IE 461 – SAFETY ENGINEERING

Designation as a ‘Required’ or ‘Elective’ course
TYPE OF COURSE: Required for BSIE AND BSEM Majors

Course (catalog) description
COURSE DESCRIPTION: Safety Engineering. 3 or 4 hours. Accident losses; standards and codes; hazards control; accident investigations; mechanical injuries; heat, pressure, and electrical hazards; fires and explosions; toxic materials and radiation; vibration and noise; course project for graduate level. 3 undergraduate hours; 4 graduate hours.

Prerequisite(s)
PREREQUISITE(S): IE 342 Probability and Statistics for Engineers, 3 hours.

Textbook(s) and/or other required material

Course objectives
COURSE OBJECTIVES: This course is designed to introduce students to the principles of health and safety engineering, with an emphasis on the application to the occupational setting. Both quantitative and qualitative tools are discussed.

Topics covered
MAJOR TOPICS: Hours
1. Health Protection Fundamentals 6
2. Mechanical Hazards and Control 7.5
3. Electrical, Thermal, Pressure Hazards and Control 4.5
4. Fire, Explosion Hazards and Control 3
5. Ionizing/Non-ionizing Radiation, Noise Hazards and Control 7.5
6. Chemical, Biological Hazards and Control 6
7. Ventilation Control Systems and Personal Protective Equipment 4.5
8. Accident investigation, emergencies 3
9. Examination 3
Total 45

Class/laboratory schedule, i.e., number of sessions each week and duration of each session
CREDIT HOURS: 3 hours undergraduate, 4 hours graduate
TYPE OF INSTRUCTION:

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<th>Type of Instruction</th>
<th>Contact Hours/Week</th>
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<tr>
<td>Lecture/Discussion</td>
<td>3</td>
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<tr>
<td>Laboratory</td>
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Contribution of course to meeting the professional component
This course provides a fundamental understanding of health and safety engineering with an emphasis as it pertains to the occupational environment. Identification of hazards and their associated methods of control are discussed. The underlying theme throughout the course is that worker health protection may be afforded through prevention by the anticipation, recognition, evaluation, and control of workplace hazards.

Relationship of course to program outcomes

**Outcome A:** Ability to apply knowledge of mathematics, science, and engineering
Measureables: 1. Students are able to integrate health protection principles, the physical environment, and engineering solutions.
Instruction Notes: Students work in small groups to develop quantitative and qualitative control strategies for problems presented during lecture. For example, students develop control strategies for occupational thermal hazards in mining and construction settings.

**Outcome E:** Ability to identify, formulate, and solve engineering problems
Measureables: 1. Students are able to formulate quantitative problems for health protection evaluation and control.
2. Students are able to solve quantitative problems for health protection evaluation and control.
Instruction Notes: Students develop quantitative problems based on the content of the course and provide quantitative solutions to demonstrate their ability to apply standard equations used in practice. For example, students develop and solve noise problems that demonstrate the calculation of sound pressure levels.

**Outcome F:** Understanding of professional and ethical responsibility
Measureables: 1. Students are able to understand their responsibility as engineers for the protection of worker health in the industrial environment as well as the surrounding community.
2. Students are able to understand that society values these responsibilities, as demonstrated through professional work ethic, litigation, and legislation.
Instruction Notes: Students develop this sense of responsibility to the public through lecture, conversation, and reading on the social, political, and economic implications of health protection. For example, we discuss the economic versus health aspects of the current federal hearing protection standard.
Outcome H: Broad education necessary to understand the impact of engineering solutions in a global and societal context

Measureables: 1. Students are able to apply a framework with which they are able to approach health and safety concerns in any occupational environment.
   2. Students are able to integrate and apply their understanding of the physical environment, health and safety hazards, and engineering solutions to an array of concerns.

Instruction Notes: Students apply health and safety fundamentals along with engineering control solutions to problems that extend to global and societal concerns. For example, students examine health and safety issues related to the global industry of ship breaking that greatly impacts worker health in developing countries.

Outcome I: Recognition of the need for, and an ability to engage in life-long learning

Measureables: 1. Students are able to recognize the continuous development of health protection technology.
   2. Students are able to recognize the continuous development of standards and legislation that affect health protection.

Instruction Notes: Students learn through lecture and discussion the availability of new health and safety control technologies, along with new standards and laws that affect the practice of health protection. For example, students learn about the annual review of documentation for the continuous development of occupational exposure limits such as the ACGIH Threshold Limit Values.

Person(s) who prepared this description and date of preparation

Steven E. Lacey, Assistant Research Professor, February 27, 2007

Comments on outcomes

These outcomes are what students are expected to gain from this course.