

Incorporation of Sustainability Concepts – Sheryl Ehrman  
Department of Chemical and Biomolecular Engineering, University of Maryland

**ENES 100: Introduction to Engineering Design**

I give the globalization lecture each semester to all ENES 100 students. I am using globalization of the automobile industry as my current case study and, starting this Fall, I will incorporate additional sustainability concepts into this lecture. Climate change and ecological footprint implications of adding 100's of millions of projected new cars to our planet's roads will be discussed. I will also encourage the ENES 100 team to include another special topic lecture focused specifically on sustainability and engineering design.

**ENCH 446: Process Economics and Design II**

This is the senior capstone Chemical and Biomolecular Engineering course. In the next course offering that I teach, likely Spring 2013, I will incorporate sustainability concepts in the economics, design and process safety portions of the course. One sustainability concept, "systems thinking", is naturally a part of this capstone course, in both economics and design. I will take advantage of opportunities to highlight how sustainability can be approached from a systems perspective. On process economics, true cost accounting, costing of products taking into account environmental and social impacts, will be included to the extent possible, given currently available information. On process design, open-ended plant design is a big component of the course and emphasis will here be placed on the manufacturing portion of life cycle analysis, with sustainability by design from the ground up. Students will be encouraged to incorporate sustainability considerations from the earliest brainstorming stage through downselecting from among different process options to final design details. Specific examples: students will be asked to consider renewable process feedstocks when possible, and to also look at downstream utilization of all process streams, incorporating true cost accounting to decide between design alternatives. On equipment selection and costing in design, the students will be asked to consider life cycle analysis of the equipment to look for secondary environmental and social impacts of their process design.

On process safety, the course was revamped in the Spring 2011 offering to include a more thorough discussion of risk management and process safety. A big focus is workplace safety but environmental stewardship is also important and this discussion can be expanded. In the next offering, I

will include sustainability into the discussion of process safety, through discussion of recent chemical industry accidents including the BP oil spill, and the resulting consequences on the ecosystems and economies affected by the spill in the Gulf of Mexico.

**HNOR 288M: Boomtowns**

In this honors seminar, to be offered for the first time in 2012, we will examine conditions necessary for boomtowns to take off, as well as what leads to their downfall. Case studies to be covered in the class will include Bodie, CA, Detroit, MI, Fairbanks, AK, and the Santa Clara Valley (aka Silicon Valley) CA. From the question of what technological and socioeconomic advances led to the formation of the boomtown, the next question is what can be done to ensure long-term sustainability of the resulting community.

Sustainability principles will be used to frame a discussion of economics, engineering, entrepreneurship and urban planning and policy around the question of sustainable communities.