

Course	SE 55000 - Manufacturing System Design for Sustainability
Type of Course	Elective
Catalog Description	<p>This course prepares manufacturing and information technology leaders to design and analyze manufacturing processes to achieve manufacturing system objectives that meet internal and external customer's quality, cost, and delivery requirements within a safe environment. The course project covers major aspects of manufacturing system design and Industry 4.0 in the context of meeting customer needs. Technology leaders and entrepreneurs learn how to work with others to develop the design of manufacturing systems that are sustainable (business, ecological, social, technological) for the long term. When to use lean and six-sigma techniques in the context of the manufacturing enterprise system design to meet customer needs will be assessed from a system design perspective, through analytical and computer simulation techniques, and through the use of physical modeling tools.</p>
Credits	3
Contact Hours	3
Prerequisite Courses	None
Corequisite Courses	None
Prerequisites by Topics	Prerequisites: Senior or graduate class standing in an engineering or science degree program, or consent of instructor.
Textbook	None
Course Objectives	<p>Students who successfully complete this course will be able to:</p> <ol style="list-style-type: none">1. Design manufacturing processes and equipment to support manufacturing system requirements.2. Explain why our tone affects the ability to make systems improvements; realize that the origin of at least 90 percent of all issues is due to the system design and implementation and not the people.3. Apply a language to identify, describe, and relate system design thinking to manufacturing system structure and standard work. Lean is the result of the enterprise and manufacturing system design, and not the activity that we go and do.

4. Align performance measures to reinforce manufacturing system design requirements with the knowledge that total cost results from the system design and is not the sum of the unit cost of individual operations / manufacturing processes.
5. Design a manufacturing system and the included manufacturing processes to be able to produce to takt time using single-piece flow cells that produce part families. Takt time (time/unit) is the average pace of customer demand.
6. Create a controllable, robust system design, i.e., a manufacturing system that meets customer quality and delivery expectations in spite of disruptions / abnormal conditions.
7. Minimize the 5 Delays that increase manufacturing lead time by using manufacturing system design.
8. Apply methods to evaluate and develop Manufacturing Systems, including the Manufacturing System Design Decomposition (MSDD), and the Six Sigma (DMAIC) Process.
9. Develop a program for continuous improvement and system sustainability that uses Plan Do Check Act (PDCA), and Standard Work to takt time as the basis for improvement.
10. Develop an organizational structure to sustain and improve the manufacturing system.

Lecture Topics

1. If Lean is So Easy, why is it So Hard? Why is Lean so difficult to sustain?
2. The Tone of Leadership and Manufacturing System Design
3. System Design Thinking and Language for System Design
4. Structure and Actions in a System Design
5. System Design for Controllability and Robustness
6. The Long-Term Evolution of Manufacturing System Design
7. Manufacturing System Design for Sustainability

Computer Usage	None
Laboratory Experience	None
Design Experience	Low
Coordinator	David S. Cochran, Ph.D.
Date	11/16/2022