ME 345: AUTOMATION AND MANUFACTURING METHODS Fall 2021

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Office hours: By appointment (email or phone)

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Course Description: An introduction to the major concepts and practices of modern manufacturing, including production system dynamics, process development, and computer-aided design and manufacturing techniques. Topics include numerically controlled machines, robotic control, real-time process control, computer vision, statistical process control, programmable logic control, and production system dynamics & design. Strong emphasis is given on hands-on laboratory experience, with a lecture component covering fundamental concepts and supporting the laboratory exercises and projects.

Texts: (selected readings on blackboard*)

1. **The Goal** : E. M. Goldratt, North River Press
2. Juran Quality Handbook
3. Chp 7 Factory Physics, Hopp and Spearman

Objectives:

1. Introduce principles, methods, and hardware/software tools used in modern computerized design, automation, and manufacturing of discrete parts.
2. Acquire practical experience in computer-aided design, process development, automation, and manufacturing through a series of laboratory exercises.
3. Understand the main principals and components involved in optimizing production system design and operations.
4. Introduction to team work issues.

Grading:

1.	Lab (pre-lab and lab performance, lab report)	27%
2.	Homework	21%
3.	In-class exam	17%
4.	Final	28%
5.	Manufacturing Presentation	6%

Manufacturing Presentation: Each student will pick a topic and make a 5 minute presentation. The topic should be related to modern manufacturing practices and problems. **The student needs to submit a 1 page outline of the topic by the second week of the course.** Please check out the posters around the lab to get a feeling of what we are looking for and see me before hand to discuss your idea. **Your research should be more then a survey of whats available on the web**.

The objective of this assignment is to broaden your knowledge of state-of-the-art manufacturing practices, as well as to help you improve your presentation skills including answering questions (which are actually a compliment, since it indicates that you have created interest in the audience). You will also be asked to critique another student's presentation, where you are expected to deliver real criticism, but in a constructive fashion.

There will typically be two presentations each Monday and one each Wed. that we meet for class.

Note, if you want, you can go over a draft of your presentation with me before your presentation to get some feedback.

ME 345 Labs: Following is a list of labs indicating the order in which they will be done. The class will be divided into two groups: those labs on the same line will be conducted in parallel (where groups A and B switch the following week). Students are expected to work in teams of two, and in some cases, three, although each student must hand in a separate pre-lab and lab report reflecting their own work.

Pre-lab Attendance: Since many of the labs involve operating machines, you **must** attend the Pre-Lab lectures the Friday before the lab. Students missing the pre-lab for labs involving safety issues (in **BOLD**) will **not** be able to perform those labs without permission from the lab supervisor.

Grading for the labs will consist of: pre-lab write up = 20%, lab write up = 80%

GROUP A	GROUP B
Lab 1: ADML DEMO	
LAB 2: Intro to CAD/CAM Milling	
LAB 3: Manufacturing of Milled Parts	
LAB 4: Introduction to Robotics	**LAB 5: Introduction to OpenCIM***
LAB 6: Statistical Process Control	Lab 7: Vision
LAB 8: Robot 2: **Assembly**	Lab 9: PLC*

Labs in **BOLD** involve safety issues, pre-lab attendance required. Labs with * have readings assignments to be completed BEFORE the prelab session.

Team-work: A strong emphasis of the course is in learning team skills, and will involve in-class case studies (see course outline).

class hours: MW 2:30 - 4:15

ME 345 schedule

class	week		lecture	pre lab lec *	lab**
1	0	sept 8 w			
2	1	9/13/2021 m	ADML Demo		system demo
3		sept 15 w	Intro to MFG concepts	CAD/CAM (whole class period)	
4	2	sept 20 m	Team work: Brush Fire (in-class)		
5		sept 22 w		Robot 1	
6	3	sept 27 m	The Goal (discussion)		Robot 1
7		sept 29 wed		Milling	
8	4	oct 4 m	SPC		Milling
9		oct 6 wed			
		oct 11 m no class			no lab
10	5	oct 12 tues Monday	Production Dynamics		no lab
11		oct 13 w		Robot 2 + SPC	
12	6	oct 18 m	Closed loop Control		Robot 2 + SPC
13		oct 20 wed		Robot 2 + SPC	
14	7	oct 25 m	PLC		Robot 2 & SPC
15		oct 27 w		Vision & PLC	
16	8	nov 1 m	Beer Game (production dynamics)		PLC & Vision
17		nov 3 w		Vision & PLC	
18	9	nov 8 m			PLC & Vision
19		nov 10 w		CIM 1	
20	10	nov 15 m	In Class Exam		CIM 1
21		nov 17 w		CIM 2	
22		nov 22 m	Odyssey Team Case		
		T Giving			
23	11	nov 29 m	Cell Phone Game (manufacturing operations design)		CIM 2
24		dec 1 w			
25	12	dec 6 m			
26		dec 8 m	Guest speaker: MFG automation/sensors		
			exam 12/14		

* Most pre-lab lectures were typically