

## **EIN 4451 Lean Production**

- 1. Catalog Description:** History of manufacturing. Principles, design, and analysis of lean manufacturing systems. Small lot production, setup-time reduction, continuous improvement. Principles and control of push and pull manufacturing systems. Production planning and operations scheduling (3 credits).
- 2. Pre-requisites:** ESI 4312 Operations Research I, STA 4321 Mathematical Statistics I.
- 3. Course Objectives:** In this course, we will cover the following topics: history of manufacturing systems, design of different manufacturing systems, design and control of lean manufacturing systems, and planning and control problems encountered in manufacturing systems. At the end of the semester the students should be have a basic understanding of the design, operation and control of lean manufacturing systems and be able to use quantitative methods to model, analyze, and optimize such systems.
- 4. Contribution of course to meeting the professional component:** This course contributes to the professional component criterion 4 part (b) by applying optimization models and methods to design manufacturing systems to convert raw materials and semi-finished assemblies into finished goods using manufacturing resources optimally to meet the stated customer needs in a cost effective way.
- 5. Relationship of course to program outcomes:** This course accomplishes the following program outcomes: (1) apply knowledge of mathematics, science and engineering; (2) design a system, component, or process to meet desired needs; (3) identify, formulate and solve engineering problems; (4) understand contemporary engineering issues; and (5) use the techniques, skills, and modern engineering tools necessary for engineering practice.
- 6. Instructor:** Dr. Suleyman Tufekci
  - a. Office location:** Weil Hall 468
  - b. Telephone:** 392-1464 ext 2022
  - c. E-mail address:** tufekci@ise.ufl.edu
  - d. Office hours:** TBA
- 7. Teaching Assistant:** TBA
  - a. Office Location:** TBA
  - b. Telephone:** TBA
  - c. E-mail address:** TBA
  - d. Office hours:** TBA
- 8. Meeting Times.** MWF 7
- 9. Class/laboratory schedule:** The class will meet three times a week and the meetings will be 50 minutes each.
- 10. Meeting Location:** FLG 0260

**11. Material and Supply Fees:** N/A

**12. Textbooks Recommended:** Askin, R.G. and J.B. Goldberg. 2002. *Design and Analysis of Lean Production Systems*. John Wiley & Sons Inc. ISBN 0-471-11593-2

**13. Recommended Reading:** Lecture notes can be supplemented using following textbooks:

- Askin, R.G. and C.R. Stanridge. 1993. *Modeling and Analysis of Manufacturing Systems*. John Wiley & Sons Inc. ISBN 0-471-51418-7
- Nicholas, J. 1998. *Competitive Manufacturing Management*. Irwin/McGraw Hill. ISBN 0-256-21727-0
- Nahmias, S. 2004. *Production and Operations Analysis*. 5<sup>th</sup> Edition. McGraw Hill/Irwin. ISBN 0-07-241741-2

**14. Course Outline:** The instructor reserves the right to change the topics covered as she sees fit.

**TOPICS**

Session	Topic	Reading & Lecture Notes	HW Due
	Course introduction World Class Manufacturing	1	
	World Class Manufacturing Order Winners and Qualifiers	2	
	Agile Manufacturing	3	
	Lean Manufacturing 5S Principles	4	
	Lean Manufacturing Standard Work	8	
	Lean Manufacturing Continuous Improvement & TPM	6	
	Lean manufacturing SMED	5	
	Lean manufacturing Total Cost of Quality	26, 27	
	Lean Manufacturing - Pull Production (Kanban, CONWIP)	7, 10	
	Lean manufacturing - Pull Production (JIT)	7, 10	
	Lean Manufacturing - Pull Production	12, 13, 14	
	<b>Midterm Exam I</b>		
	Lean manufacturing - Cellular Manufacturing	23	
	Lean manufacturing - Value Stream Mapping	25	
	Factory Physics Laws and Bottleneck Scheduling	9, 11	
	Factory Physics Laws and Bottleneck Scheduling	9, 11	

	Lot streaming, Heijunka	12, 13, 14	
	Lot streaming, Heijunka	12, 13, 14	
	Aggregate Production Planning Linear Programming & Mixed Integer Linear Programming Models	24	
	Operations Management - Materials Requirement Planning BOM, Explosion calculus	21, 22	
	Materials Requirement Planning	21, 22	
	<b>Midterm Exam II</b>		
	Materials requirement planning Lot sizing	21, 22	
	Operations scheduling Single machine scheduling & Flow shop scheduling	15	
	Operations scheduling Job shop scheduling	16	
	Project scheduling, Assembly line balancing	17, 18, 19, 20	
	General Review for the Final		
	<b>Third Exam (last day of classes)</b>		

### 15. Class Policies:

- a. Students will be assigned several homework assignments each with 3-5 questions (some of which may require simple spreadsheet implementations). All homework assignments will be collected *at or prior to the beginning of the class period* on the assigned date. *No* late homework assignments will be accepted and you will get a credit of zero in case you do not submit the homework on time. Homework assignments *submitted at the end of the class period* will be considered as *late submissions* and will receive a credit of 0. Homework policy is non-negotiable.
- b. The mid-term exams will be given during class periods, and the final exam during the scheduled time.
- c. There will be several **unannounced short quizzes** throughout the semester (5-8). Question will usually be related to the topic discussed in that day's lecture. Quizzes will affect your final grade by 5%. There will also be some **attendance checks randomly throughout the semester**. Attendance will affect 5% of your grade.
- d. You are responsible for all announcements made in class.
- e. You are responsible for printing the assignments from the class web page located at <https://elearning2.courses.ufl.edu>. Paper copies of assignments will not be distributed in class. The instructor will prepare lecture notes to

accompany class discussions, which will be made available to the students through the class web site also.

- f. Requests for re-grading of assignments and exams will be considered only with a written explanation and only within a one-week period from the time graded work is returned in class.
  - g. Grades will be posted on the web. Throughout the semester, you have to ensure that they are entered correctly. Corrections will be considered only within a one-week period after the grades have been posted on the web.
  - h. Please remember to turn off cell phones and pagers before you come to class. If your cell phone or pager rings during class, you will be asked to leave the classroom.
  - i. Please come to class in time. Late arrivals as well as walking out and in during the lectures disrupt the flow of the lecture.
  - j. **Final exam will be administered in the last day of our regular class time and in the same classroom.**
- 16. Grading:** Your final grade for the class will be calculated as follows: Homework Assignments %20, Midterm Exam I 20%, Midterm Exam II 20%, Quizzes 5%, Attendance 5%, and Third Exam 30%.
- 17. Grading Scale:** Final grade averages will be rounded off to the nearest one-tenth point, and assigned on the standard scale as follows: 92.0 and above A; 90.0 to 91.9 A-; 88.0 to 89.9 B+; 83.0 to 87.9 B; 80.0 to 82.9 B-; 78.0 to 79.9 C+; 73.0 to 77.9 C; 70.0 to 72.9 C-; 68.0 to 69.9 D+; 63.0 to 67.9 D; 60.0 to 62.9 D-; and Below 60.0 E.
- A C- will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit:  
<http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html>”
- 18. Make-up Exam Policy:** The exams are scheduled in advance, please plan accordingly. Make-up tests will be given for unanticipated absences ONLY (e.g., illness with a doctor's report, death in family, but NOT for job interviews).
- 19. Honesty Policy:** All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.
- 20. Accommodation for Students with Disabilities:** Students requesting classroom accommodation must first register with the Dean of Students Office. That office will

provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

- 21. UF Counseling Services:** Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
- University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
  - SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
  - Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
  - Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.
- 22. Software Use:** All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.