MARINE TECHNOLOGY EDUCATION TODAY AND TOMORROW

Viinistu Art Harbour, 25.08.2023

Multiplier Event

Erasmus+ KA203 project SHIPMARTECH

„UPGRADING AND HARMONIZATION OF MARITIME ENGINEERING MASTER'S LEVEL COURSES„

TAL TECH KURESSAARE COLLEGE

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Programme

- 09.00 Registration and coffee
- 09.30 Opening address and introductory remarks
- SUMMARY OF COMPANIES' FEEDBACK ON THE MASTER'S PROGRAMME IN MARINE TECHNOLOGY. Prof. **Kristjan Tabri**, TalTech
- 10.00 International cooperation in curriculum and course development in the Erasmus+ project SHIPMARTECH: results, experiences and lessons learnt. **Tõnis Tõns**, specialist-project manager; **Mihhail Afanasjev**, programme director, TalTech Kuressaare College
- 11.00 Panel discussion: DEVELOPMENTS IN MARITIME ENGINEERING HIGHER EDUCATION IN EUROPE. Moderator professor **Mihkel Kõrgesaar**, TalTech Kuressaare College.
- **Panellists**: prof. **Viktor Senčila**, Klaipeda University; prof. **Jani Romanoff**, Aalto University; prof. **Roger Skjetne**, Norwegian University of Science and Technology; prof. **Fjodor Sergejev**, Tallinn University of Technology
- 12:00 TEAMWORK: Brainstorming ideas for long-term marine technology student projects. Moderator professor **Kristjan Tabri**, TalTech
- 13:30 PRESENTATION OF GROUP WORK RESULTS
- 14:00 CLOSING WORDS. LUNCH
- 15:00 Transport to Tallinn

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ECK0380 Ship Buoyancy and Stability

- Masters' compulsory course, 6 ECTS (26h/ECTS, 156h workload), semester 1
  - Workload 156h = 48h frontal lessons (31%) + 108 self-study (69%)
  - Prerequisites: Engineering Mechanics, Fluid Mechanics
- **Learning Outcomes:** upon successful completion of this course, students will be able to evaluate:
  - Hydrostatic pressure force and the centre of pressure on submerged bodies
  - Ship's buoyancy and initial stability
  - Ship's dynamic stability
  - Ship's stability in special cases
    - free surface
    - hanging load
    - damage stability
    - grounding

