

# ORI 390Q.5 - Scheduling Theory and Applications

## Syllabus

### Professor

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### Office Hours

TTh, 2:00 – 2:45 p.m., (or, stop by, I'll meet with you if I am not busy, or send an e-mail)

### Class Meetings

Times: TTh, 12:30 p.m. – 2:00 p.m., Room: ETC 4.150

### Course Web Page

Canvas: [canvas.utexas.edu](http://canvas.utexas.edu)

### (Official) Course Description

*Subject Matter Description:* Theory of Scheduling, and its Applications in Manufacturing and Service Systems. *Topic Description:* Modeling, analysis and solution techniques for production and service scheduling problems, machine scheduling in deterministic and stochastic settings, exact and heuristic algorithms, industrial applications including semiconductor manufacturing and airlines operations.

*Meeting Information:* Three lecture hours a week for one semester.

*Degree Plan Information:* May be repeated for credit when the topics vary.

*Prerequisite:* Graduate standing, ORI 391Q (Topic 4) or equivalent, or the consent of the instructor.

### (Unofficial) Prerequisite

Working knowledge of at least one computer programming language (e.g., C++, Java, Python).

### Text

M. Pinedo, *Scheduling: Theory, Algorithms, and Systems*, 4th or 5th Edition, Springer, 2012-2016 (5th Edition is available as e-book).

### Other references

- M. Pinedo, *Planning and Scheduling in Manufacturing and Services*, 2nd Edition, Springer, 2009 (Available as an e-book).
- K.R. Baker and D. Trietsch, *Principles of Sequencing and Scheduling*, Wiley, 2009 (Available as an e-book).
- P. Brucker, *Scheduling Algorithms*, 5th Edition, Springer, 2007 (Available as an e-book).
- M. Pinedo, X. Chao, *Operations Scheduling*, McGraw Hill, 1998
- T.E. Morton and D.W. Pentico, *Heuristic Scheduling Systems*, Wiley, 1993.
- S. French, *Sequencing and Scheduling*, Wiley, 1982.

- K. Baker, *Introduction to Sequencing and Scheduling*, Wiley, 1974.

## Software

- Modeling languages:
  - AMPL ([www.ampl.com](http://www.ampl.com))
  - GAMS ([www.gams.com](http://www.gams.com))
  - Xpress-MOSEL ([www.fico.com/en/products/fico-xpress-optimization-suite](http://www.fico.com/en/products/fico-xpress-optimization-suite))
- Solvers and callable libraries:
  - CPLEX ([www-01.ibm.com/software/commerce/optimization/cplex-optimizer/](http://www-01.ibm.com/software/commerce/optimization/cplex-optimizer/))
  - XPRESS-MP ([www.fico.com/en/products/fico-xpress-optimization-suite](http://www.fico.com/en/products/fico-xpress-optimization-suite))
  - GUROBI ([www.gurobi.com](http://www.gurobi.com))
- Open source optimization software: COIN OR Project: [www.coin-or.org](http://www.coin-or.org)
- Microsoft Excel Solver: Frontline ([www.solver.com](http://www.solver.com)) and Open-source alternatives ([www.opensolver.org](http://www.opensolver.org))
- Software from Pinedo's book: LEKIN ([web-static.stern.nyu.edu/om/software/lekin/](http://web-static.stern.nyu.edu/om/software/lekin/))

## Web Sites

- Complexity Results for Scheduling Problems ([www.informatik.uni-osnabrueck.de/knust/class/](http://www.informatik.uni-osnabrueck.de/knust/class/))
- Beasley's OR Library including scheduling problem data sets ([people.brunel.ac.uk/mastjjb/jeb/info.html](http://people.brunel.ac.uk/mastjjb/jeb/info.html))

## Journals

- INFORMS Journals: Operations Research, Management Science, Manufacturing and Service Operations Management ([pubsonline.informs.org](http://pubsonline.informs.org))
- Journal of Scheduling ([www.springerlink.com/link.asp?id=111647](http://www.springerlink.com/link.asp?id=111647))
- IISE Transactions ([www.tandfonline.com/toc/uiie21/current](http://www.tandfonline.com/toc/uiie21/current))
- Production and Operations Management Journal ([onlinelibrary.wiley.com/journal/10.1111/\(ISSN\)1937-5956](http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1937-5956))

## (Tentative) Outline

- Introduction: Scheduling in an enterprise, Example scheduling problems (Chapter 1).
- Deterministic Models: Preliminaries (Chapter 2).
- Deterministic Single Machine Models (Chapter 3).
- Advanced Deterministic Single Machine Models (Chapter 4).
- Deterministic Parallel Machine Models (Chapter 5).
- Deterministic Flow Shops (Chapter 6).

- Deterministic Job Shops (Chapter 7).
- General Purpose Procedures for Scheduling in Practice (Chapter 14)
- Advanced General Purpose Procedures for Scheduling (Chapter 15)
- Modeling and Solving Scheduling Problems in Practice (Chapter 16)
- Stochastic Models: Preliminaries (Chapter 9).
- Stochastic Single Machine Models (Chapters 10 and 11)
- Stochastic Parallel Machine Models (Chapter 12).

## **Grading**

You will have two exams, several homework assignments, and a project. The details of the project will be announced later. Grading will be based on the following weights:

- Homework: 15%
- Project: 35%
- Exams: 25%, 25%

I expect that each assignment (homework, project, and exam) be neat and professional. You will not be allowed to make-up the exams unless there is documented emergency. Homework assignment that is one class late will be penalized with a grade level reduction (4 instead of 5, 3 instead of 4, etc.); it will not be accepted after that date.

## **Academic Dishonesty**

Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and dismissal from the University. Since dishonesty harms the individual, fellow students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced. Cheating will not be tolerated, and incidents of dishonesty will be reported. For more information, and for what constitutes “cheating,” see: [deanofstudents.utexas.edu/conduct/academicintegrity.php](http://deanofstudents.utexas.edu/conduct/academicintegrity.php).

## **Classroom Interaction and Expectations**

I expect that each of you will pay attention to class, ask questions, and participate in lecture, discussion, and other activities in class. Any action that disturbs this environment, including cell phone use or use of computers besides authorized class activity, is not allowed during class.

## **Students with Disabilities**

The University of Texas at Austin provides, upon request, appropriate academic adjustments for qualified students with disabilities. Students with disabilities may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 512-471-6259, [diversity.utexas.edu/disability/](http://diversity.utexas.edu/disability/).

## **Course Evaluation**

Near the end of the semester, you will have an opportunity to anonymously evaluate the course and instructor using the standard Cockrell School of Engineering evaluation form.

## **Dropping the Course**

An engineering student must have the Dean’s approval to add or drop a course after the 12th class day of the semester. A student seeking to drop a class after the 12th class day should visit the Cockrell School of Engineering Student Services (Engineering Student Services Building, 471-4321).