

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

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

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

		system model; Left ventricle and arterial system model; Normal and diseased Valves	and Bool Circulation Matlab Simulator
27	27 (recorded on 11/24/10)	<b>Peskin's Simulator: Heart Valves Modeling (cont'd); The general circulation model;</b> <b>Students Presentation 1: Wilfredo Rivas-Torres and Christopher Mitchell "Dopamine Synthesis and Release"</b>  Systemic arterial resistance auto-regulation	Book Ch. 1 Peskin's simulator  Skip students presentation #2 <a href="#">about lungs</a> located on this video  Dr. Roth: Book Ch. 1
28	28 (recorded on 11/29/10)	<b>Students Presentation 3: Deepti Pappusetty and David Dittman "Model for Spread of the H1N1 Epidemic and Vaccination Strategies"</b>	May skip students presentation #4 <a href="#">about respiratory center</a>
29	29 (recorded on 12/1/10)	<b>Students Presentation 6: Abishek Duraiswamy and Frans Badenhorst "Fetal Heart and Blood Circulation Model"</b>	May skip students' presentation #5 <a href="#">about viral dynamics</a>  Book Ch. 1