

SOCIETAL-IMPACT & ETHICS COURSE CONTENT DESCRIPTION & OUTCOMES TEMPLATE

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Course Number: CH ENGR 118/218

Course Name: **Environmental Multimedia Assessment**

COURSE DESCRIPTION

- The course deals with real world environmental assessment associated with manufacturing and use of chemicals (including nanomaterials), releases to the environment, environmental and health risks and proposed risk mitigation strategies. The course covers aspects of the beneficial use of chemicals and the need for responsible manufacture and use of chemicals that considers the need to protect human health and the environment. The course introduces the students to concepts of toxicity, environmental justice and economic impacts associated with manufactured chemicals and strives to develop an understanding and an engineering road map for sustainable and responsible manufacturing.

This course is an essential component in the education of engineering and science students who need to understand the connection between engineering, the environment and sustainability. Engineering students must understand the impact of industrial manufacturing (in all engineering disciplines) on the environment in order to understand not only the benefit of industrial processes and product use, but also to appreciate their potential risks and the approaches that should be taken to mitigate societal risks and develop sustainable industries.

- The course focuses on environmental impact assessment considering the release of pollutants to the environment (associated with industrial activities) and the transport of pollutant through and among the various environmental compartments (i.e., air, soil, groundwater, water bodies, sediment, vegetation, biota), as well as transformation of chemicals in the natural environment. The students are introduced to real world examples of environmental impact assessment. Material is drawn from actual research work done by UCLA Faculty and students in connection with various impact assessment studies. Examples include the Santa Susana Field Laboratory site, Valdez Oil Loading Terminal, DDT in Torrance, Stringfellow Acid Pits, VOCs and PAHs and Nitro-PAHs in Los Angeles and more. A critical component of the course is a term team project in which the students are assigned a particular geographical region in the U.S. and are guided through the process of conducting an environmental impact assessment for a specific chemical(s) and then propose suitable risk mitigation strategies. The project follows the accepted first-level impact assessment as conducted by professionals in the field.

In addition to weekly homework assignments, the students are engaged in a team term-project with weekly reporting and illustrative problems that are relevant to the project. Student teams provide weekly presentations (briefings) on their project progress (including identification of problem areas) in a discussion session with all other project teams. The course and project follow the main steps of identifying and quantifying environmental and health risks associated with anthropogenic pollution sources and proposing mitigation strategies.

- Course topics include: (1) Introduction on environmental pollution and its impact on our environment, environmental regulations, exposure and risk; (2) Pollution sources, (3) Pollution control, (4) Dispersion of pollutant in the environment, (5) Transport of Chemicals Across Environmental Phase Boundaries; (6) Multimedia Modeling of Pollutant Partitioning in the Environment; (7) Exposure analysis; (8) Risk analysis; (9) Group projects: student teams conduct detailed environmental impact analysis for a given region and pollutants of concern. The teams assess the extent of environmental and societal risks associated with the release and potential exposure to specific contaminants in a selected region and then propose risk mitigation strategies.

OUTCOMES

- The course specifically addresses the impact of anthropogenic pollution sources (e.g., industrial processes, product use and disposal, vehicular emissions) on the environment and human health. Student are confronted with the reality that it is the responsibility of science and engineering professionals to understand the impact of technology and to arrive at solutions that will lead to sustainable/green engineering and minimize/avoid adverse societal impacts. In this regard, students are confronted in this course with the reality that technological advances should not impose constraints on our society but provide for positive impact on society and the environment and promote environmental justice.

Outcome 1: Environmental pollution and its impact on our environment, Major environmental regulations, Exposure and risk.

Outcome 2 (optional): Pollution Control: Source reduction, Treatment technologies, Disposal of chemical wastes, Remediation - The penalty for past deficient environmental protection.

Outcome 3: Multimedia Risk Analysis: Health risks: Chronic versus acute health risks, Toxicology and risk assessment: laboratory versus epidemiological studies, Ecological risks (i.e., non-human health risks), Societal risks - discussion, Uncertainties in Risk Analysis.

Outcome 4: Group project: A multimedia exposure and risk assessment for a given chemical in a specific geographical region and development of risk mitigation strategies.