

COURSE TITLE BLACKBOARD SITE	EME 6663 Applied Stochastic Processes, Industrial Engineering Capstone Fall 2012 – http://my.ltu.edu and select CRN 2188
INSTRUCTOR	Professor: Dr. Steve Sobolak ssobolak@ltu.edu 1) Wimba classroom appointments scheduled per student request 2) Campus appointments scheduled per student request 3) Wimba (on-line) Appointments scheduled per student request
SCHEDULE	August 31, 2012 – December 22, 2012 Refer to http://www.ltu.edu/registrars_office/calendar_final_exam.index.asp for the last date to withdraw and other important registration related information.
LEVEL/ HOURS PREREQUISITE	This is a graduate level course worth 3 semester credit hours. Writing at a graduate level using APA style for in-text citations and listing of references is a requirement.
REQUIRED TEXT (See Blackboard for additional resources)	Operations Research Applications and Algorithms, Wayne L. Winston, 4 th Edition, 2004, Cengage Learning, ISBN-13: 9780534380588. Available for online purchase through LTU Bookstore.
ADDITIONAL RESOURCES	LTU Online student resources: http://www.ltu.edu/ltuonline/
TECHNICAL AND ACADEMIC SUPPORT	Technical support for using Blackboard is provided by the Helpdesk, 248.204.2330 or helpdesk@ltu.edu . Send the Help Desk a form detailing any issues by clicking here http://tinyurl.com/3yqrvne . Visit www.ltu.edu/ehelp for additional helpful technical information. University Status Line: To check status of Blackboard/Banner 248.204.2222. Library http://www.ltu.edu/library/index1.asp Academic Achievement Center http://www.ltu.edu/aac/

COURSE SCHEDULE FOR COLLEGE OF MANAGEMENT SEMESTER COURSES

Module 0: The pre-course module (Module 0) has been developed to insure your success. This module includes a review of the syllabus and its key points – for example, assignments, grading and time management. Also, in this module, we will utilize the discussion board. Discussion Board participation is a critical skill to master as you proceed with this course. In Module 0, review the online participation rubric carefully. Finally, in this module you will meet your classmates and define your personal expectations for our work together.

Plan on investing adequate time reviewing Module 0 prior to beginning Module 1.

Modules: Each module starts on Monday and ends on Sunday, unless otherwise specified.

All topics will be covered during the week they are listed in the matrix below. **It is advisable to complete the readings the week before they are due in order to be prepared to participate online.** All assignments are due on the Ending Sunday of the Module week. Please send me an e-mail if you are planning on submitting any assignments late.

Week	Modules	Topics / Readings	Assignments Due (Chapter, section, problem)	Points		
				HW	DB	Total
Week 1	Module 0 Orientation	Online Learning Orientation Overview of Syllabus Course Orientation and Introduction	Participate in Module 0. instructions for the introduction will also be published in the announcements section. DUE Sunday			
Week 2	Module 1 Decision Making Under Uncertainty	Chapter 13 Read 13.1 - 13.5 Skim section 13.7 up to spreadsheet section.	Homework: 13.2.7, 13.2.8, 13.2.6 Discussion Board	125	50	175
Week 3	Module 2 Game theory	Chapter 14 Read 14.1 - 14.5 Skip LINGO materials	Homework: (14.1.2, 14.2.6, 14.3.3)-60 pts. (14.4.3 14.4.7)- 50 pts. (14.4.3 & 14.4.7 are to be completed on group discussion board by class – problems to be solved by group collaboration). Discussion Board	125	50	175
Week 4	Module 3 Deterministic EOQ Inventory Model	Chapter 15 Read Entire chapter	Homework: 15.1.3, 15.1.12, 15.2.3, 15.4.2 Discussion Board	125	50	175
Week 5	Module 4 Probabilistic Inventory Model	Chapter 16 Read Entire chapter Skip LINGO materials	Homework: 16.6.2, 7.2, 8.2 Discussion Board	125	50	175
Week 6	Module 5 Markov Chains	Chapter 17 Read entire chapter	Homework: 17.2.1, 5.1, 5.13, - review problem 1 Discussion Board	125	50	175
Week 7	Midterm- 1,250 points					
Week 7	Module 6 Deterministic Dynamic Programming	Chapter 18	Homework: 18.2.2, 6.6 Discussion Board	125	50	175
Week 8	Module 7 Probabilistic-Dynamic Programming	Chapter 19	"Dedicated time for Report" (800 points)			
Weeks 9 & 10	Module 8 Queuing Theory Part I	Chapter 20 Read entire chapter, skip sec. 9 & 10	Homework: 20.2.3, 2.6, 3.2, 4.11 Discussion Board	125	50	175
	Module 9 Queuing Theory Part II	Chapter 20 Read entire chapter up to and inc. 10, skip sec. 9.	Homework: 20.5.6, 6.5, 8.1, 10.5 Discussion Board	125	50	175
Weeks 11 & 12	Module 9 Simulation Part I	Chapter 21 Simulation Read entire chapter	Homework: Discussion Board	125	50	175
	Module 10 Simulation Part II	Chapter 21 Simulation Read entire chapter	Homework: Discussion Board	125	50	175
Week 13	Term End	Wimba questions				
Week 14	Final- 1,250 Points					
Week 15	Module 16 Course Wrap-up		Exam DUE Sunday - Course Reflection - Due xxxxxxx			
				1250	500	1750

