011
Final Exam 26C: 12:30-2:30 pm April 26
Instructors – Dr. James W. Jones, Dr. Senthold Asseng

Week	Description	Available Files
1 Jan 5-Jan 7	***Course Overview*** Introduction to Systems and Modeling Diagrams used in Systems Analysis	Week 1 Lectures Keen&Spain Ch 1 Ch 2 Ch 3 Jones&Luyten Paper
2 Jan 10-Jan 14	***Computer Simulation of Dynamic Models*** Finite Difference, continuous states, discrete time Errors in Numerical Simulation, Choice of time step	Week 2 Lectures Thornley&Johnson Ch.1.2
3 Jan 17- Jan 21	***Back to Modeling – Biological & Physical Models*** Example Models	Week 3 Lectures Keen&Spain Ch-6, Ch 7-8
4 Jan 24 – Jan 28	***Additional Modeling Concepts*** Compartment models of biogeochemical systems Lags in dynamic biological models Adding spatial & age dimensions in biological models	Week 4 Lectures Keen&Spain Ch 9 Keen&Spain Ch 12-14
5 Jan 31–Feb 4	***Modeling Temperature Effects on Biological Systems*** Effects on chemical reaction rates Effects on biological activity, general Effects on developmental processes in plants and other biological organisms Degree-day models: basis for and use of	Week 5 Lecture Degree Days Handout Curry Chapter on Development Development Paper by Salazar

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Feb 7-Feb 11
	Crop Modeling
	    • State variables
	    • Development
	    • Dry matter growth
	     - photosynthesis, respiration
	     - Light Use Efficiency (LUE)
	    • Partitioning of dry matter
	    • Other Components
		Weeks 6 Lectures
		Salazar Paper on Growth
		Jones et al. (2003)
		DSSAT Pest Module Description
		
		Wallach et al. (2006) Chapter 9

7 Feb 14–Feb 18	**Mid Term Exam (Thursday)** Introduction to "Working with Dynamic <crop> models Two forms of <crop> models	Review Notes Chapter 1 Lecture Notes Wallach et al. (2006) Ch 1
8 Feb 21-Feb 25	Students bring laptops to class a. Introduction to the R Programming Language b. Simulation exercises in R (with homework) c. Students bring notebooks to class	R Introduction Lecture www.cran.r-project.org R Lecture PDF R-Introduction.pdf Part 2, R Lecture HW-4 Assignment Weather data for HW-4

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Feb 28-Mar 4
	Bring laptops to class
	a. Review of Basic Statistics, Random Variables
	   i. Examples
	   ii. Distributions
	   iii. Expectation
	b. Working with Statistics in Simulation
	c. Approximation of distributions from numerical outputs
	d. Expected Values (Mean, Variance, Covariance – 2 methods)
	e. Random Sampling, Monte Carlo Methods
	f. Bayesian Statistics
		Stat Introduction Lecture Notes
		   Statistics lecture-1
		   Statistics lecture-2
		Wallach et al., Appendix
		Other References
		
		Special Project Instructions

10 Mar 5-Mar 12	**Spring Break (March 5-12)**	
11 Mar 14-Mar 18	a. Discussion of Semester Project Requirements b. Evaluating Dynamic Models • Light HW assignment	Handout outline Wallach et al. (2006) Ch 2 Evaluation Lectures (1&2) Exercise files for class Also see Wallach et al. (2006) chapters 12-13 for examples HW-5 Due Mar 24
12 Mar 21-Mar 25	Uncertainty and Sensitivity Analysis • Light HW assignment	Wallach et al. (2006) Ch 3 Uncertainty/Sensitivity Lectures Also see chapters 14, 15, 16 HW-6 instructions HW-6 R Program shell Morris Paper on SensAnal Alam Paper on SensAnal Exercise Booklet
13 Mar 28–Apr 1	Parameter Estimation Light HW assignment	Wallach et al. (2006) Ch 4 Makowski et al. (2002) Wang et al. (2005) Beven and Binley (1992) Parameter Estimation Lectures HW-7 HW-7-zip-files

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Apr 4-Apr 8
	a. Introduction to:
	   • Optimization with Simulation Models
	   • Data Assimilation with Dynamic Models
	
	b. Special Project Presentations and Discussions
		Wallach et al. (2006) Ch 5, 6
		Lecture
		Jones et al. paper - 2004

15-16 Apr 11-20	Special Project Presentations Review for Final Exam (Tuesday, Apr 19)	

April 26 (Tuesday) Final Exam 26C, 12:30 – 2:30 pm
Room: ROG 283