LSC Use Only Proposal No:

LSC Action Date:

UWUCC Use Only Proposal No:

UWUCC Action Date:

Senate Action Date:

Undergraduate Curriculum Committee

Contact Person(s)

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X Course Revision X Course Number and/or Title Change X Catalog Des

Proposals

Catalog Description Ch Program Revision Program Title Change New

Proposed program name, if changing:

5. Appro

Course Revision: SAFE 345 Systems Safety

Part II – Description of the Curricular Change

1. Syllabus of Record.

The revised syllabus of record is attached in Appendix A.

2. A summary of the proposed revisions:

a. The course name, prerequisites, description, objectives and content were updated to better

safety management program represents a current and comprehensive approach to systems

safety management which can be used as a universal guideline for all systems safety programs. Thus, incorporating more of an emphasis on the process safety management guidelines will prepare student for the current trends in systems safety management

I. Catalog Description

SAFE 345 Process and Systems Safety

Prerequisites: MATH 105 and SAFE 111 or instructor permission

3 class hours
0 lab hours
3 credit hours
(3c-0l-3cr)

Focuses on the evaluation of system designs using detailed system analysis techniques. Topics covered include system definition, economics of systems safety, quantitative and qualitative systems safety methodology, and systems safety / process safety program administration. Skills gained include the ability to perform hardware and human factors systems analysis. Techniques include

B. Overview of Systems Safety Programs (Per Process Safety Guidelines) (4.5 hours)
   1. Employee Participation
   2. Systems / Process Safety Information
   3. Hazard Analysis
   4. Operating Procedures
   5. Employee Training
   6. Mechanical Integrity

[redacted]

   7. Contractors
   8. Pre-Start-up Safety Review
   9. Management of Change
   10. Incident Investigation Overview

C. Accident Causation Models (2.5 hours)
   1. Clarification of Terminology

[redacted]

   3. Contemporary Models

D. Overview of Systems Concepts (2.5 hours)
   1. Definitions
   2. Systems
   3. Subsystems
   4. Components
   5. System Safety Lifecycle

E. Hazard Identification Methods for Systems Safety (3.5 hours)
   1. The Process of Hazard Identification
   2. What if
   3. Cause Consequence
   4. Functional Block Analysis
   5. Checklists
   6. Analytical Trees

F. Examination #1 (1 hour)

G. System Safety Risk Assessment (3.5 hours)
   1. Definition of Risk Types
   2. Quantifying Risk
   3. Developing Risk Assessment Codes
   4. Risk Assessment Charts
   5. Criticality Analysis

[redacted]

I. Overview of Systems Analysis Techniques and Assumptions (4.5 hours)

1. Human Factors
2. Hardware Factors
3. Quantitative Techniques
4. Qualitative Techniques
5. Preliminary Hazard Lists & Analysis
6. System and Subsystem Hazard Analysis

J. Human Factors Theory (3 hours)

1. Human Factors Theory Overview
2. Human Error and Human Error Types
3. Management Systems which influence Human Error

V. Example Grading Scale

[redacted]

A = 90-100%
B = 80-89%
C = 70-79%
D = 60-69%
F < 60%

[redacted]

Henley, G. & Kumamoto, H. (1980). *Reliability Engineering and Risk Assessment.* Englewood Cliffs, CA: Prentice Hall.

Layton, D. M. (1989). *System Safety Including DOD Standards*. Chesterland: Weber Systems Inc.

Levenson, N. G. (1995). *Safeware.* New York, NY: Addition-Wesley Publishing Co.

O'Connor, P. D. T. (1985). *Practical Reliability Engineering.* 2nd Edition. Chichester, UK: John

Wiley and Sons.

Roland, H. E. (1990). *System Safety Engineering and Management*. New York, NY: Wiley Interscience.

Stephenson, J. (1991). *System Safety 2000.* New York, NY: Van Nostrand Reinhold.

Appendix B: Old Syllabus of Record

I. Catalog Description

SAFE 345 Systems Safety Analysis — 3 class hours, 0 lab hours, 3 credit hours (3c-0l-3cr)

Prerequisites: MATH 105 or Instructor Permission

Focuses on the evaluation of system designs using detailed system analysis techniques. Topics include system definition, economics of systems safety, systems safety methodology, mathematics of systems analysis including statistical methods, Boolean algebra, and reliability. Skills gained include the ability to perform system hazard analyses and operating and support hazard analyses.

[redacted]

error rate prediction. Practical analysis work is accomplished through in-class discussion and demonstration sessions and homework assignments.