Points TTI = 5,000 → HW = 1,250, DB = 500, Test(s) = 2,250, report = 1,000

STUDENT EVALUATION

We will be doing a number of on-line discussions. Prior to your first on-line assignment, review the Online Participation Evaluation Rubric (contained within this syllabus) for a detailed explanation of how your online assignments will be evaluated in this class.

The course has several assignments totaling 5,000 points. Points are deducted for late assignments.

Class Points	Letter Grade
96 and above	A
90 – 95	A-
87 – 89	B+
83 – 86	B
80 – 82	B-
77 – 79	C+
73 – 76	C
70 – 72	C-
61 – 69 (Undergrad Only)	D
60 and below	E

Assignments	Percentage	Points Total
Discussion Forums (DB)	10.0	500
Homework	25.0	1,250
Research Report	20.0	1,000
Mid – Term Exam	22.5	1,125
Final Exam	25.0	1,125
Points	100	5000

Note: Grades lower than “B” fall below the LTU graduate standard

PREREQUISITE SKILLS

Writing at a graduate level using APA style for in-text citations and listing of references is a requirement.

EDUCATIONAL GOALS

This course provides applied knowledge of stochastic models to solve uncertain (stochastic) service operations and production systems. The concepts of random variables, stochastic processes and random fields will be introduced. Methodologies covered include discrete and continuous time Markov processes, Poisson processes, Brownian motion, stochastic approximation including Kalman filtering and random search techniques. Applications relate to design and analysis of problems, inventory control, queuing systems, scheduling systems, services operations, game theory and decision analysis. Applications of stochastic processes will be demonstrated through student seminars.

REPORT - STUDENT LEARNING OBJECTIVES / OUTCOMES

A report is required from all students and should be related on real life applications where the course materials could be used for the project. However, it should be more in-depth than class materials. The main purpose of the project is to use advanced optimization techniques for real-life applications. The project must be based on *Applied Stochastic Modeling* in any applications but not limited to facility or process, applications of manufacturing systems, logistics, supply chain, hospital operations, chemical/pharmaceutical plants and business operations. The written documentation of the study should be clearly and concisely written report form; should have: abstract, introduction, literature review, problem description, stochastic modeling, critical findings, conclusion, references and appendix (in any).

Further details will be provided during the second week of the course. In lieu of chapter 19, week 8 (module 7) has been set aside for time to assemble the report.

STUDENT LEARNING OBJECTIVES / OUTCOMES

- Understand and solve decision making in uncertain situations using Van Neumann-Morgenstern utility models, decision models and decision trees.
- Have the ability to solve zero and constant sum games using a reward matrix.
- Analyze and determine optimal inventory decisions with deterministic demand and develop economic order quantity (EOQ) model.
- Ability to solve inventory models where demand is uncertain / random for the EOQ model (R,S) model.
- Assess how a random variable changes / evolves over time – stochastic processes.
- Use dynamic programming to obtain optimized solutions by working backwards from the end of the problem toward the beginning, thus breaking up a large, unwieldy problem into a series of smaller, more tractable problem.
- Develop mathematical models for waiting lines / queues.
- Comprehend simulation and the techniques used to solve real-world system as it evolves over time use / development of a simulation model and have the ability to express as mathematical or logical relations between the objects of interest in the system.

