ISYE 3232 STOCHASTIC MANUFACTURING AND SERVICE SYSTEMS

Credit: 3-0-3

Required

Prepared Prof. Ayhan, Fall 2008

Prerequisite(s): ISYE 2027 or MATH 3215-C or MATH 3225-C

Catalog Description:
Models for describing stochastic movements of parts and materials in manufacturing facilities, supply chains, and inventory systems. Analysis of congestion, delays, machine usage, line balancing, equipment availability, inventory ordering policies, and system crashes. Basics of Markov Chains and queueing theory.

Texts:
Goldratt, E, *The Goal: Process On Ongoing Improvement*, North River, 3rd Ed., 2003.

Feldman, R.M., and Valdez-Flores, C., *Applied Probability and Stochastic Processes* (custom printing), Thomson, 2004.

Littlefield Technology Access Case, Responsive L, 2007.

Objective
The objective of this course is to develop stochastic modeling techniques and managerial insights for design and control or manufacturing and service systems.

Topical Outline
1. Discrete and Continuous-Time Markov Chains. Markov Property, Transition Probabilities, State Classifications, Exponential Distribution.
2. Queueing Processes: Basic Definitions, Single Server Systems, Multiple Server Systems, Jackson Networks, Approximations
3. Production Models: Serial Production Systems, Selecting Distributions, Bottleneck/Throughput Analysis, Line Balancing.
4. Stochastic Models: Basic Inventory Models Including Newsvendor and Single Period.

Outcomes

At the end of this course, students will be able to:

- Model a system when randomness is significant
- Describe how variability affects a system's behavior and performance
- Apply Markov Chains
- Apply basic inventory models
- Define key concepts in production flow such as bottlenecks, line balancing, and Little's Law
- Use open and closed Jackson networks
- Maintain throughput in a closed Jackson network and compute corresponding WIP levels

Course outcome \ Program Outcomes	**a. apply math**	**b. data**	**c. IE method**	**d. team**	**e. problem solving**	**f. prof/ and ethical responsibilities**	**g. communication**	**h. global, eco, envi and soc context**	**i. continue to improve**	**j. current issues**	**k. participate in an organization**
Model a system when randomness is significant	H		M		M				L		
Describe how variability affects a system's behavior and performance	H		M		M						
Apply Markov Chains	H				L						
Apply basic inventory models	M		M								
Define key concepts in production flow such as bottlenecks, line balancing, and Little's Law			H		M						L
Use open and closed Jackson networks	H		H								
Maintain throughput in a closed Jackson network and compute corresponding WIP levels				M	M				L		

Evaluation of the important outcomes

1. The students should be able to apply Markov Chains to various kinds of problems.
2. The students should be able to define key concepts in production flow such as bottlenecks, line balancing, and Little's Law
3. The students should be able to use open and closed Jackson networks
4. The students should be able to maintain throughput in a closed Jackson network and compute corresponding WIP levels