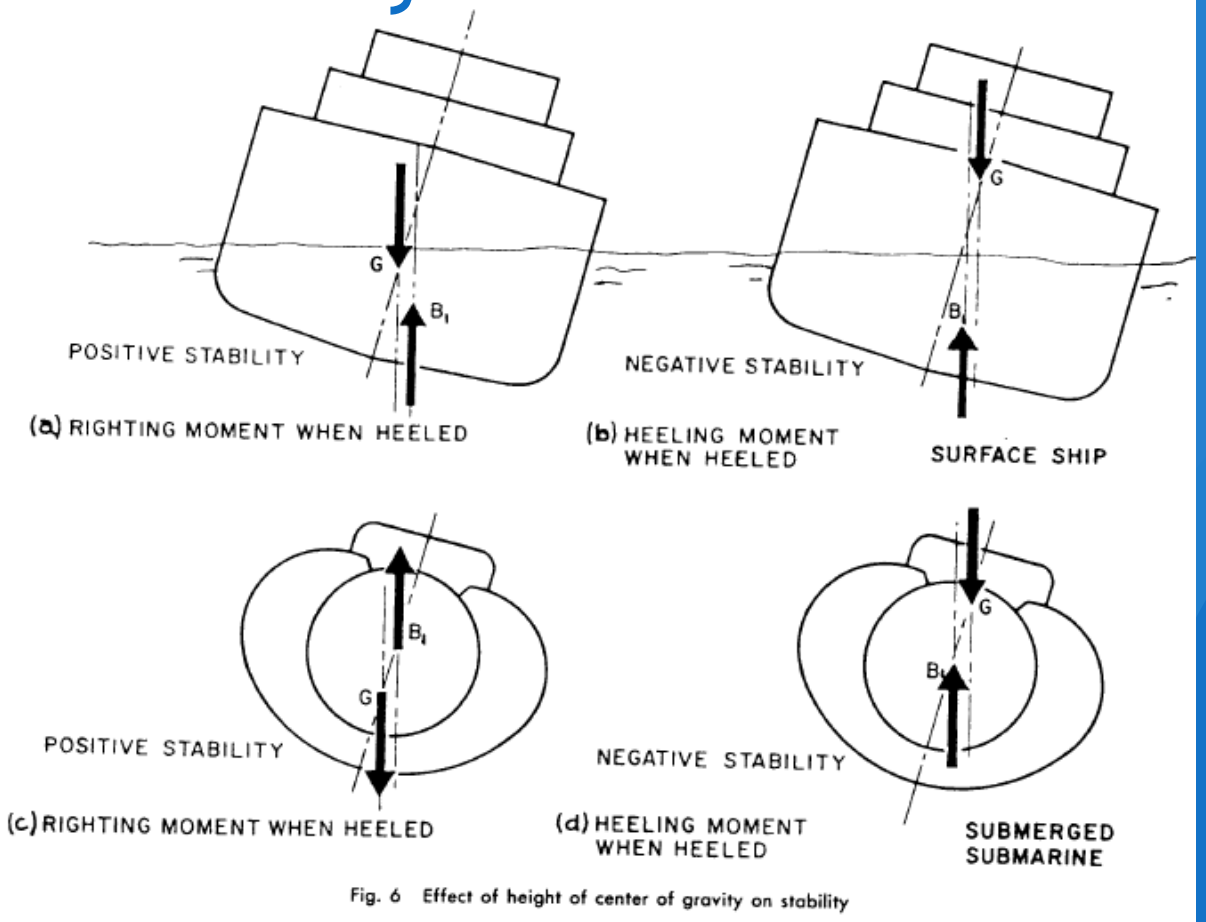

Fig. 6 Effect of height of center of gravity on stability

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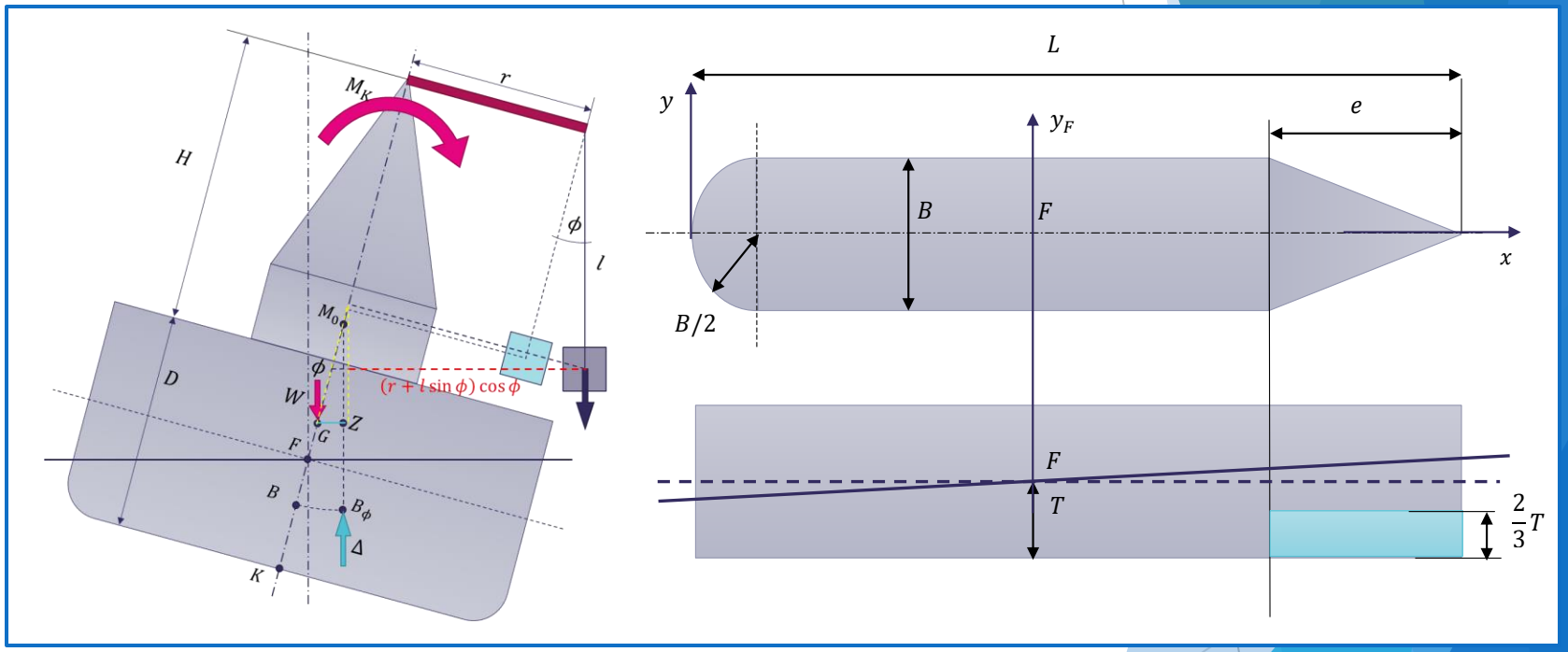
ECK0380 Ship Buoyancy and Stability: Teaching & learning methods

