LOSS PREVENTION IN PROCESS INDUSTRY

1.1. Identification

University:	Alma Mater Studiorum – Università di Bologna																	
School:	School of Engineering																	
Course:	Loss Prevention in the Process Industries (Graduate Course)																	
ECTS:																		
Semester:	*Winter*						X	*Summer*										
Category	*Fundamental course*						X	*Specialisation course*										
Module	*MFI*	X	*MFII*		*MFIII*			*MSI*		*MSII*		*MSIII*						
Teachers:	Sarah Bonvicini, Gigliola Spadoni																	
Language:	*English*			*Italian*		X	*Swedish*			*Spanish*								

1.2. Learning-outcomes

The aim of the course is to give students the basic theoretical notions and the technical tools for:
- the identification of hazards;
- the evaluation of the consequences of incidents (through the consequence analysis and the damage models);
- the evaluation of their occurrence frequency (through reliability engineering);
- the assessment of risk measures as a combination of frequencies and consequences.

1.3. Competencies

- **General**
  - to have a good comprehension of the physical phenomena related to incidental scenarios
  - to describe a physical phenomenon through a mathematical model, introducing simplifying assumptions if necessary
  - to interpret the results of the mathematical model

- **Specific**
  - to be aware of the incidental scenarios which can arise from a specific chemical substance
  - to look for and determine the hazards of a chemical process
  - to evaluate the consequences i.e. the physical effects of an incidental scenario
  - to evaluate the damage distribution produced by an incidental scenario
  - to evaluate the occurrence frequency of an incidental scenario
  - to calculate individual risk distributions and societal risk curves, combining damage estimates and occurrence frequencies
  - to suggest preventive and protective measures to reduce risk

- to know the regulatory requirements the process industries have to comply with

1.4. Contents

1. Introduction to the concept of risk
2. Hazard identification
3. Damage models
4. Consequence analysis
5. Reliability engineering
6. Calculation of risk measures
7. Inherent safety
8. Runaway reactions
9. Risk of ”NATECH” disaster
10. Transportation risk analysis

1.5. Teaching Methodology

- Lessons performed with the aid of power point presentations
- Seminars held by experts
- Laboratory computer simulations with a consequence analysis software
- Working in teamsto apply the HAZOP tecnique to a a real case

1.6. Evaluation

Oral proof. During the oral proof students can be asked to set up simple numerical exercises.

1.7. Bibliography

- F.P.Lees, Loss prevention in the process industries (II Ed.), Butterworth-Heineman, Oxford, UK, 1996
- I.Pasquon, Rischi potenziali sicurezza e protezione ambientale nell'industria chimica, CLUP, Milano, I, 1989
- D.A.Crowl, J.F.Louvar,Chemical process safety: fundamentals with applications, Prentice Hall, New Jersey, USA, 1990
- Centre for Chemical Process Safety of AIChE, Guidelines for chemical process quantitative risk analysis, New York,
- USA, 1989
- Center for Chemical Process Safety of AIChE, Guidelines for hazard evaluation procedures (II ed.), AIChE, New York, USA, 1992
- TNO, Methods for the evaluation of physical effects. Report CPR 14E (III ed.), The Hague, NL, 1997
- E.Henley, H.Kumamoto, Reliability engineering and risk assessment, Prentice Hall Inc., Englewwod Cliff N.J., USA, 1981