COURSE ORGANIZATION

Blackboard at my.ltu.edu contains the link to this course. Within your course shell is the syllabus, all assignments, supplemental reading materials, lecture notes, links to Web resources, articles and discussion forums. You will submit all assignments via Blackboard and are expected to participate regularly in discussion topics. You will want to check the site frequently for announcements reminding you of new resources and upcoming assignments.

Please take time to familiarize yourself with the organization of the Blackboard site. This course is organized on Blackboard as follows:

Announcements: This will welcome you to the course as well as alert you to items requiring your attention. All announcements are also communicated via email.

Faculty Information: Information on Steve Sobolak

Syllabus: The syllabus

Modules: For each module, there is theory and practice folder.

Discussion Board: This area is used to for “case discussions.” There is a discussion per chapter where we look at the use of the chapter’s topic in industry. Please comment on the case discussions by Wednesday of each week and reply to one of your fellow students by the end of each.

Home Work - “Home Work WIMBA Group Discussion Room”: This area is dedicated for open discuss to the class to discuss homework problems with your classmates and gain insight on solving the problems if needed, not for obtaining complete solutions to all the homework problems themselves. Homework must be submitted individually, unless otherwise specified. (The room can be found under the “Wimba Classroom” folder)

Assignments: Items to be completed will be located here. Grading rubrics and other documents vital to your success as a student are also included here.

Class Policies and Expectations

I plan to offer you a valuable learning experience and expect us to work together to achieve this goal. Here are some general expectations regarding this course:

Each student has a LTU email account. If you wish to use a different email address for this course, please **change your email address in Blackboard under “Blackboard Tools”, then “Personal Information.”** Note that this is on myltu.edu and NOT in the course shell.

Readings, discussion forum participation and written assignments must be completed according to the class schedule. If business travel will take you away from regular participation, please let me know about these dates in advance.

It is essential that all students contribute to the course objectives through sharing their professional experiences and knowledge of organizational practices. Class participation in the form of asking and answering questions, offering examples and discussing course concepts will enhance our collective learning experience.

All assignments must be submitted on schedule, via Blackboard and using Microsoft Office compatible software.

Assignments must be completed to an adequate standard to obtain a passing grade. Requirements for each assignment are detailed in this syllabus.

At midterm and at the end of the course, you will be invited to participate in a University evaluation of this course. Your feedback is important to the University, to LTU Online and to me as an instructor and I encourage you to participate in the evaluation process.

Professor Sobolak Wishes to emphasize the following:

Assistance: Students are encouraged to contact the instructor if they are having difficulties in the course.

Conduct: Students are expected to conduct themselves in a professional manner at all times and to be courteous to their classmates. The use of objectionable language is strictly prohibited. Additional information covering the Student Code of Conduct can be accessed at http://www.ltu.edu/student_affairs/student_conduct.asp

Academic Integrity: Academic honesty is an important character trait for all students. One’s honesty is important to employers, family and others with whom students come in contact. Students benefit themselves in the long run when they work honestly and earn their grades. Students must submit their own original work done specifically for this course. This means that it is wrong to submit work done by someone else, or to utilize work that the student has done in a prior course.

All papers, examination and other assignments must be original or explicit acknowledgment must be given for the use of other person’s ideas or language. Students must cite their sources using the

publication manual of the American Psychological Association (APA) for information that is not their original thought. Examples of plagiarism are:

- Failure to use quotation marks: All work which is quoted directly from a source should be enclosed in quotation marks and followed by a proper reference giving the exact page or pages from which the quote is taken. Failure to use the quotation marks, even if a footnote is provided, is plagiarism.
- Failure to document ideas: When a student uses one or more ideas from and/or paraphrases a source, he or she must give the source from which the ideas or paraphrasing were taken.
- Falsifying or inventing sources or page references is plagiarism.
- Cite (that is, reference) all sources. This means that one's papers, **including discussion board**, must indicate from where quoted or paraphrased material has come. In grading written work it is important for instructors to know which ideas are the student's own thoughts and which are either copied or paraphrased from another source.

