ME 290R Topics in Manufacturing
Advanced Manufacturing Systems, AMS , Credit Units: 3
Fall 2012, Tu Th 11:00- 12:30pm, Etcheverry 3105

Instructor: **Omar Romero-Hernandez**

oromero@berkeley.edu

GSI: **Katie McKinstry**

mckinstry@berkeley.edu

Omar Romero-Hernandez is a Chemical Engineer with graduate studies in Economic Policy and Government and a PhD in Process Economics and Environmental Impact from Imperial College, England.

In 2001, he was appointed as Professor at ITAM, Energy Biosciences Institute Researcher in 2010 and Visiting Professor/Lecturer at the University of California, Berkeley, Haas School of Business.   He has worked for a diverse range of public and private organizations such as Procter & Gamble, PEMEX (Oil & Gas), Accenture, and the Ministry for the Environment and Natural Resources, Center for Economic and Social Studies.

Currently, he is a National Researcher, and author of various books including: Introduction to Engineering, Renewable Energy Technologies and Policies, and Industry and the Environment and several international publications on project management, business modeling, green operations and sustainable development.

He has led several internationally awarded projects in the field of sustainable business strategies, renewable energy and business processes – sponsors include the United Nations, Ministry of the Environment, Industry consortiums, S&P 500 companies, the Stock Exchange and NGOs. In 2010 he was appointed project leader of Mexico's Business Summit task force on Economic Growth and Low Carbon Emissions, which delivers recommendations to the President.

Prof. Romero-Hernandez was the recipient of the 2010 Franz Edelman Award, the world's most prestigious award on Operations Research and Management Science.

Reaching Prof. Romero-Hernandez: Ask questions of general interest (such as homework clarifications) in lecture. Ask quick questions not of general interest before or after class. For more in-depth discussions see me before or after class to set up an alternate meeting time.

OFFICE HOURS : BY APPOINTMENT

Course description

This course is designed to prepare students for technical leadership in industry. The objective is to provide insight and understanding on the main concepts and practices involved in analyzing, managing manufacturing systems for high quality, cost effective and sustainable manufacturing.

The objective of this course is to ensure that our students:

 a. Gain solid foundations on the analysis of Advanced Manufacturing Systems Analysis (AMS), including concepts, frameworks and methodologies.
 b. Understand and apply sustainable engineering practices.
 c. Put into practice decision-making activities based on solid academic rigor, quantitative tools and simulation models oriented for AMS
 d. Align their AMS to a company's strategy to deliver business advantage.

The impact of this class on the Mechanical Engineering program includes delivering core production concepts and advanced skills that blend vision and advanced manufacturing elements. This course is highly recommended for students on the Sustainable Engineering track in Mechanical Engineering.

Class Format:

15 weeks of lecture. Homework assignments. Two group design/analysis projects. One midterm examination. One final examination.

The midterm exam is scheduled during lecture. The final exam day-time tbd. <u>Availability for lectures and all examinations is required for enrollment in the class</u>. Please see me for accommodation of religious beliefs, disabilities, and other special circumstances before the end of the second week of classes for any foreseeable issues.

The class format may include lectures, case discussions, mini-cases, guest speakers, computer simulations and software tools. The success of this course relies upon your effort to arrive prepared for class and be actively involved. Students will work individually and in teams to review real-life situations which were faced by managers and are then required to propose assertive solutions.
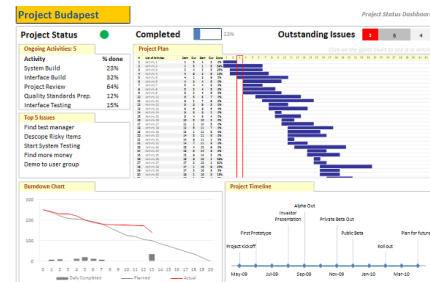
Textbooks and Course Materials:

Required material:

- Notes with class material and take-away points will be available on bSpace.
- Anupindi, R. et al., Managing Business Process Flows, 3ed, Prentice Hall, 2012
- Hopp, W., Spearman, M.L., Factory Physics-Foundations of Manufacturing Management, 2 Ed.

Reference materials:

- Romero-Hernandez, O. et al, Introduction to Engineering – An industry approach (in Spanish). Cengage Learning, 2006.
- M. P. Groover, Automation, Production Systems, and Computer Integrated Manufacturing, 2nd Ed., 2001 (or 1st edition, 1987).
- R. M. Mahoney, High Mix Low Volume Manufacturing, 1997.
- J. O. McClain, L. J. Thomas and J. B. Mazzola, Operations Management, 1992.
- Meredith, J.; Mantel, S.J., Project management – A Managerial Approach, 8e, Wiley and Sons.
- Those indicated in business cases and readings.

