MNE602: Flexible & Computer Integrated Manufacturing

Spring 2024

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Office hours: Mondays 1pm-2:30pm or by appointment

COURSE DESCRIPTION

This course provides a comprehensive description of the concepts, principles, and the analysis of manufacturing systems, including single station manufacturing cells and manual assembly lines versus automated production and transfer lines as well as cellular manufacturing and flexible manufacturing systems (FMS). Moreover, during the class students will gain exposure to quantitative methodologies and algorithms to analyze the automated manufacturing systems. The lab experiments of the course focus on two fundamental objectives: 1) Programming and troubleshooting techniques necessary to run industrial robots, 2) PLCs programming and troubleshooting which train students to execute real world projects.

Canvas

The course will make extensive use of the Canvas system to optimize student-instructor communication. All course materials including lecture slides will be distributed through Canvas. All submission projects and assignments will also be through Canvas. To access the system please go to http://Canvas.njit.edu, you will need a valid UCID to login.

GRADING

Based in individual and team performance as follows:

30% Lab Experiments - 25% Mid Term - 30% Final Exam - 15% Project Presentation

LECTURE SLIDES AND SUGGESTED READINGS

MNE602, Flexible & Computer Integrated Manufacturing lectures slides will be distributed electronically through Canvas.
Textbook: Automation, Production Systems and Computer-Integrated Manufacturing, 4th Edition, by Mikell P. Groover, Pearson.

LAB EXPERIMENTS

The lab experiments will be completed in teams of students. Each team is assigned PLC projects as well as robotic projects. At the end of each project, every team needs to have a short report of the project submitted through Canvas.

PROJECT PRESENTATION

Each student will be assigned a unique flexible manufacturing and automation project, in which student is required to review and discuss the assigned case and create a detailed PowerPoint report which focuses on given tasks. Each student will make a 15-20 minute presentation to the class. Presentations will be scheduled and announced and have to be submitted through Canvas.

COURSE OUTLINE

WKS	CHAPTER	TOPIC
Learning Module 1: Manufacturing Systems		
Week 1,2	13	**Overview of Manufacturing System**
		Components and Types of Manufacturing Systems
		Types of Manufacturing Systems
Week 3,4	14	**Single-Station Manufacturing Cells**
		Single-station Manned Cells
		Single-station Automated Cells
		Applications and Analysis of Single-station Cells
Learning Module 2: Automated Production Lines		
Week 5,6	15	**Manual Assembly Lines**
		Fundamental of Manual Assembly Line
		Line Balancing Algorithm
		Workstation Details
		Batch-Model and Mix-Model Lines
		Lab Experiments
Week 7,8	16	**Automated Production Lines**
		Fundamental of Automated Production Lines
		Applications of Automated Production Lines
		Lab Experiments
Week 9	17	**Automated Assembly Systems**
		Fundamental of Automated Assembly Systems
		Applications of Automated Assembly Systems

		Lab Experiments	
Learning Module 3: Group Technology, Cellular Manufacturing and Flexible Manufacturing Cells			
Week 10	18	**Group Technology and Cellular Manufacturing**	
		Part Families and Cellular Manufacturing	
		When to Use GT and Cellular Manufacturing	
		Composite Part Concept	
		Analysis of Cellular Manufacturing	
		Lab Experiments	
Week 11,12	19	**Flexible Manufacturing Cells and Systems**	
		Fundamentals, Components and Applications of FMS/FMC	
		Analysis of FMS/FMC	
		Alternative Approaches to FMS/FMC	
		Lab Experiments	
Week 13,14		***Project Presentations***	
Week 15		***Final Exam***	