## Florida Atlantic University Department of Computer & Electrical Engineering & Computer Science Dr. Zvi S. Roth

## **BME 5742 Bio-Systems Modeling and Control**

## Lecture Videos (recorded in Fall 2010)

## 29 videos of 1:20 hours each Matlab/Simulink Tutorials (shown in red)

Lecture Number	Video # (recording date)	Topics	Comments
1	1	Fall 2010 Course Information:	Skip the first
	(recorded	Syllabus, Grading Policy, Course	half of the video
	on 8/23/10)	Logistics, Course Goals;	(dealing with
			the now
		The Logistic Model	irrelevant
			syllabus of the
			old Fall 2010
			course)
2	2	Simulink Tutorial: Simulation of	
	(recorded	Malthusian Models, Scope data set up	
2	on 8/25/10)	and transfer to Matlab	
3	3 (recorded	Simulink Tutorial: Simulation of the	
	(1000000000000000000000000000000000000	logistic model, signals multiplexing, usage of the Fcn block;	
	011 8/30/10)	Logistic Model with Extinction and	
		Predation;	
		Logistic Models with Time Delay	
		Eligistic Wodels with Thic Delay Effects	
4	4	Logistic Models with Time Delay	
	(recorded	Effects (cont'd);	
	on 9/1/10)	Simulink Tutorial: More about	
	,	Simulink's configuration parameters;	
		Predator-Prey models	
5	5	Predator-Prey models (cont'd);	
	(recorded	Simulink Tutorial: Running Simulink	
	on 9/8/10)	from Matlab	
6	6	Simulink Tutorial: Running Simulink	
	(recorded	from Matlab – how to initiate multiple	
	on 9/13/10)	runs (cont'd);	
		Competition-Symbiosis models	
7	7	Linearization – basic concepts;	
	(recorded	Simulink Tutorial: Linearization using	

	04540		
	on 9/15/10)	Matlab and Simulink; Stability of	
		Equilibrium Points – TRIM and	
		LINMOD commands	
8	8	The SIR model for Spread of	
	(recorded	Infectious Diseases	
	on 9/20/10)	Chemical Reactions Rate: Law of	
		Mass Action	
9	9	Simulink Tutorial: SIR Model –	
	(recorded	elimination of dependent variable and	
	on 9/22/10)	the STOP block	
		Chemical Reactions Rate: Law of	
		Mass Action (Cont'd)	
10	10	Diffusion: Fick's Law;	
	(recorded	Mass Action combined with Diffusion	
	on 9/27/10)	(Simple inter-cellular control models)	
11	11	Generalized Electrical Models in	
	(recorded	Biology and Physiology	
	on 9/29/10)		
12	12	Generalized Electrical Models in	
	(recorded	Biology (cont'd)	
	on 10/4/10)	Control Tutorial by means of	
		Simulink: Basic concepts of linear	
		models	
13	13	Introduction to Enzymes; Introduction	
	(recorded	to Enzyme Kinetics	
	on 10/6/10)		
14	14	Simulink Simulation of a basic Enzyme	
	(recorded	Kinetics model;	
	on	The Michaelis-Menten model for basic	
	10/11/10)	enzyme kinetics	
15	15	Simulink Simulation of a basic Enzyme	
	(recorded	Kinetics model – use of stiff	
	on	integration (cont'd)	
	10/13/10)	Advanced Enzyme Kinetics	
		(Cooperation)	
16	16	Example: Hemoglobin and Myoglobin	
	(recorded	Oxygen Dissociation Curves	
	on	Advanced Enzyme Kinetics	
	10/18/10)	(Competitive Inhibition)	
17	17	Advanced Enzyme Kinetics	
	(recorded	(Allosteric Inhibition)	
	on	The Insulin hormone: Glucose	
	10/20/10)	Metabolism models	
18	18	Glucose Metabolism models (cont'd);	
		Simulink Models for normal patients	

	on	and Type-1 Diabetic patients	
	10/25/10)	απα 1 ype-1 Diabent patients	
19	19	Simulink: Type-1 and Type-2 Diabetes	
	(recorded	models	
	on	Osmosis ; Simplified Model of Cell	Book by
	10/27/10)	Volume Control	Hoppensteadt &
			Peskin Ch. 3
20	20	Simplified Model of Cell Volume	Book Ch. 3
	(recorded	Control (cont'd);	
	on 11/1/10)	Cell Electrical Activity (Nernst	
		Potentials);	
		Ion Movement through Cell	
		Membranes (including electrical	
		phenomena)	
21	21	Ion Movement through Cell	Book Ch. 3
	(recorded	Membranes (including electrical	
	on 11/3/10)	phenomena) (cont'd);	
		Hodgkin-Huxley Nerve Activation	
		model – general considerations	
22	22	Hodgkin-Huxley Nerve Activation	Book Ch. 3
	(recorded	model - Sodium and Potassium	
	on 11/8/10)	Channels, the mathematical model of	
		Action Potentials	
		Peskin's simulator for the nerve	
		activation model;	
		Peskin's Hodgkin-Huxley's Matlab	Peskin's HH
		Simulator: Examples	Matlab
22	22	Heart & Dland Circulation	simulator
23	23	Heart & Blood Circulation:	Book Ch.1
	(recorded	Introduction and Basic concepts; Static	
	on 11/10/10)	Flow-Pressure-Volume relationships	
24	24	Heart & Blood Circulation: Sensitivity	Book Ch. 1
24	(recorded	Analysis; The Need for Feedback	DOOK CII. I
	on	Regulation	
	11/15/10)	Heart & Blood Circulation: The Baro-	
	11,10,10)	receptor Loop	
25	25	Heart & Blood Circulation: The Baro-	Book Ch. 1
	(recorded	receptor Loop (cont'd)	
	on	Dynamic models Heart & Blood	
	11/17/10)	Circulation	
	· ·		
26	26	Dynamic models Heart & Blood	Book Ch. 1
	(recorded	Circulation (cont'd)	
	on	Peskin's Heart and Blood Circulation	
	11/22/10)	Matlab Simulator: Driven arterial	Peskin's Heart

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presentation #4
about
respiratory
center
29 29 May skip
(recorded students'
on 12/1/10) presentation #5
about viral
dynamics
Students Presentation 6: Abishek Book Ch. 1
Duraiswamy and Frans Badenhorst
"Fetal Heart and Blood Circulation
Model"