



Aalto University  
School of Engineering

# **MEC-E2009 Marine Risks and Safety**

## **Introduction**

**Osiris A. Valdez Banda, D.Sc. (Tech)**

Aalto University, Marine Technology

# Why a course in maritime risks and safety?

# Maritime accidents are complex events

Maritime accidents cause loss of life, damage to the environment, and economic costs



# Some of the accidents brought historical catastrophes



# Components of Marine Technology

## Maritime Traffic Context (Ecosystem)

### Ship

#### Technical/Design



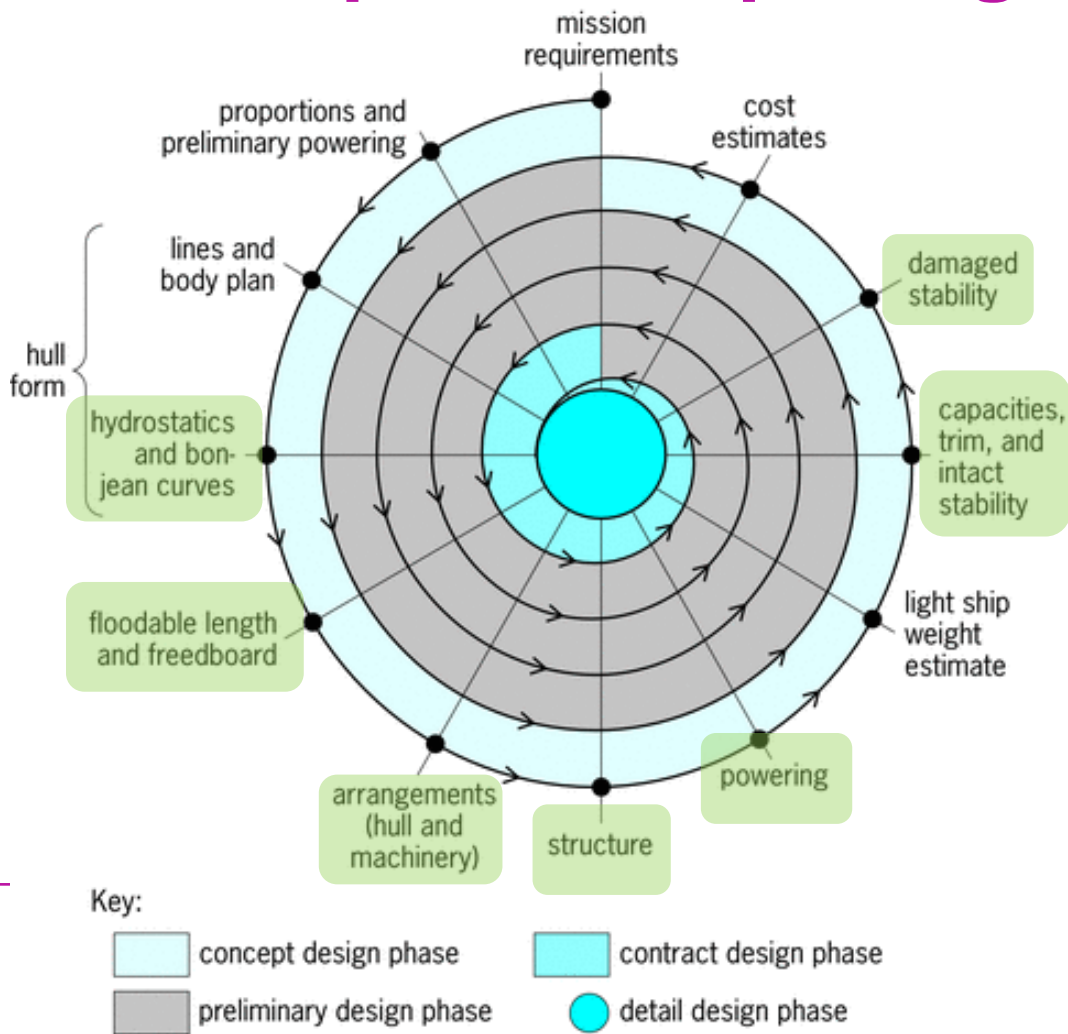
#### Operational



# Safety is a fundamental aspect of ship design

## Ship design spiral

**SAFETY**





# ... and a key concern in ship operation

## SITE SAFETY



Hard Hats  
Must Be Worn



High Visibility Vest  
Must Be Worn



Eye Protection  
Must Be Worn



Foot Protection  
Must Be Worn



# Course objectives

- Students understands the basic concepts of engineering risk and safety in the maritime context.
- Can explain the overall maritime safety regulatory regime and describe the contents of the main regulatory approaches to manage maritime risk and safety.
- Can identify and explain methods for hazard identification, risk analysis and safety engineering.
- Can select and apply appropriate methods for a particular problem related to ship design, ship operation or safety of maritime transportation