For more information visit http://www.ltu.edu/currentstudents/honor_code_offenses.asp

Any cheating on exams or papers will result in a score of zero and, potentially, a referral to the Dean. The Dean of the College responsible for the courses in which they occur reviews questions of academic dishonesty. **The usual penalty for academic dishonesty is failure in the course on the first offense and expulsion from the University on the second offense.** For more information visit Academic Honor Code at http://www.ltu.edu/currentstudents/honor_code.asp

Late Assignments: Late work will be reduced in value and may not be accepted. Any student in danger of missing a deadline should contact Professor Emmons in advance to discuss their situation.

INSTRUCTOR BACKGROUND

Currently I hold the position of powertrain model integration manager at Chrysler on the Viper and other SRT vehicle programs. Professionally, I have 8 years program management experience, 12 years in Manufacturing and 10 in Product Development. My expertise is in metals & plastics primarily focusing on powertrain & chassis systems. I have implemented several manufacturing and assembly systems / processes for Delphi and American Axle & Manufacturing. I also perform consulting with several large automotive / nonautomotive companies on a part-time basis.

Academically I hold a Masters in Automotive Engineering, BS in Mechanical Engineering and a Doctorate of Engineering. I am also a certified PMP and a Six Sigma Black Belt.

Instructor Performance: It is important for you as students to know what to expect from me as your instructor:

- I will maintain the Blackboard web site with current materials and will resolve any content-related problems promptly as they are reported to me.
- I will send out a weekly e-mail update to all class members to guide upcoming work and remind you of assignment due dates.
- I will be available to you via e-mail and phone and will promptly reply to your messages.
- I will be available to you for face-to-face appointments as requested.
- I will return all assignments to you promptly and will include individualized comments and suggestions with each assignment.
- I will hold our personal written or verbal communications in confidence. I will not post any of your assignments for viewing by the class without requesting your approval in advance.
- I will treat all members of the class fairly and will do my best to accommodate individual learning styles and special needs.

- If any of these points need clarification, or when special circumstances arise that require my assistance, please contact me so that we can discuss the matter personally.

PRACTICAL GUIDELINES FOR CLASS LOAD EXPECTATIONS

A three-credit course generally requires at least nine hours per week of time commitment. Here are some practical guidelines to help schedule your time commitments for this online course:

- A 14-week semester (the summer semester is compressed into 10 weeks) would require at least 120 hours of time commitment to successfully complete all readings, activities, assignments and texts as described in this syllabus.
- You should reserve at least 6 hours per week to read the required textbook chapters and resources as well as participate in online discussions.
- You should organize your remaining time to roughly correspond with the point value of each major assignment.

These guidelines may not reflect the actual amount of outside time that you – as a unique individual with your own learning style – will need to complete the course requirements. The number of hours each week will vary based on assignment due dates, so please plan ahead to insure that you schedule your academic, work and personal time effectively.

Time management suggestions for EME 6663: Complete readings on Sunday, before the week begins. For example, read Module 1 materials during Module 0! On weeks with assigned discussions, write initial posting for Discussion (DB – discussion board) early in the week in order to proofread, revise and post on Thursday. On Friday and Saturday, respond to your classmates.

ASSIGNMENT DETAILS

Please review these details carefully. Assignments are submitted using the Blackboard “Assignments” or “SafeAssign” functions or posted to the Blackboard Discussion Forum for student comments. Directions for submission are provided with each assignment.

On-Line Participation Evaluation Rubric: Students are required to participate in assigned on-line discussions. In addition to posting their own response to the question(s) posed, the student is required to respond to a minimum of **two posts** from their peers for EACH discussion. Each discussion is evaluated on its own merit.

In an online environment, we are “seen” via our written word. Insure that what you write is what you want others to hear. Use good netiquette and always err on the side of courtesy.

