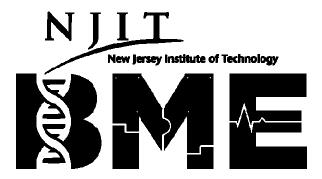
Dr. B Mantilla



BME 382 – ENGINEERING PHYSIOLOGY

COURSE	3 credits	OFFICE	Textbook: Fundamentals
INSTRUCTOR:	Required	HOURS	of Human Physiology, 4th
Dr. Bruno Mantilla	CLASS	(Fenster 612)	Edition
(973) 596 5363	HOURS	Thursday 1:00	Lauralee Sherwood - West
bam3@njit.edu	4.5 hours	pm	Virginia University
Professional	/ week	Or by	ISBN-10:
Component:		appointment	0840062257 ISBN-13:
Medical / Biological			9780840062253
Topics/ modeling			

Description:

Students learn to develop quantitative models of organs and physiological systems. Students translate their understanding of physiological systems into models that evolve dynamically based on engineering block diagrams. Additional topics include: hierarchical structure, sensitivity analysis, parameter estimation, negative feedback control, and characteristic traits of models. Students will use models to gain insight into how a physiological system functions. Systems studied include the cardiovascular system, nerve and muscle action potentials, and musculo-skeletal spinal reflex.

Prerequisites:

Prerequisites: BME 111, BME 301, BME 302 and MATH 222 all with a C or better.

Objectives:

Developing quantitative models is an essential discipline needed to be learned by every engineering student.

In order to understand the principles of modelling physiological systems the student will:

- Understand the physiological system intended to be modeled.
- Identify which is the specific interest and future use of the model to be developed.

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- Define and select the parameters and variables needed for the intended modeling.
- Develop an equivalent physical model.
- Define the equations pertinent to the model.
- Develop a computer based model using Simulink

Week	Course outline
1	Introduction to Engineering Models of Physiological Systems
	Intro To Simulink
2	Model 1 Arterial System
	Tips on Translating Physical-to-SIMULINK Model File
	Physical Model of Lumped Arterial System
3	Physical Model of Lumped Arterial System
4	Model 2 Left Ventricle E(t). Top-Down Model Development
5	Model 3 Left Heart + Vasculature. Estimate Arterial Compliance
6	Model 4 Complete Circulation: LV+RV
7	Mid-Term Exam
8	Model 5 Autonomic Nervous Control of Circulation. Arterial
	Baroreceptors.
9	Model 5 Arterial Baroreceptors. Neg. Feedback System Analysis
10	Model 6 Neuro-Muscular Control.6 Muscle Reflex Diagram
11	Model 6 Limb Mechanics. Muscle Contractio. Spindle Sensor & Filter
12	Model 7 Neural Action Potential. Introduction To Neuron
13	MModel 7 Introduction To Neuron. Neuron Subsystem Overview
14	Final Exam / (Final Project)

The Course Outline may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the Course outline and schedule.

BME 3823: Course Learning Outcome

OUTCOME 6:

An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

Outcome #6. 1. Be able to describe a major physiological system and identify their major elements and describe their relationship and performance in living organisms.

Strategies & Actions	Assessment Methods
During the introductory sessions, students will review the	Lab report. Class discussions.
pertinent physiology of the system of interest.	Quizzes
They will define the scope of the intended model and identify the	
basic elements of interest for the intended model.	
Outcome # 6.2. Be able to identify the elements of the	
physiological system and mathematically describe their	
interaction to achieve homeostasis.	

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Strategies & Actions	
Students will create a theoretical mechanical equivalent (Physical	Lab report. Class discussions.
Equivalent) of the physiological system model, consisting of different instruments or parts that will allow a better	Quizzes
understanding the physics to be used governing the model.	
From this "Physical Equivalent" of the model, the student will	
identify and select the mathematical expressions describing the	
behavior of the system.	
Outcome # 6.3. Be able to derive a computational model of the	
physiological system using Simulink.	
Strategies & Actions	
Once the equations defining the system have been identified, a	Lab report. Class discussions.
Simulink model will be implemented, conducted and evaluated.	Quizzes