

ISYE 3232 STOCHASTIC MANUFACTURING AND SERVICE SYSTEMS

Required for BSIE

Credit: 3-0-3

Prepared Prof. Steimle, Ayhan, Maguluri, Tovey

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

Catalog Description:

Methods for describing stochastic movements of material in manufacturing facilities, supply chain, and equipment maintenance networks. Includes analysis of congestion, delays, and inventory ordering policies.

Texts:

1. Goldratt, E, *The Goal: Process On Ongoing Improvement*, North River, 3rd Ed., 2003.
2. *Littlefield Technology Access Case*, Responsive L, 2007.

References

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

Course Description

Manufacturing & service systems typically have random components to their behavior such as the demand for products and services. We will learn quantitative methods which are useful in analyzing, designing, and operating stochastic systems particularly manufacturing and service systems. Much of our attention will be focused on understanding, managing, and reducing variability for inventory, production and service systems.

Topical Outline

The topical outline is shown in the table below. The table has 2 columns. The first column lists the topics to be covered. The second column lists the number of weeks these topics will be covered.

Topics	Weeks
Introduction, News Vendor problem	3

Topics	Weeks
Queuing Theory overview, Kingman's Approximation, Little's Law, Bottleneck	1.5
Discrete and Continuous-Time Markov Chains: Markov Property, Transition Probabilities, State Classifications	4
Poisson Process, Poisson Random Variable and random variables for Poisson Processes, Time-inhomogeneous Poisson Process, Thinning Poisson Process, Merging Poisson Process, Examples of continuous Markov Chain	2
Continuous Markov Chains, Generation Matrix, M/M/1/b queue, M/M/∞, M/M/k Queues.	2.5
Summary	1
	14

Course Learning Outcomes

The goal of this course is to provide an overview of methods and modeling techniques used to design, analyze, and manage a manufacturing or service system with uncertainty.

1. Describe the role of uncertainty in manufacturing and service systems
2. Analyze and manage uncertainty in systems dealing with perishable items
3. Quantify the waiting time, length of the queue, and utilization in queueing systems
4. Analyze and manage uncertainty in systems using predictions of potential future outcomes
5. Effectively work as a member of a team to analyze the role of uncertainty in a system and communicate the findings

The Mapping from the Course Outcomes to ABET Student Learning Outcomes

The table below shows the relationship between course outcomes and ABET student learning outcomes. The table has 8 columns. The first column lists the course learning outcomes listed above. The next 7 columns list the abbreviated ABET Student Learning Outcomes. The entry of H in a row with specific course learning outcome and column with specific ABET Student Learning Outcomes indicate the importance of attain this outcome is high and will be assessed.

Course outcome \ Program Outcomes	1. identify, formulate solve engg prob by engg, sci & Math	2. produce solutions consider public health, safety, welfare, global, cultural, social, environ & economic	3 communicate with a range of audience	4 recognize ethical & professional responsibilities, make informed judgement consider resolutions in global, economic, environ and societal context.	5. effective on a team provide leadership, collaborative and inclusive envirm, plan tasks & meet objectives	6. develop and conduct experiment, analyze and interpret data & use engineering judgement to draw conclusions.	7. acquire and apply new knowledge using appropriate learning strategies
1. Describe the role of uncertainty in mfg and service systems							
2. Analyze and manage uncertainty of perishable items	H						
3. Quantify waiting time, length of queue and utilization	H						
4. Analyze and manage uncertainty using predictions of potential future outcomes	H						
5. Effectively work as a member of a team to analyze the role of uncertainty in a system and communicate the findings.					H		

Evaluation of the important outcomes

The outcomes 2, 3 and 4 will be assessed via direct complex verbal questions in an engineering context on final exam, and outcome 5 will be assessed based on a team project.