- Seminars
  - (2x90min/week)
- 5 Moodle (online) tests
- Written exam
- Reading notes
- Course project



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ECK0380 Ship Buoyancy and Stability: Learning resources & Assessment

Learning resources

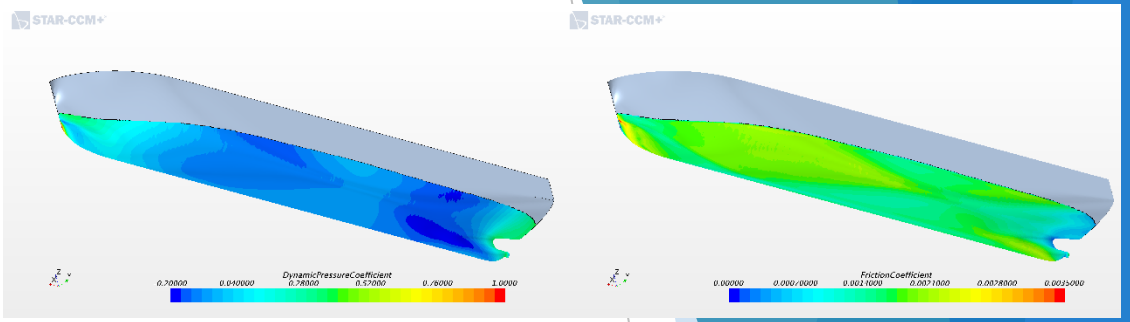
- Lecture notes
- Adrian B. Biran Ship Hydrostatics and Stability 2014
- Rawson, K.J., Tupper, E.C. Basic Ship Theory. Vol. 1,2, 5th Edition, Oxford: Butterworth-Heinemann, 2001.
- Larsson, L., Eliasson, R., Orych, M. Principles of Yacht Design. A&C Black, 2014