To be counted as participation, postings need to be thoughtful; that is, they demonstrate reflection on the assignment and relationship to the assigned readings and videos, personal experiences, relevant issues in the news, information obtained from other sources, or ideas expressed in the postings of other class members. Students are required to reference the assigned readings and videos to support their arguments and to encourage further discussion. When a source is referenced, **it should also be cited within the posting.**

The following rubric will be employed when grading on-line participation (**late responses are reduced one full point**):

Posting Quality Rating	Examples
5 (A)	<ul style="list-style-type: none"> • Original thoughts not already contained in the threaded discussion that demonstrate a high level of reflection and relate the material with the assigned readings and videos

	<ul style="list-style-type: none"> • A minimum of two responses to classmates citing agreement or disagreement including rationale • Cited examples/ideas from other resources (assigned readings and videos, articles, or web sites) using proper APA style are used in original post as well as both responses • No errors in spelling or grammar
4.75 (A-)	<ul style="list-style-type: none"> • Same as 5 (A) except cited examples/ideas from other resources (assigned readings and videos, articles, or web sites) needs minor APA style improvements
4.5 (B+)	<ul style="list-style-type: none"> • Same as 5 (A) except cited examples/ideas from other resources (assigned readings and videos, articles, or web sites) using proper APA style are NOT used in original post as well as both responses
4.25 (B)	<ul style="list-style-type: none"> • Same as 5 (A) except cited examples/ideas from other resources (assigned readings and videos, articles, or web sites) are NOT used in original post as well as both responses AND needs minor APA style improvements
4 (B-)	<ul style="list-style-type: none"> • Content is acceptable yet does not demonstrate a high level of reflection and/or lacks an adequate relationship with the assigned readings and videos
3.5 (C-)	<ul style="list-style-type: none"> • APA style requires significant improvement OR errors in spelling or grammar distract reader from the message
3 (D)	<ul style="list-style-type: none"> • Lacks the minimum number of two responses to classmates
2	<ul style="list-style-type: none"> • No cited examples
No Credit	I agree/disagree with no reason/explanation/etc.

TIPS FOR DOING WELL ON YOUR ON-LINE ASSIGNMENTS:

Do the work on time and follow the directions completely. For example, if a 5-7 paragraph summary is required, write 5-7 paragraphs. If the directions ask you to review specific materials, review those materials and make it obvious from your postings that you have read and understood the material.

Write the assignment off-line. Supplement your comments by referring to the text or other materials you have read. Share your related personal experiences. Use good writing skills and use spell check. Reread your work to insure that the content is well written. After you are satisfied with your work, post your response. Only after you post, do you read the contributions of others. That way, you are first clear in your own opinion and then can learn from others.

Comment on the ideas of your classmates. Not just “I agree” or “I disagree” but when you have something of value to add to their ideas. Ask questions of your classmates if something they wrote has attracted your curiosity. If you are asked questions, you need to respond.

Remaining assignments are submitted using the Blackboard “Assignments” or “SafeAssign” function.

Pre-Course Survey: Directions and a submission link are posted under Assignments.

Alignment Assessment: Directions and a submission link are posted under Assignments.

Leadership Assessment & Plan: Directions and a submission link are posted under Assignments.

Strategic Management Plan (Capstone Project): This assignment will be partially developed from discussion board assignments. A template and a submission link are posted under Assignments.

Capstone Exam: Directions and a submission link will be posted under Assignments.

Post Course Reflection: Directions and a submission link are posted under Assignments.

SYLLABUS ADDENDA

Please see the LTU Online web site <http://www.ltu.edu/ltuonline/index.asp> for comprehensive information about Lawrence Tech's academic services, library services, student services and academic integrity standards. **The content of this web site is explicitly included as syllabus requirements.**

Expanding the Student menu provides links to a wealth of helpful information including academic integrity standards and grading rubrics used to evaluate written assignments, discussion forum participation and group assignments.

When signing on to <https://my.ltu.edu/>, the Blackboard welcome page (myltu) contains links to the Academic Achievement Center and Library Services. Please note that the SafeAssign anti-plagiarism product will be used for written assignments submitted for this course.

