PROCESS SAFETY ASSESSMENT METHODS
(Spring 2009)

COURSE OUTLINES:

Part One Introduction

- ♣ Background
- ♣ Definitions
  - Accident
  - Hazard
  - Risk
- ♣ Tasks of Hazard Assessment
- ♣ Implementation Procedure
- ♣ Risk Reduction Measures
- ♣ "Acceptable" Risk
- ♣ Legislation and Law

Part Two Hazard Identification and Assessment

- ♢ Checklist
- ♢ Hazard Surveys
  - Dow's Fire & Explosion Index
  - Dow's Chemical Exposure Index
- ♢ Hazard and Operability (HAZOP) Studies
  - Principles of HAZOP
  - Guide Words
  - Examples
- ♢ Failure Modes and Effects Analysis (FMEA)
- ♢ Fault Tree Analysis (FTA)
  - Introduction
  - Problem Definition
  - Fault-tree Synthesis Procedures
    - Heuristic Guidelines
    - Computer-aided Tools
      Digraphs
      The Lapp-Powers Algorithm
      Trees

Negative Feedback Loops (NFBLs)
Negative Feed Forward Loops (NFFLs)
Multiple Loops
Examples
- Solutions of Fault-trees
- Common-Mode Failures
- Probability Calculations
- Protective Systems

♢ Event Tree Analysis (ETA)

<u>Part Three</u> Reliability Engineering

♡ Introduction

♡ Failure Models

♡ Qualitative System Analysis

♡ Systems of Independent Components

♡ Component Importance

♡ Markov Models

♡ Counting Processes

♡ Dependent Failures

<u>Part Four</u> Safety-Related Issues in Process Design

♠ Design Principles
- Inherently Safe Processes
- Operability and Controllability
- Fail-Safe Design
- Second Chance Design
- System Size

♠ Design of Alarm/Trip Systems
- Sensor Systems
- Alarm Generation Logic
- Shut Down Unit

♠ Design of Pressure Relief Systems
- Overview
- Relief Sizing

GRADING POLICY

⋆ Project I or Midterm Exam I: 33.3 %
⋆ Project II or Midterm Exam II: 33.3 %
⋆ Project III or Final Exam: 33.3 %

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