MFGE-640: Manufacturing System Design & Simulation
Course Objectives

Catalog Description:
Design of manufacturing systems using contemporary methods and philosophies. Modeling and comparison of system designs using simulation software. Interpretation of experimental simulation results to evaluate system design alternatives. Preparation of technical reports summarizing projects.

Course Objectives:
Successful completion of this course will enable the students to:
1. Explain various methods of evaluating manufacturing system designs based on key performance measures.
2. Utilize lean enterprise principles and other methods in the design of manufacturing systems.
3. Design manufacturing simulation models using a common simulation software.
4. Evaluate and interpret alternative system designs.
5. Prepare technical reports documenting systems design alternatives and recommending implementations for new or improved manufacturing systems.
6. Apply simulation modeling to an industrial problem, utilizing experimental design techniques.
7. Summarize industrial application, problem solving experience, results, and recommendations in both oral and written formats.
Course Evaluation (unchanged):

This course will be evaluated through course assignments, examinations, simulation model completion, and technical project reports. Graduate students will also present their projects to the undergraduate course students in fulfillment of their graduate objectives.

Old Course Outline:

1. Review of the effects of demand patterns and product mixes on manufacturing system design.
2. Group technology
   a. Review of Group Technology methods
   b. Manufacturing system design laboratory
3. Introduction to evaluation methods of alternative manufacturing system designs
   a. Queueing theory
   b. Mean value analysis
   c. Monte Carlo simulation
4. Review of probability and statistics
   a. Discrete probability distributions
   b. Continuous probability distributions
   c. Data fitting
   d. Software supporting statistics and data fitting
5. Introduction to the system modeling process
   a. Identification of objectives
   b. Experimental design
   c. Data collection
   d. Model building
   e. Model verification and validation
   f. Analysis of simulation model results
6. System modeling formats
   a. Narratives
   b. Flowcharts
   c. Simulation model code
7. Review of limitations and advantages of available simulation software packages
8. Evaluation of manufacturing system designs using simulation software
   a. Rework problem laboratory
   b. System constraints problem laboratory
   c. Lot size problem laboratory
   d. Resources problem laboratory
   e. Facility layout problem laboratory
   f. Scheduling problem laboratory
   g. Manufacturing system design problems
New Course Outline:

1. Introduction to the system modeling process
   a. Identification of objectives
   b. Experimental design
   c. Data collection
   d. Model building
   e. Model verification and validation
   f. Analysis and interpretation of simulation model results

2. Review of probability and statistics
   a. Discrete probability distributions
   b. Continuous probability distributions
   c. Data fitting
   d. Software supporting statistics and data fitting

3. Kinds of simulation
   a. Static vs. dynamic
   b. Continuous-change vs. discrete-change
   c. Deterministic vs. stochastic

4. Introduction to evaluation methods of alternative systems
   a. Queueing theory
   b. Mean value analysis
   c. Monte Carlo simulation

5. Systems description methods
   a. Narratives
   b. Flowcharts
   c. Simulation modeling
   d. Value stream mapping

6. Lean enterprise methods and philosophy modeling in systems designs
   a. Group technology methods
   b. Cellular manufacturing
   c. Just-in-time production
   d. Pull manufacturing (one piece flow)
   e. WIP elimination
   f. Value stream mapping

7. Simulation software modeling and evaluation of manufacturing system designs (including but not limited to: rework impacts, systems constraints, lot sizing, facility layout and design, order scheduling, just-in-time production, cellular/group technology, one-piece flow, pull manufacturing)

8. Preparation and presentation of model development, interpretation, experimentation, analysis, and recommendations in properly formatted technical report.
Current Resource Requirements:

Rental Resources:

Note: Book contains CD of Arena Software. When loaded without a license, an evaluation copy can be used with limited model development abilities onto student laptops and/or PCs.