Recommended References:

- An Introduction to Stochastic Modeling, Karlin, Samuel and Taylor, Howard M., Third Edition, 1998, Academic Press.
- Modeling and Analysis of Stochastic Systems, Vidyadhar G. Kulkarni, Second Edition, 2009, Chapman & Hall/CRC.
- Introduction to Modeling and Analysis of Stochastic Systems, Vidyadhar G. Kulkarni, 2010, Springer.
- Lectures on Stochastic Programming: Modeling and Theory, Alexander Shapiro, Darinka Dentcheva and Andrzej Ruszczyński, 2009.
- Engineering Uncertainty and Risk Analysis, Second Edition: A Balanced Approach to Probability, Statistics, Stochastic Models and Stochastic Differential Equations, Sergio E. Serrano, 2011.
- Markov Processes for Stochastic Modeling, Oliver C. Ibe, 2008.

Recommended Articles:

- Modeling a flexible manufacturing cell using stochastic Petri nets with fuzzy parameters, Tiysuz, Fatih; Kahraman, Cengiz, **Expert Systems with Applications**, vol. 37, no. 5, pp. 3910-3920, 2010.
- Application of generalized stochastic petri nets (GSPN) in modeling and evaluating a resource sharing flexible manufacturing system, Goli, Aryanejad Mir Bahador; Zileh, Zahra Honarmand Shah, **Proceedings of World Academy of Science, Engineering and Technology**, vol. 57, pp. 356-365, 2009.
- Designing integrated cellular manufacturing systems with scheduling considering stochastic processing time, Ghezavati, Vahidreza; Saidi-Mehrabadi, Mohammad, **International Journal of Advanced Manufacturing Technology**, vol. 48, no. 5-8, pp. 701-717, 2010.
- A stochastic model for production loading in a global apparel manufacturing company under uncertainty, Wu, Yue, **Production Planning and Control**, v 22, n 3, p 269-281, 2011.
- A stochastic dynamic programming based model for uncertain production planning of re-manufacturing system, Li, Congbo; Liu, Fei; Cao, Huajun; Wang, Qiulian, **International Journal of Production Research**, vol. 47, no. 13, pp. 3657-3668, 2009.
- Multi-objective stochastic supply chain modeling to evaluate tradeoffs between profit and quality, Franca, Rodrigo B.; Jones, Erick C; Richards, Casey N.; Carlson, Jonathan P., **International Journal of Production Economics**, vol. 127, no. 2, p.p 292-299, 2010.
- Coordinating a supply chain with effort and price dependent stochastic demand, He, Yong; Zhao, Xuan; Zhao, Lindu; He, Ju, **Applied Mathematical Modelling**, vol. 33, no. 6, pp. 2777-2790, 2009.
- A measure of the bullwhip effect in supply chains with stochastic lead time, Due, Truong Ton Hien; Luong, Huynh Trung; Kim, Yeong-Dae, **International Journal of Advanced Manufacturing Technology**, vol. 38, no. 11-12, pp. 1201-1212, 2008.
- A genetic algorithm and queuing theory based methodology for facilities layout problem, Raman, Dhamodharan; Nagalingam, Sev V.; Gurd, Bruce W., **International Journal of Production Research**, vol. 47, no. 20, pp. 5611-5635, 2009.

- Queuing network model of uniformly distributed arrivals in a distributed supply chain using subcontracting; Bhaskar, Vidhyacharan; Lalletment, Patrick, *Decision Support Systems*, vol. 51, no. 1, pp. 65-76, 2011.
- An airline scheduling model and solution algorithms under stochastic demands; Yan, Shangyao; Tang, Ching-Hui; Fu, Tseng-Chih, *European Journal of Operational Research*, vol. 190, no. 1, pp. 22-39, 2008.

Journals:

- Stochastics: An International Journal of Probability and Stochastic Processes
- International Journal of Stochastic Analysis
- Journal of Applied Mathematics and Stochastic Analysis
- Stochastic Analysis and Applications
- Stochastic Systems journal
- Stochastic Processes and their Applications
- Statistical Inference for Stochastic Processes
- Applied Mathematical Modeling