MFE 654
Production Systems Design and Control
Y.B. Moon

Instructor Information
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Course Description
• Introduction to design, planning, execution and control of production systems using mathematical, computational and other modern techniques. Forecasting, inventory control, lean manufacturing, materials requirement planning, enterprise resource planning, and supply chain planning.
Students’ Information

- Name
  - Email address
  - Phone number
- Background
  - Academic
  - Work experience
  - Current responsibility

Course web address

www.ecs.syr.edu/mfe654

Textbooks


Prerequisite

- ECS 526 or equivalent

Course Emphasis

- Inventory models
- ERP

Course Structure

- Lectures
  - Each lecture will be given under the assumption that students will have read an assigned chapter before the class.
- Assignments
  - The assignments are designed to help students understand the covered subjects better. Discussions with other students are encouraged, but the assignments must be done individually.
- Lab exercises
  - A number of lab exercises using SAP R/3 will be conducted.
- Examinations
  - There will be two tests during the semester. The tests will evaluate students' understanding of the subjects covered in lectures and assignments. The tests will be closed-book exams, however, students are allowed to bring an information sheet.
Assessment Policy

- Assignments: 30%
- Mid-term examination: 25%
- Final examination: 25%
- Class participation: 10%
- Lab exercises: 10%

Course schedule (tentative)

1. Jan 17: Introduction
2. Jan 24: EOQs (Ch 5)
3. Jan 31: Introduction to ERP
4. Feb 7: Lot Sizing (Ch 6)
5. Feb 14: MRP (Ch 15)
6. Feb 21: ERP exercises
7. Feb 28: Stochastic Models (Ch 7)
8. Mar 7: Mid-term Examination
9. Mar 14: No Class (Spring Break)
10. Mar 21: Class A (Ch 8)
11. Mar 28: Class C (Ch 9)
12. Apr 4: Style/Perishable Items (Ch 10)
13. Apr 11: Coordinated Replenishments (Ch 11)
14. Apr 18: Supply Chain Management (Ch 12)
15. Apr 25: Forecasting (Ch 4)
16. May 10 (Th): Final Examination

Manufacturing Doesn’t Matter: arguments

- agrarian -> industrial -> service
- agriculture employment of the workforce:
  - 29 % (1929) -> 3 % (1985)
- manufacturing employment of the workforce:
  - 50 % (1950) -> 20 % (1985)
- toward a global economy
Manufacturing Matters: facts

- agricultural production has not declined (since 1929)
  - due to dramatic increase in productivity
  - two or three times as many workers are employed in jobs
tightly linked to agriculture
- agriculture was automated, while manufacturing
  moved abroad (at least partially)
  - most of the tightly linked jobs will shift overseas as well
  - about 21 million people employed directly in manufacturing
- Offshoring: Agriculture never shifted offshore in a manner analogous to manufacturing jobs shifting overseas.

Manufacturing Matters: leads to innovation

- the payoff for R&D comes only when the production is manufactured and sold
- VCR example
- Sun, Apple, 3M
  - “70% of its sales in 5 years will come from products that don’t exist today”
- Income disparity, 2000

Linkages Between Manufacturing and Services

- Manufacturing directly employs 21 million jobs
  - About 20% of all jobs.
- Manufacturing actually supports 40-60 million “tightly linked” jobs, including many service jobs.
- Offshoring manufacturing would lose many of these tightly linked service jobs
- Automating to improve productivity might not.
Services tightly linked

- Design and engineering services for product and process
- Payroll
- Inventory and accounting services
- Financing and insuring
- Repair and maintenance of plant and machinery
- Training and recruiting
- Testing services and labs
- Industrial waste disposal
- Support services for design and service production equipment
- Transportation firms

Impact of Manufacturing

- Production Side:
  - Manufacturing represents roughly 50% of GNP in terms of production.
    - Directly 24% of GNP
    - Report of the President on the Trade Agreements Program estimates 25% of GNP originates in services used as inputs by goods producing industries.
- Demand Side:
  - Manufacturing goods represent 47% of GNP (services are 33%) in terms of final demand.

Manufacturing Matters

- A “service economy” may be a comforting thought in the abstract, but in reality may be an oxymoron.
Scope

- Manufacturing
  - includes product design, process development, plant design, capacity management, product distribution, plant scheduling, quality control, workforce organization, equipment maintenance, strategic planning, supply chain management, inter-plant coordination, ... 
- manufacturing
  - direct production functions like cutting, shaping, grinding, and assembly...

The American Identity

- the myth of the frontier
- the myth of the self-made man
- the scientific method
  - scientific management
  - the reductionist method

The reductionist method

- analyze system by breaking them down into their component parts
- improvement of overall efficiency by
  - decomposing work into specific tasks
  - improving the efficiency of each task
- could be a good paradigm for analyzing complex systems
- but not the only valid perspective
The holistic or systems perspective

- individual components are viewed
  - in terms of their interactions with other subsystems
  - in the light of the overall goals of the system
- example: setup time
  - EOQ (economic order quantity)
  - SMED (single minute exchange of die)

EOQ

- also referred to as the economic lot size

\[ Y(Q) = \frac{hQ}{2D} + \frac{A}{Q} + c_Q^* = \frac{2AD}{h} \]

- \( A \): setup cost

SMED’s Conceptual Stages

- Stage 1: Separate internal and external setup
- Stage 2: Convert internal setup to external setup
- Stage 3: Streamline all aspects of setup operations
Manufacturing Planning and Control System

Resource Planning → Production Planning → Resource Allocation

Demand Analysis → Master Production Schedule

Detailed Capacity Planning → Detailed Material Planning

Material and Capacity Plans

Shop-floor Systems → Vendor Systems

Assignment by Jan 24

- Open an ECS computer account (130 Link Hall)
- Read Chapter 5
- Start reading “Why ERP?”
  - a report (1-page) will be due on Jan 31
  - What three things were good about the implementation of SAP R/3 at the North Carolina plant?
  - What three things were bad about the implementation of SAP R/3 at the North Carolina plant?
  - What are the first three things that Billy should do next?