# University Of California, Berkeley
# Department of Mechanical Engineering

## ME 101: Introduction to Lean Manufacturing Systems (3 UNITS)

**Undergraduate Elective**

***Syllabus***

### CATALOG DESCRIPTION

Fundamentals of lean manufacturing systems including manufacturing fundamentals, unit operations and manufacturing line considerations for work in process (WIP), manufacturing lead time (MLT), economics, quality monitoring; high mix/low volume (HMLV) systems fundamentals including just in time (JIT), kanban, buffers and line balancing; class project/case studies for design and analysis of competitive manufacturing systems.

### COURSE PREREQUISITES

Completion of all lower division requirements for an engineering major, or consent of instructor.

### TEXTBOOK(S) AND/OR OTHER REQUIRED MATERIAL

**Required:**

- R. G. Askin and J. B. Goldberg, *Design and Analysis of Lean Production Systems*, 2002.
- One i-clicker transmitter.
- An NCEES-approved-model calculator (http://www.ncees.org/Exams/Exam-day_policies/Calculator_policy.php).

**Reference:**

- M. P. Groover, *Automation, Production Systems, and Computer Integrated Manufacturing*, 2008.
- R. M. Mahoney, *High Mix Low Volume Manufacturing*, 1997.
- J. O. McClain, L. J. Thomas and J. B. Mazzola, *Operations Management*, 1992.
- S. Kalpakjian and S. Schmid, *Manufacturing Engineering and Technology*, 2014.

  All texts will be on reserve in Kresge Engineering Library.

### COURSE OBJECTIVES

This course will enable students to analyze manufacturing lines in order to understand the production process and improve production efficiency. The course provides practical knowledge and skills that can be applied in industry, covering the complete manufacturing system from production planning to quality control. Students are given a chance to practice and implement what they learn during lectures by conducting projects with local or global manufacturing companies.

### DESIRED COURSE OUTCOMES

Students will understand the whole scope of manufacturing systems from production planning to quality control, which can be helpful to set up manufacturing lines for various products. Students will be capable of identifying sources of manufacturing problems by analyzing the production line and produce multi-level solutions to optimize manufacturing efficiency.

## TOPICS COVERED

- Overview, Intro to Manufacturing Systems
- Production Economics, Production System Basics
- Production Systems cont'd
- Manufacturing Strategy, Supply Chain
- Production Economics, Single Stage Inventory Control
- Market Characterization
- Material Requirements Planning
- Decentralized Pull Systems (*kanban*)
- Constant Work in Process
- Statistical Process Control
- Quality Engineering, Process Quality Improvement
- FMS, Cell Formation, Line Balancing
- Improving Product Flow, Lean Manufacturing
- Final Project Presentations

## CLASS/LABORATORY SCHEDULE

Three hours of lecture per week, 1 hour of discussion per week.

## CONTRIBUTION OF THE COURSE TO MEETING THE PROFESSIONAL COMPONENT

This course contributes primarily to the students' knowledge of manufacturing systems, identifying and defining problems, and problem solving techniques. This course also encourages students in developing entrepreneurial skills. Various practical issues including economic analysis, the global manufacturing environment, concurrent manufacturing issues, and some exposure to social and cultural issues of labor are covered to insure students are well prepared for competitive international manufacturing.

## RELATIONSHIP OF THE COURSE TO ABET PROGRAM OUTCOMES

An ability to apply knowledge of mathematics, science, and engineering; an ability to design a system, component, or process to meet desired needs; an ability to identify, formulate, and solve engineering problems; a knowledge of contemporary issues; an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

(a) an ability to apply knowledge of mathematics, science, and engineering
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(e) an ability to identify, formulate, and solve engineering problems
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES**

- Weekly homework assignments (15%)
- Midterm and final examinations (20% and 30%)
- Class participation and discussion (5%)
- Term project and peer evaluation (30%)

**PERSON(S) WHO PREPARED THIS DESCRIPTION**

Professor Sara McMains, 10/1/14

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**ABBREVIATED TRANSCRIPT TITLE (19 SPACES MAXIMUM):** INTRO LEAN MFG SYS
**TIE CODE:** LECS
**GRADING:** Letter
**SEMESTER OFFERED:** Fall and Spring
**COURSES THAT WILL RESTRICT CREDIT:** None
**INSTRUCTORS:** McMains, Dornfeld
**DURATION OF COURSE:** 14 Weeks
**EST. TOTAL NUMBER OF REQUIRED HRS OF STUDENT WORK PER WEEK:** 9
**IS COURSE REPEATABLE FOR CREDIT?** No
**CROSSLIST:** None