

CE 111 Engineering Risk Analysis

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Lecturers: Dr. J.J. Bommer.

Structure: 4 hours lectures, 4 hours tutorials

Links: see below

Introduction

The module is intended to introduce the basic concepts related to risk and a lexicon of terminology related to risk analysis and risk management. The concepts and the lexicon of terminology lay the basis for addressing risk and risk management in subsequent modules throughout the degree course, including in the major design project in the Third Year. The module does not aim to equip the student with the mathematical tools required to undertake a probabilistic risk assessment, but rather to enable the student to appreciate how formal risk assessments can fit in to the general practice of risk management.

Objective

The objective of the module is to demonstrate how risk management is an integral part of civil and environmental engineering projects and that risk management should be treated as simply one component of successful engineering. The module commences with an introduction to basic concepts of risk in general and an overview of risk in civil engineering, including issues related to health and safety. Subsequent lectures illustrate risk analysis in specific areas of civil and environmental engineering. The introductory lecture and subsequent case histories all include elements of interactive tutorials in which the students explore and discuss risk analysis and risk management.

Aims

The aim of the module is to enable the student to employ a standard and unambiguous vocabulary to refer to risk-related issues and to identify the elements of risk in engineering projects. The student should also acquire an appreciation of how risk management can be incorporated into the general practice and management of civil and environmental engineering.

Module Structure

The module consists of four 2-hour sessions, each consisting of a lecture and interactive tutorial session. Attendance at the lectures and participation in the tutorials is compulsory for all students.

Links with other course modules

The module is counted as part of Engineering in Context I (CE 108). The concepts introduced in Engineering Risk Analysis emerge many times throughout the degree course, particularly in Engineering in Context II (CE 211) and the Third Year Group Design Projects (CE 315).

SYLLABUS

In the 2003-2004 session, the programme for the module was as shown in the table below; the programme will vary from year to year, but follow broadly similar lines.

Session	Lecturer	Lecture Topics
1	Dr Julian Bommer	Concepts of risk, risk analysis and risk management; lexicon of risk terminology; risk management as an integral aspect of engineering; perception of risk
2	Dr Christian Onof Dr Neil McIntyre	The use of rainfall forecasts to reduce the risk of droughts; Contamination of drinking water with agricultural pesticides
3	Simon Nurney <i>Construction Lawyer, Macfarlanes</i>	Risk and responsibility in the construction industry: risk transfer through contact and insurance
4	Prof. Stephen Richardson <i>Head of Department of Chemical Engineering and Chemical Technology, Imperial</i>	The 1988 failure of the Pieper Alpha oil platform in the North Sea as an illustration of the concepts of health and safety in engineering

Coursework and submission dates

There is no coursework for this module.

Assessment

There is no formal assessment of this module and no examination. Therefore all students are awarded full marks provided they attend and participate in all four sessions, at which a register is taken. Students missing sessions without justification (which must be reported to the module co-ordinator) will have marks deducted from their CE 108 marks.

Recommended Textbooks/Reading

There is an enormous amount of literature now available on risk analysis, much of which is interesting to read, but none of which could be classified as comprehensive or definitive. Three excellent reports by the Royal Academy of Engineering (*Risks Posed by Humans in the Control Loop*, *Common Methodologies for Risk Assessment & Management*, *The Societal Aspects of Risk*) are concise and well-crafted documents written from an engineering perspective. A short introduction to these three reports by the leader of the RAEng Risk Project, John Turnbull, provides an excellent summary on the topic of *Risk and Engineering*.

The most recommendable text is *Reckoning with Risk: Learning to live with Uncertainty* by Gerd Gigerenzer (Penguin Books, 2002)

A good general introduction to risk, albeit somewhat lengthy and repetitive, is *Risk* by John Adams (UCL Press, 1995). A very readable book, from a very different perspective, is *Technological Risk* by H.W. Lewis (Norton, 1990). Other worthwhile texts include *Normal Accidents: Living with High-Risk Technologies* by Charles Perrow (Princeton University Press, 1999) and *Against the Gods: The Remarkable Story of Risk* by Peter L. Bernstein (John Wiley & Sons, 1996).

Learning Outcomes

After completing the module students will have an appreciation of the nature of risk, and the fact that risk is fundamental to most human activities and in particular the construction industry. Students are expected to become familiar with the definition of

risk, and to be able to discuss concepts such as the perception, identification, management and transfer of risk. Students are also expected to develop an awareness of the paramount importance of health and safety issues in civil and environmental engineering, and the responsibility of the professional engineer with regards to ensuring safe practice during construction and operation of civil engineering projects.