II. Course Outcomes

Students will be able to:

A. Explain the general concept of a system, system design processes and the system life cycle.

B. Construct organizational policies for preparing system safety program plans and for conducting

III. Course Outline

A. Overview of Systems Concepts (2.5 hours)
   1. Definitions
   2. Systems
   3. Subsystems
   4. Components
   5. System Safety Lifecycle

B. Military Standard-882D System Safety Program Requirements (2.5 hours)
   1. Background
   2. Task Descriptions
   3. Evaluation Criteria

C. Systems Safety Program Planning (3.5 hours)
   1. Program Organization
   2. System Safety Program Plans
   3. Management Planning
   4. Milestone Charts
   5. System Safety Workgroups

D. Overview of Analysis Techniques (5.5 hours)
   1. Quantitative Techniques
   2. Qualitative Techniques
   3. Preliminary Hazard Lists
   4. Preliminary Hazard Analysis
   5. Event Diagrams
   6. System and Subsystem Hazard Analysis
   7. Operator and Support Hazard Analysis
   8. Health Hazard Analysis

Examination #1 (1 hour)

E. Statistical Techniques (2.5 hours)
   1. Component Reliability
   2. System Reliability
   3. Probability of Failure
   4. Systems in Series
   5. Systems in Parallel

F. Risk (2.5 hours)
   1. Definition of Risk
   2. Quantifying Risk
   3. Developing Risk Assessment Codes
   4. Risk Assessment Charts

G. Boolean Algebra (2 hours)
   1. Boolean Postulates
   2. Developing Boolean Equations

H. Fault Tree Analysis (FTA) (5.5 hours)

1. Fault Trees Versus Reliability Trees
2. Establishing Fault Trees

[redacted]

4. Analyzing Systems using FTA

Examination #2 (1 hour)

I. [redacted]

1. Assumptions of FMEA
2. Analyzing Systems Using FMEA

J. Hazard Analysis Techniques (4.5 hours)

1. HAZOP
2. Cause-Consequence
3. Flow Analysis
4. What if
5. Energy Trace Barrier Analysis

K. Operator and Support Hazard Analyses (4 hours)

1. Procedure (Task) Analysis
2. Human Reliability Analysis
3. Technique for Human Error Rate Prediction

V. Example Grading Scale

The grading scale will be based on the following:

A = 90-100%
B = 80-89%
C = 70-79%
D = 60-69%
F < 60%

A grading curve that results in an appropriate distribution of grades may be used as needed.

VI. Course Attendance Policy

Although there is no formal attendance policy for this class, student learning is enhanced by regular attendance and participation in class discussions and the university expects all students to attend class.

VII. Required Textbooks

Stephans, Richard A. (2004). System Safety for the 21st Century. New York: John A. Wiley and Sons, Inc. ISBN 0-471-44454-5

VIII. Special Resource Requirements

None

IX. Bibliography

Davies, John Booth, et al. (2003). Safety Management: A Qualitative System Approach. London, England: Taylor and Francis Publishing Company.

Yang, Guangbin (2007). Life Cycle Reliability Engineering. Hoboken, NJ: John Wiley & Sons, Inc.

Historic Titles

Copi, Irving M. (1986). Introduction to Logic. 7th Edition. New York, NY: MacMillan.

Department of Defense. (1993). Military Standard 882D: System Safety Requirements. Washington, D.C.: United States Department of Defense.

Engineering Design Handbook – Fault Tree Analysis. (1971). Washington, DC: US Army Material Command.

Green, A.E. (1984). Safety Systems Reliability: Chichester, UK: John Wiley and Sons.

Hammer, Willie. (1972). Handbook for System and Product Safety. Englewood Cliffs, CA: Prentice Hall.

Henley, G. and Kumamoto. (1980). Reliability Engineering and Risk Assessment. Englewood Cliffs, CA: Prentice Hall.

Ireson, W. Grant, ed. (1966). Reliability Handbook. New York, NY: McGraw Hill Book Co.

Layton, Donald M. (1989). System Safety Including DOD Standards. Chesterland: Weber Systems Inc.

Leveson, Nancy G. (1995). Safeware. New York, NY: Addison-Wesley Publishing Co.

Vesely, W.E., et al. (1981). Fault Tree Handbook. NUREG-0492. Washington, DC: Nuclear Regulatory Commission.

Vincoli, Jeffrey W. (1993). Basic Guide to System Safety. New York, NY: Van Nostrand Reinhold.

Appendix C: Proposed Revised Catalog Description

SAFE 345 Process and Systems Safety **3c-01-3cr**
Prerequisites: MATH 105 and SAFE 111 or instructor permission

Focuses on the evaluation of system designs using detailed system analysis techniques. Topics covered include system definition, economics of systems safety, quantitative and qualitative systems safety methodology, and systems safety / process safety program administration. Skills gained include the ability to perform hardware and human factors systems analysis. Techniques include

failure mode and effect analysis, hazard and operability studies, what-if and scenario building, and operating and support hazard analysis. Practical analysis work is accomplished through in-class

discussion and demonstration sessions and homework assignments.