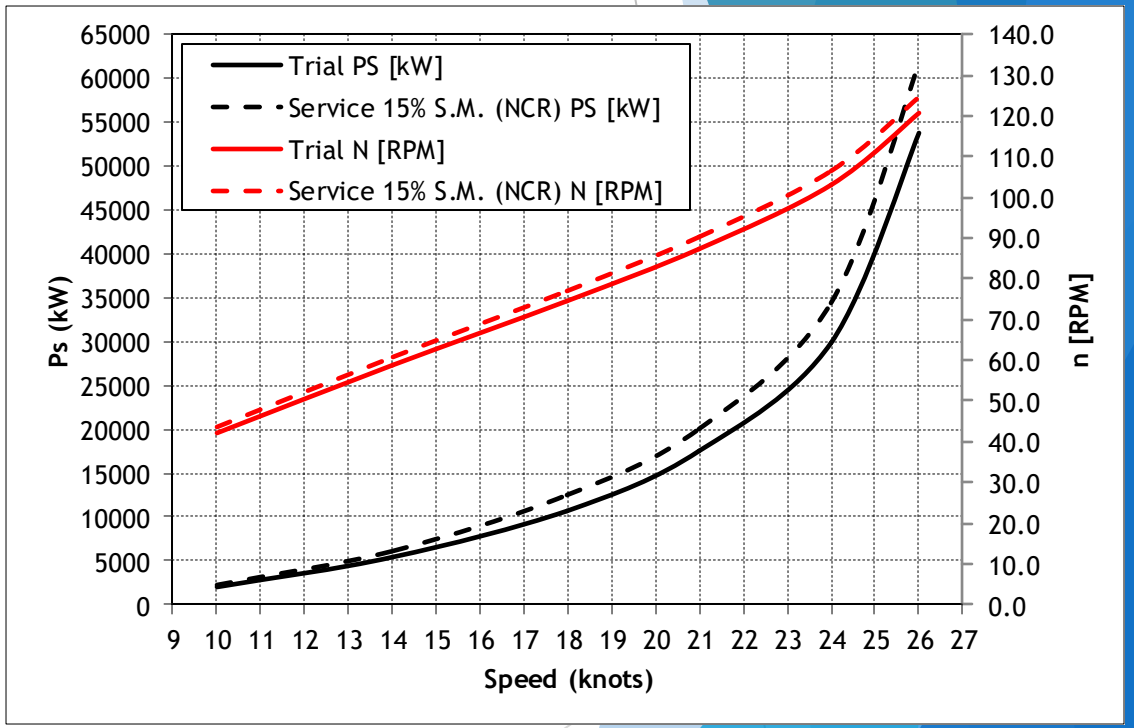
Assessment tool	Weight
Moodle tests	10 %
Reading notes	20 %
Course project	20 %
Written Exam	50 %
Total	**100%**

"5" excellent 91-100
"4" very good 81-90
"3" good 71-80
"2" satisfactory 61-70
"1" poor 51-60
"0" fail less than 51

ECK0390 Ship Hydrodynamics

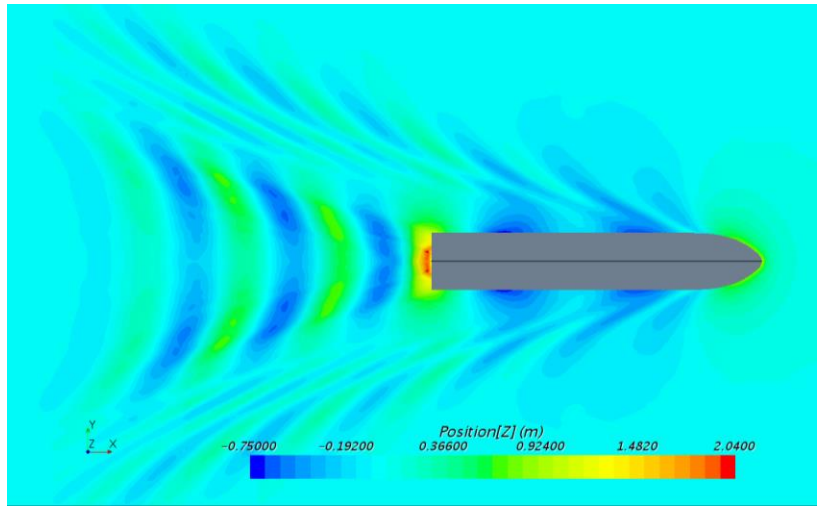
- Masters' elective course, 6 ECTS (26h/ECTS, 156h workload), semester 2
  - Workload 156h = 48h frontal lessons (31%) + 108 self-study (69%)
  - Prerequisites: Engineering Mechanics, Ship Buoyancy & Stability, Fluid Mechanics
- **Learning Outcomes:** upon successful completion of this course, students will be able to:
  - Classify different components of a ship's resistance.
  - Estimate a ship's resistance using experimental and empirical methods.
  - Estimate a ship's propulsive power and efficiency.

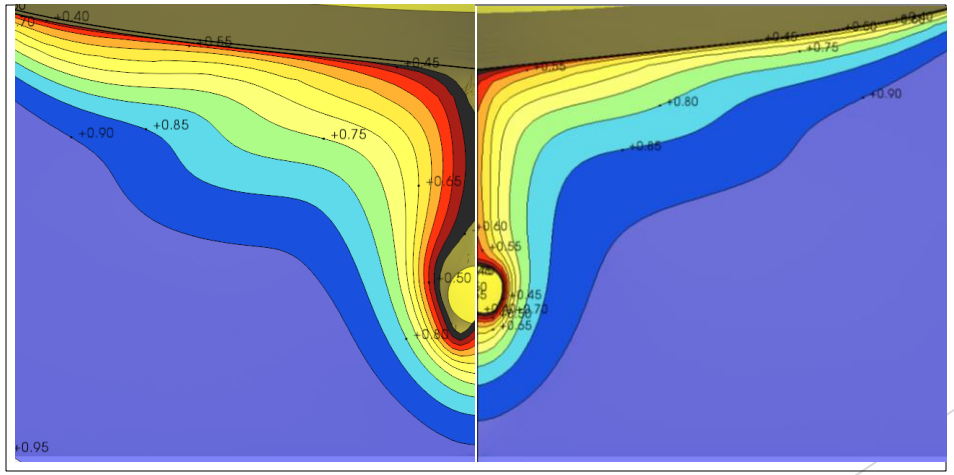




ECK0390 Ship Hydrodynamics:Teaching & learning method

- Seminars
  - (2x90min/week)
- 5 Moodle (online) tests
- Written exam
- Reading notes
- Course project





Wake at propeller plane CFD in model scale (left) and in full scale (right) with default k-ε turbulence model

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ECK0390 Ship Hydrodynamics: Learning resources & Assessment

Learning resources

- Lecture notes
- Lars Larsson & Hoyte C. Raven, Principles of Naval Architecture Series - Ship Resistance and Flow,(2010)
- Justin E. Kerwin and Jacques B. Hadler, PRINCIPLES OF NAVAL ARCHITECTURE SERIES: PROPULSION, (2010)
- J.S. Carlton, Marine Propellers and Propulsion , (2007)
- Molland, A., Turnock, S., & Hudson, D. (2017). Ship Resistance and Propulsion