# Course schedule

# Lectures

Date	Topic	Lecturer
07.09	L1: Introduction, accidents, rules and regulations	Osiris Valdez Banda
13.09	L2: Introduction to reliability theory, classic accident modeling theories and hazard analysis methods	Ahmad Bahoo Toroody; Osiris Valdez Banda
20.09	L3: System Safety Engineering, STAMP, STPA and CAST	Osiris Valdez Banda
27.09	L4: Risk- and goal-based ship design	Martin Bergström
04.10	L5: Arctic Shipping and Pollution Prevention and Response?	Floris Goerlandt
11.10	L6: Workshop and presentation of the final assignment*	Osiris Valdez Banda

**Attendance is not obligatory, but highly recommended**

**Lectures cover each topic. Some lectures rely on prior reading.**

**Deeper understanding through complementary and extra materials on MyCourses**

# Lectures\*

**\* Lectures L2 and L3 contain the main topics of the assignment. Reading and working in advance will be very beneficial**

**\*\* Lecture L6 is a workshop for the presentation of the course assignment. Instructions for the workshop will be given in L4 and L5**

# Assignments

No.	Topic	Timing	Duration
1	Classic modelling technique vs STPA hazard analysis (ship accident case)	1 week (week)	6 weeks
2	Learning logs	every week	1 week (x5)

- The assignment will be posted to MyCourses (including the reading material) by Friday 9.9.2022
- Assignment will be introduced in details during Lecture 2
- Learning logs instructions are available via Mycourses.
- **Learning philosophy:** problem-based learning and reflection

# Exam (important)

- **Date:** 17 October 2022
- **Time:** 13:00-16:00
- **Place: room 326**
- Exam covers all content from the lectures.  
Also the complementary study materials “CM” (articles, texts) given online on MyCourses are covered in the exam.  
Materials listed as extra reading “EM” are to deepen or widen understanding but are not in exam as such.
- Questions will be in line with intended learning outcomes.  
Focus on gaining knowledge and understanding.
- **HOWEVER**, in every lecture we will have a fast quiz that can count to either get points for the final exam or to get the actual total points of the exam

# Fast Quiz

- At the end of each lecture, you will have a fast quiz covering the contents covered in the lecture.
- The fast quiz will contain questions that lead to a grade for the quiz that will be calculated as the weight for the final exam. How:

Student		Exam					Weight					
ID	Name	E-Q1	E-Q2	E-Q3	E-Q4	E-Q5	E-Q1	E-Q2	E-Q3	E-Q4	E-Q5	TOTAL
XXXXX	Last name, Name	10	2	3,5	4,5	5,5	0,15	0,25	0,25	0,2	0,15	56

Min	Max	Grade
0	50	0
50	60	1
60	70	2
70	80	3
80	90	4
90	100	5



# Course grading

- Scale 1 (pass) – 5 (excellent)
- Calculation basis:
  - 45% “exam and/or fast quizzes”
  - 40% assignment
  - 15% learning logs and feedback

# Course staff 2021



# Osiris Valdez Banda, D.Sc. (Tech) Assistant Professor

## Teaching

- Main course responsible
- Lecture L1, L3 and L6
- Exam
- Contact
  - Present at each lecture\*
  - [osiris.valdez.banda@aalto.fi](mailto:osiris.valdez.banda@aalto.fi)

## Research interests

- Risk analysis
- Systems safety and resilience engineering
- Safety management and modelling
- Smart shipping
- Winter navigation



# Ahmad Bahoo Toroody

## Course assistant

### Contact

- Send assignment and learning logs
- Questions and instructions for the assignment
- Any other practicality about the course
- Contact
  - [ahmad.bahootoroody@aalto.fi](mailto:ahmad.bahootoroody@aalto.fi)

### Teaching

- Lecture L2
- Contact
  - Present at all lectures

### Research interests

- Safety and reliability of Smart shipping
- Smart maintenance
- Machine learning and AI



# Martin Bergström, PhD

## Guest lecturer (DLR Germany)

### Teaching

- Lecture L4
- Contact
  - Present at L4
  - Contact only regarding L4
  - [martin.bergstrom@aalto.fi](mailto:martin.bergstrom@aalto.fi)

### Research interests

- Risk- and goal-based ship design
- Arctic shipping
- Winter navigation



# Floris Goerlandt, D.Sc. (Tech) Professor at Dalhousie University

## Teaching

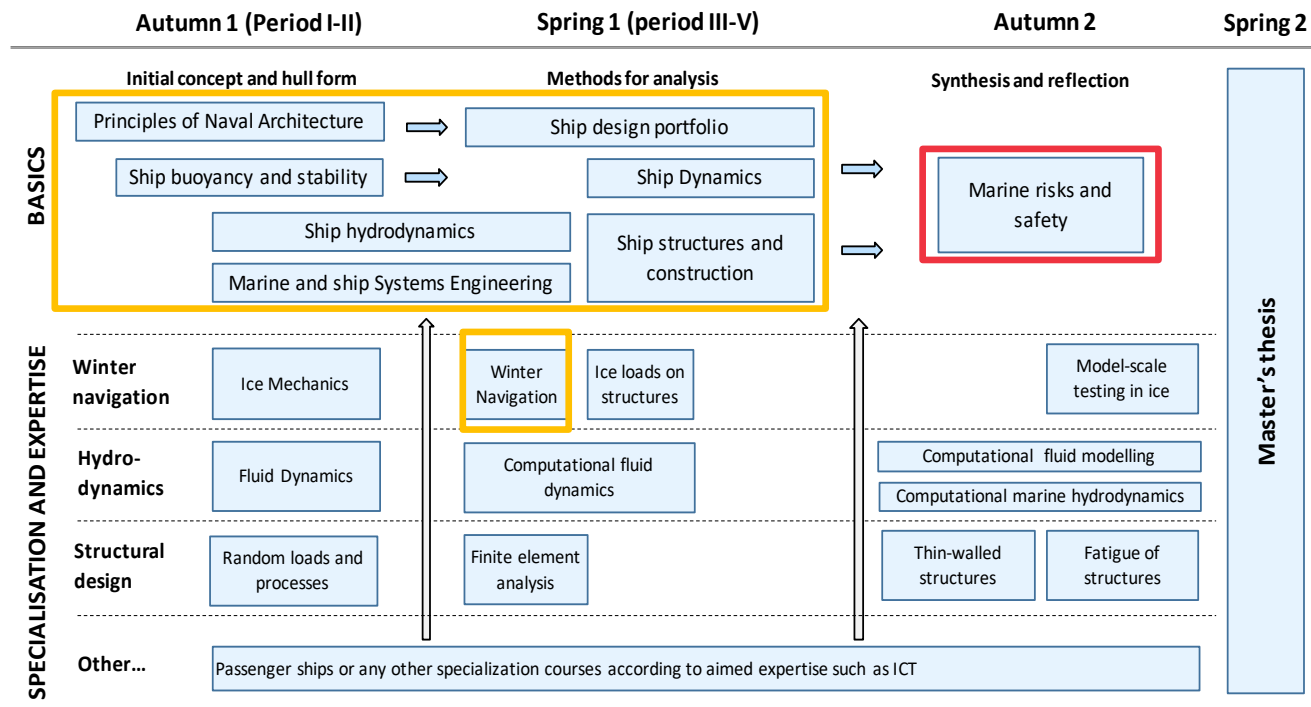
- Lecture L5
- Contact
  - Contact only regarding L5
  - [floris.goerlandt@dal.ca](mailto:floris.goerlandt@dal.ca)

## Research interests

- Maritime waterway risk management
- Design of tools for enhancing maritime safety
- Safety of arctic navigation
- Uncertainty analysis
- Validation of risk analysis



# MEC-E2009 Marine Risks and Safety in Marine Technology



*Common studies and other supportive courses are selected based on the study path and student's interest*

## More courses in MEC about safety:

MEC-E3004 Safety Management in Complex Sociotechnical Systems

MEC-E6003 Materials Safety