ME 222 – Production Engineering

Catalog Description:
Introduction to the modern techniques of production systems including Inventory Control, Economic Analysis, Demand Forecasting, Just-in-Time Manufacturing, Material Requirements Planning and Production Scheduling, Queuing Theory, Push and Pull Production Systems, Total Quality Manufacturing, and Shop Floor Control.

Prerequisite:
Consent of the Instructor

Texts:

Course Objectives:
Production Engineering provides an overview of tools and techniques utilized in the design, operation, and optimization of modern production systems. Students are introduced to concepts needed for the effective and efficient planning, management and control of production systems. They will develop an intuitive understanding of the behavior of product flows in manufacturing systems, diagnose the performance of simple production systems with quantitative methods, have a good understanding of quality, statistical quality control and queuing theory, be acquainted with the structure of a general pull planning framework and be introduced to the domain of shop floor control.

Topics:
- Introduction to Operations
- Competitiveness & Strategy
- Supply Chain Management
- Forecasting
- Systems Dynamics
- Inventory Management
- Processes, Technology, & Capacity
- Aggregate Planning
- Scheduling
- Waiting Line Analysis
- Facilities / Facility Location Models
- Just-In-Time and Lean Production
- Products & Services - QFD

Design Project:
Not applicable.

Computer Usage:
Students will be using Microsoft Excel on many of the assigned homework problems to be handed in. The text publisher’s online resources (electronic text, online homework problems and sample problems with integrated help, self tests, and a simulation program) will also be utilized during the course.

Evaluation Methods:
Homework, Group Project (w/in-class exercise, report and presentation), Mid Term Exam, Final Exam
Contribution to Professional Component:
As an elective course, Production Engineering introduces concepts needed for the effective and efficient management and control of production systems. Meanwhile, the course builds upon the basic engineering tools developed in the core courses.

Relationship of Course Objectives to Program Educational Objectives:
The objectives of Production Engineering directly contribute to the fulfillment of Program Educational Objective #1: “Our alumni practice mechanical engineering by designing systems and solving problems using mathematical, scientific and engineering principles and tools,” and Program Educational Objective #2: “Our alumni approach engineering decisions with an informed consideration of global and societal contexts and consequences,” and Program Educational Objective #3: “Our alumni continue to expand their professional and personal skills and engage in life-long learning.”

Relationship of Course Objectives to ABET 3a-k:

a) an ability to apply knowledge of mathematics, science, and engineering:
Production Engineering requires the use of computer-based tools, particularly spreadsheet based linear programming, to assist in making production engineering decisions. In-class examples and independent homework develop student proficiency.

b) an ability to design and conduct experiments, as well as analyze and interpret data:
An in-class experimental exercise simulates the operation of a supply chain with students making the relevant production engineering (operations management) decisions and experiencing the effects on performance of the system. The implications of the decisions, in the context of the system’s structure, are reviewed and analyzed.

Students will optimize these models and utilize them to evaluate the relative value of proposed alternative procedures (for, etc.)

c) an ability to design a system, component, or process to meet desired needs:
Students will evaluate, through homework assignments, in-class discussions, and group project work, how well common industry standard processes help make real-world production engineering decisions, by assessing the effects these decisions have on operational objectives.

d) an ability to function on multi-disciplinary teams: Working in teams, the students design and test modifications to the baseline experimental exercise in an attempt to better address scheduling and inventory control performance in response to (customer) demand. Although the make-up of the teams may not have been multidisciplinary, successful accomplishment of the objectives required understanding of the interactions between multiple organizational functions.

e) an ability to identify, formulate, and solve engineering problems:
Exercises in evaluating the efficacy of common industry standard processes give students the ability to identify and solve problems in engineering.

f) an understanding of professional and ethical responsibility: not applicable.

g) an ability to communicate effectively:
Students’ ability to effectively communicate will be enhanced principally through in-class discussions and the their participation in formal presentations.

h) the broad education necessary to understand the impact of engineering solutions in a global and societal context:
The topics discussed stress inventory control, material requirements planning, JIT manufacturing and total quality management, basic factory dynamics, queuing theory, push and pull production systems, production planning, forecasting, kanban systems and shop floor control, which greatly impact the economic cost to society of quality merchandise.

i) a recognition of the need for, and an ability to engage in life-long learning:
Students are exposed to the rapid changes in production engineering, driven by continuously evolving concepts and knowledge, which emphasizes the need for continuous learning.

j) a knowledge of contemporary issues: not applicable

k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice:
Students gain the ability to use techniques, skills and modern engineering tools (such as linear programming) in the solution of manufacturing operations problems.

Relationship of Course Objectives to Course Outcomes:

1) Students will understand how production engineering decisions fit into the overall strategic framework of a company (particularly with regards to TQM, company positioning, and inventory and shop floor controls).

2) Students will have a working knowledge of the application of inventory control, material requirements planning, JIT manufacturing and total quality management, basic factory dynamics, queuing theory, push and pull production systems, production planning, demand forecasting, kanban systems and shop floor control.

3) Students will be able to utilize linear programming techniques (via MS Excel).

4) Students will be familiar with a variety of operations management tools available across various industries and be able to select the appropriate tool.

5) Students will be able to predict future demand from historical data by the utilization of basic forecasting techniques.

6) Students will understand the advantages and limitations of JIT Manufacturing and how adopting a lean approach affects a company’s demands on its production systems.

7) Students will be able to use computer based means to model and evaluate the effects of alternative operational procedures on a company’s performance.

Approval Block

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