MSE 4761: Industrial Controls & Manufacturing (required)

Catalog Description: (2-3-3)
Prerequisites: ECE 3710 Circuits & Electronics
Students are introduced to industrial controls and the fundamentals of manufacturing with hands-on experience based on lab projects using industry software and hardware for communications and control.

Textbook: E.W. Kamen, Industrial Controls and Manufacturing, Academic Press, 1999.

Prepared by: Donggang Yao

Topics Covered:

1. Manufacturing fundamentals
2. Laplace transform and its use in control
3. Modeling and control of continuous-variable processes
4. Z-transform and its use in digital control
5. Predictive, adaptive, and neural net controllers
6. Boolean operations and its use in discrete logic control
7. Ladder logic diagrams and programmable logic controllers
8. Manufacturing systems
9. Production systems
10. Equipment interfacing and communications

Course Outcomes: Specifically, at the end of the course the students will be able to:

1. Describe the basic working mechanisms of common controllers, including PIs, PIDs, PLCs, and predicative and adaptive controllers.
2. Analyze control systems using mathematical tools, including Laplace transform, z-transform, and Boolean operations.
3. Design and conduct experiments, as well as to analyze and interpret data.
4. Apply knowledge of industrial control to solve polymer/fiber engineering problems.
5. Function effectively in teamwork.

Correlation between Course Outcomes and Student Outcomes:

Course Outcomes	Student Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
1. Describe the basic working mechanisms of common controllers, including PIs, PIDs, PLCs, and predicative and adaptive controllers.	x										
2. Analyze control systems using mathematical tools, including Laplace transform, z-transform, and Boolean operations.	x										
3. Design and conduct experiments, as well as to analyze and interpret data.		x									
4. Apply knowledge of industrial control to solve polymer/fiber engineering problems.	x										
5. Function effectively in teamwork.						x					
Entire Course	**2**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**
0 = None or insignificant; 1 = Some; 2 = Moderate; 3 = Strong											

School of Materials Science and Engineering Student Outcomes:

a) an ability to apply knowledge of mathematics, science and engineering
b) an ability to design and conduct experiments, as well as to analyze and interpret data
c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d) an ability to function on multidisciplinary teams
e) an ability to identify, formulate, and solve engineering problems
f) an understanding of professional and ethical responsibility
g) an ability to communicate effectively
h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice