Engineering Faculty Document No. 22-04

October 14, 2004

TO: The Faculty of the College of Engineering

FROM: The Faculty of the School of Civil Engineering

DATE: October 14, 2004

RE: New Undergraduate-Level Course

The faculty of the School of Civil Engineering has approved the following new undergraduate course. This action is now submitted to the faculty of the College of Engineering with a recommendation for approval.

CE 355 Engineering Environmental Sustainability

Sem. 2.Class 3, cr. 3

Prerequisite: sophomore standing

An introduction to the examination of global-scale resource utilization, food, energy and commodity production, population dynamics, and their ecosystem impacts.

Reason: Human existence requires the consumption of food and energy, and the utilization of space and raw materials. These activities have interrelated societal, political, economic, and environmental effects. It is apparent that humans have an impact on the environment at both local and global scales. Whether consumption by humans will exceed the earth's capacity to produce the resources needed to indefinitely sustain the people of industrialized nations at their current standard of living is not known. Furthermore, approximately 75% of the world's population live under conditions that citizens of industrialized nations would find unacceptable. Global industrialization coupled with human population growth over the next 50 years will result in unprecedented stress on ecosystems and the environment. This course examines current industrialized nation's practices within the context of developing an environmentally sustainable society.

Supporting Information

This course has been taught as CE 497E during Spring semester in 2002, 2003, and 2004. Enrollment has ranged between 35 – 50 students each semester.

Course Credits. Engineering science = 2credits, Engineering design = 1 credit.

Course objectives. Upon the completion of CE 355 students will be able to:

1. Recall examples of social, political, and economic issues that affected technical solutions.
2. Apply engineering principles to evaluate mass and energy flows in large-scale systems.
3. Identify problem constraints and assumptions and use them while forecasting future resource needs.
4. Propose conceptual designs for alternative energy, food, and commodity production systems.
5. Analyze environmental and ecosystem impacts of current and prospective energy, food, and commodity production systems.

Text. There is no assigned text. Selected references and articles are used and updated each year. Below are examples that were used in 2004.

Example reference: The World Resources Institute
http://www.wri.org/
WRI maintains a high quality database on Biodiversity, Ecosystems size, use, and productivity, Energy and Resource Use, Population and Human Development, and Economic Indicators.

Example articles: Graedel, T.E. and R.J. Klee, 2002. Getting serious about sustainability. *Environ. Sci. and Technol.*, 36:523-529.

Huesemann, M.H., 2003. The limits of technological solutions to sustainable development. *Clean Technol. Environ. Policy* 5:21–34.

Instructor. Loring Nies

Course Topics Overview

1. Sustainability Concepts and Definitions (1 week)
2. Current Environmental Quality (1.5 weeks)
3. Resource Utilization (1.5 weeks)
4. Mass & Energy Balances (1 week)
5. Population Growth (1 week)
6. Land Use (1 week)
7. Food Production (1.5 weeks)
8. Energy (2 weeks)
9. Materials (1.5 weeks)
10. Ecology & Ecosystems (1 week)
11. Achieving Sustainability (2 weeks)

Grading is based on eight individual homework assignments (45%), four group projects (40%) and a final examination (15%).