Homework: Homework will be assigned in lecture and will be due as indicated on each homework (usually one week later). Please do plan in advance since no questions concerning the homework problems, projects, exams, presentations etc. will be accepted 24 hrs prior to the corresponding deadline. Late homework will <u>not</u> be accepted. You must turn in all problems together (i.e. you can't turn in some on time and others late). Make sure that procedure and reasoning behind your answer is included.

Case studies: Case studies will be discussed in this class. Instructions for preparing for discussion of the cases will be reviewed during class. Business cases posted on study.net are copyrighted material and must be purchased.

On bSpace you will find questions for the cases. These are graded assignments, due by 09:00 on the day of the class meeting.

Groups, Simulations, and Class Projects: We will be working in groups for much of the semester. The groups will work primarily on two term projects with a manufacturing company. The objective is to learn about real manufacturing system problems from an engineering-management perspective, gain experience working in teams, and develop your communication and presentation skills to complement your analytic skills. Projects are about process analysis, design, and simulation. Details of both projects will be covered in class. The projects will require periodic progress reports.

- The first project will be submitted one class before the midterm exam. A presentation of your design/analysis as well as one formal report and presentation per group is also required.
- The second project will be submitted not later than the last lecture in November.

Projects are intended as opportunities for each student to contribute her/his special skills. Pleases note that it is expected that all students will participate in the group project with equal effort. Peer evaluations will be part of the final project grade.

Grading:
Homework   15%
Class Participation   10%
Projects   30%
Midterm Exam   15%
Final Exam   30%

Academic Honesty:
For homework assignments in this class, you are allowed (and encouraged!) to discuss the problems and techniques with other students in this course, but each student must write up their own solution and do their own Matlab/Excel/etc. work from scratch on the computer. I would recommend NOT mixing discussion with writing up of solutions or code, since this can result in work that looks like it was copied directly. If you discussed your work with other students, or checked your answers against theirs, you must describe the collaboration in your write-up and acknowledge the student(s) who assisted you or who you assisted (all students will receive full credit in this case). Turning in someone else's work as your own (or letting someone else turn in your work as their own), on the other hand, will be treated as cheating, and will result in a grade of zero on the assignment for all students involved in the incident. Cheating on a midterm or final exam may result in a failing grade for the entire course. In all cases of cheating, your actions will also be reported to the Center for Student Conduct and Community Standards (http://students.berkeley.edu/osl/sja.asp) for administrative review.

Dates and list of topics.

See next page. Please note:

November 22-23, 2010 – No Lecture/Discussion (academic and administrative holiday)

Classes end – November 30th, 2012. See UC Berkeley academic calendar for more details.

		Topics to be covered in the course:	Readings	Main Objective to cover
08/23		1. Introduction and course presentation	Hopp, Ch1	
08/28 08/30		2. The Industrial Enterprise. Manufacturing Management & Strategy Production systems, dynamics	Hopp, Ch1 Anupindi Ch1, 2	a, b, d
09/04 09/06		3. Process Flow Metrics Introduction, Flow measures, Little's law, Top-down analysis.	Hopp, Ch1 Anupindi Ch3	a, b, d
09/11 09/13		4. Flow Time Analysis Time based competition, theoretical flow times Critical paths, resource allocation, implications for cost.	Anupindi Ch4	a, c, d
09/18 09/20		5. Flow Rate Capacity Analysis Theoretical and net capacity analysis, the role of resources, inventory (cash, items, orders, etc)	Anupindi Ch5 Hopp 18	a, c, d
09/25 09/27		6. Inventory Analysis	Anupindi Ch6 Hopp, Ch 2.1, 2.2	a, c, d
10/02 10/04		7. Managing Flow Variability: Safety Inventory	Anupindi Ch7 Hopp 13 Hopp 17	a, c
		Midterm Exam Tuesday 10/09		
10/11 10/16 10/18		8. Managing Flow Variability: Safety Inventory & Capacity	Anupindi Ch8	a, c, d
10/23 10/25		9. Managing Flow Variability: Process Control and Capability Quality Manufacturing, sustainability and quality	Anupindi Ch9 Hopp 12	a, c
10/30 11/01		Process Capability Product Design (Guest Lecturer)	Anupindi Ch9 Hopp 12	a, c, d
11/06 11/08		10. Lean Manufacturing: Synchronization 11. Supply Chain Management Green supply chains	Anupindi Ch10 bSpace	a, b, d
Fr 11/09		Visit to TESLA facilities (starts at 3pm)		
11/13 11/15		12. Sustainable system design and manufacturing Ways to evaluate env. impact of products	Cases	a, b, d
11/20		13. Project management Project change management	Hopp 19 Meredith	a, b, c, d
11/27 11/29		14. Pulling all together Final presentations		
12/12		**Final Exam 08.00 to 11.00 hrs** http://registrar.berkeley.edu/Default.aspx?PageID=examf.html		