

**COURSE NAME: TMR4555 Applied risk analysis (for marine operations) – (Module 3,75 stp)**

**Lecturer:** Jan Erik Vinnem

**Course content:**

The course shall provide the students with knowledge and understanding of the hazards that apply to complex marine systems, mainly offshore installations. The course focuses on analytical approaches to the management of these hazards in the design and operations of marine systems. The main topics are related to structural hazards, stability and buoyancy, in addition to other hazards that may cause major accidents.

**Intended learning outcomes:**

After having completed the course, the students shall be able to define basic requirements, main processes, basic methods and management strategies related to the design, installation and operation of complex marine systems in order to achieve a major accident risk level which is As Low As Reasonably Practicable (ALARP). More specifically this means that the students:

- Understand the various hazards that apply to complex marine systems, mainly offshore installations, and be aware of the important lessons learned and main historical developments.
- Know the authority requirements to robust design and accidental loads and the use of national and international standards.
- Know how the various hazards are analysed, the main parameters and the critical factors.
- Be aware of the main causes of major accidents and know how to design and operate in order to avoid such accidents.
- Understand the potential risk reducing measures for each hazard and know the risk management process needed in order to decide on the implementation of risk reducing measures.
- Know how to interpret major accident risk results, the regulatory requirements to risk assessment, the internal control challenges and the ethical dilemmas.
- Understand the basic requirements to barrier management and how they apply to marine hazards on the Norwegian Continental shelf, including arctic waters.

# TMR4555 Module Applied risk analysis (for marine operations)

Lecture plan H2013

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Time:

Consultation time:

Date	Subject	Activity type	Teaching objectives	Reference	Required reading
Day1	1. Course introduction Lecture plan Use of risk analysis in offshore petroleum activity	Lecture 2x45 mins	Use of QRA Insight into regulations & standards Knowledge of Z-013 requirements	Offshore Risk Assessment <sup>1</sup>	
Day1	2. Causes of major accidents on offshore installations Combination of investigations & QRA	Lecture 2x45 mins	Overview of major accidents Insight into causes of historical major accidents Accident investigation	Offshore Risk Assessment <sup>1</sup>	(new lecture)
Day1	Students send email about group members ASAP (2 students per group)	Other			
Day2	3. Analysis of collision risk, passing vessels and attending vessels	Lecture 2x45 mins	Overview of hazards Insight into risk mechanisms Knowledge of main barriers	Offshore Risk Assessment <sup>1</sup>	
Day2	4. Analysis of FPSO – shuttle tanker collision risk	Lecture 2x45 mins	Overview of hazards Insight into risk mechanisms Knowledge of main barriers	Offshore Risk Assessment <sup>1</sup>	
Day2	Assignment text published on Its' Learning for group work	Other			
Day3	5. Analysis of construction risk and marine risk	Lecture 2x45 mins	Overview of hazards Insight into risk mechanisms Knowledge of main barriers	Offshore Risk Assessment <sup>1</sup>	
Day3	6. Analysis of tow-out, installation and decommissioning risk	Lecture 2x45 mins	Overview of hazards Insight into risk mechanisms Knowledge of main barriers	Offshore Risk Assessment <sup>1</sup>	(new lecture)
Day4	7. Analysis of fire & explosion risk Operational risk analysis, MTO aspects	Lecture 2x45 mins	Overview of hazards Insight into risk mechanisms Knowledge of main barriers Insight into operational risk analysis	Offshore Risk Assessment <sup>1</sup>	
Day4	8. Use of data in risk analysis Quantification of fatality risk Presentation of risk picture ALARP evaluation	Lecture 2x45 mins	Knowledge of data sources for accident, frequency and barrier failure occurrences Insight into fatality statistics and result presentation Requirements to risk presentation	Offshore Risk Assessment <sup>1</sup>	
Day5	9. Ethical aspects of risk assessment, challenges with internal control Barrier management	Lecture 2x45 mins	Insight into case study Insight into risk indicators for national and industry perspective Insight into management of barriers in all life cycle phases	Offshore Risk Assessment <sup>1</sup>	
Day5	Course summary & evaluation	Lecture 2x45 mins			
Tbd	Submission of assignment by student groups	Other			

Please note:

- Lectures will give an overview of the most crucial topics and will emphasis on what are essential aspects.
- Extensive self study will be required in addition, see required reading of the textbook. Lecture notes are not sufficient. Not all topics are covered in lectures.
- There are no exercises, but there is one project assignment, to be completed in groups of 2 students.

<sup>1</sup> J. E. Vinnem: Offshore Risk Assessment, Principles, Modelling and Applications of QRA Studies, 3<sup>rd</sup> Edition, Springer, 2013, Volume I & II.