

IEOR 130
Methods for Improving Manufacturing Performance
Fall, 2015
TuTh 1230-2 145 Moffitt Hall

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Introduction

Course 130 is an introduction to Industrial Engineering methods for improving manufacturing performance. This course describes the grand challenges of improving manufacturing performance along the dimensions of equipment productivity, product quality, customer service and time to market. Techniques of industrial engineering and operations research that are effective for improvements along these dimensions are introduced.

Throughout the course, semiconductor manufacturing is used as the running subject for concrete and specific illustration of the challenges and the techniques. The emphasis of the course is on recognizing and characterizing the challenges faced by managements of high-technology manufacturing and on mastering the principles and perspectives needed to adapt and apply techniques of industrial engineering and operations research.

There will be one midterm examination and one final examination. There will be approximately 10 homework assignments. Homework does not count towards the course grade. However, examination questions will be similar to homework questions, so that mastery of homework questions is a strong predictor of good examination performance. The course grade is computed according to a maximization function involving weighted averages of letter grades assigned to midterm and final examinations, as follows:

$$G = \text{Max} \{ F, 0.33M + 0.67F \}$$

where G denotes the course grade, F denotes the final exam grade and M denotes the midterm exam grade. Note that an A grade on the final exam means an A grade in the course. Moreover, a good midterm examination grade can help to offset a weak final exam grade.

Required text: None. Course notes and lecture presentation slides may be down-loaded from the course web site, <http://ieor.berkeley.edu/~ieor130>. Required readings (course notes) include the following:

Statistical Process Control, R. C. Leachman, 2003.

Yield Modeling, R. C. Leachman, 2003.

Maintenance Models, R. C. Leachman, 2003.

Closed-Loop Measurement of Equipment Efficiency and Equipment Capacity, R. C. Leachman, 2002.

Industrial Engineering Design of Production Planning Systems for the Semiconductor Industry, R.C. Leachman, 2013.

Factory Floor Scheduling, R. C. Leachman, 2014.

SLIM: Short Cycle Time and Low Inventory in Manufacturing at Samsung Electronics, R. C. Leachman, Jeenyong Kang and Vincent Lin, 2002.

The Engineering Management of Speed, R. C. Leachman, 2014.

The Competitive Semiconductor Manufacturing Survey: Summary Report on Findings from Benchmarking Eight-inch, sub-350nm Wafer Fabrication Lines, R. C. Leachman, 2002.

Lecture outline (copies of presentation slides used in course lectures will be made available on the course web site)

1. Introduction to semiconductor manufacturing (1.5 hours)
(The film “Silicon Run” will be shown during the first class meeting)
2. Introduction to the computer-integrated manufacturing environment and introduction to FMEA (1.5 hours)
3. Statistical process control (3 hours)
Please read the “Statistical Process Control” reading beforehand.
4. Yield analysis and defect density models (3 hours)
Please read the “Yield Modeling” reading beforehand.
5. Planning equipment maintenance (3 hours)
Please read the “Maintenance Models” reading beforehand.
6. Measurement of equipment efficiency and capacity (6 hours)
Please read the equipment efficiency paper beforehand.
7. Midterm examination and review of solutions (3 hours)
8. Production planning and on-time delivery management (3 hours)
Please read the “Production Planning” reading beforehand.
9. Cycle time management and the engineering of speed (9 hours)
Please read the “Engineering Management of Speed” reading beforehand.
10. Factory Floor Scheduling (6 hours)
Please read the “SLIM” paper and the “Factory Floor Scheduling” reading beforehand.
11. Benchmarking semiconductor manufacturing performance (3 hours)
Please read the “CSM Survey” reading beforehand.
12. Review for final examination (1.5 hours)