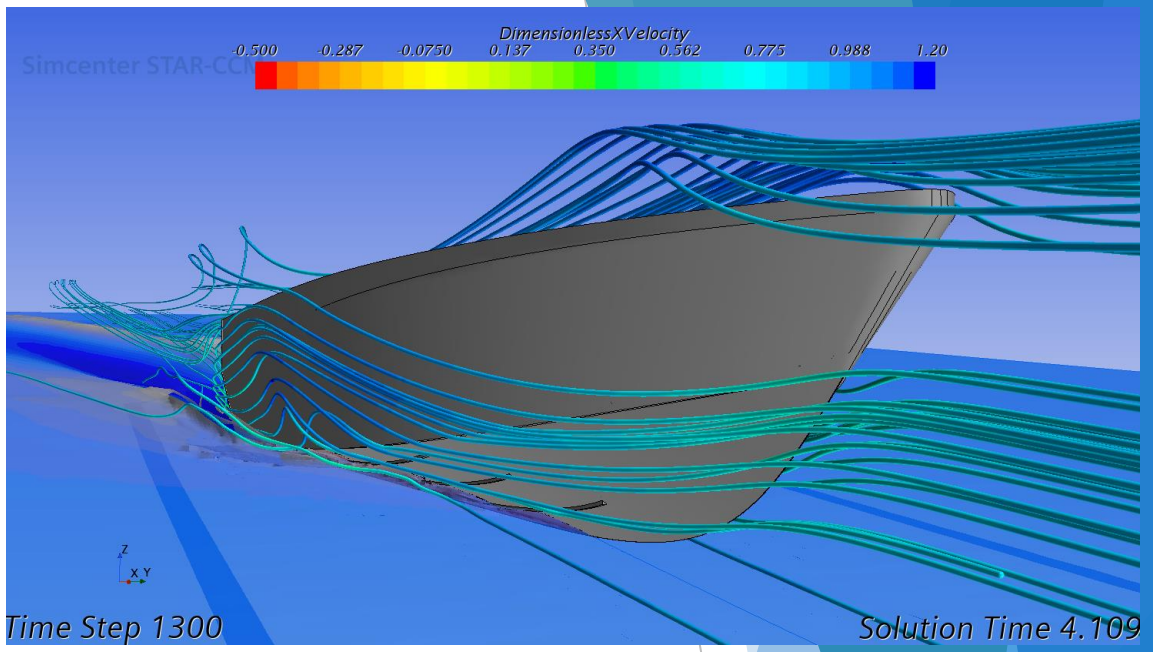
Assessment

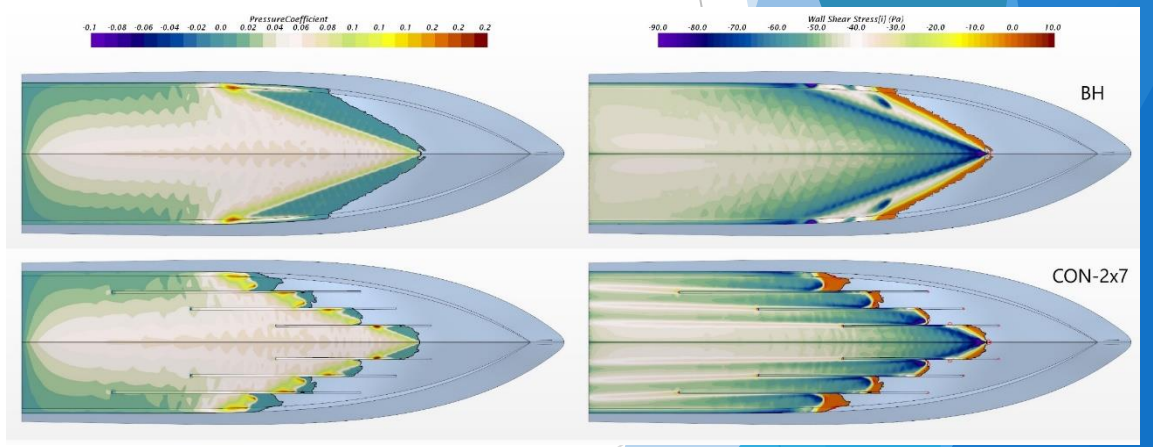
Assessment tool	Weight
Moodle tests	30 %
Reading notes	20 %
Written Exam	50 %
Total	100%

"5" excellent 91-100
"4" very good 81-90
"3" good 71-80
"2" satisfactory 61-70
"1" poor 51-60
"0" fail less than 51

ECK0400 Computational Marine Hydrodynamics

- Masters' elective course, 6 ECTS (26h/ECTS, 156h workload), semester 3
  - Workload 156h = 48h frontal lessons (31%) + 108 self-study (69%)
  - Prerequisites: Ship Stability, Ship Hydrodynamics, Fluid dynamics
- Learning Outcome Upon successful completion of this course, students will be able to:
  - Compare different numerical approaches
  - Select an appropriate numerical set-up for a given problem
  - Calculate a ship's resistance by numerical simulation
  - Verify & validate the numerical model





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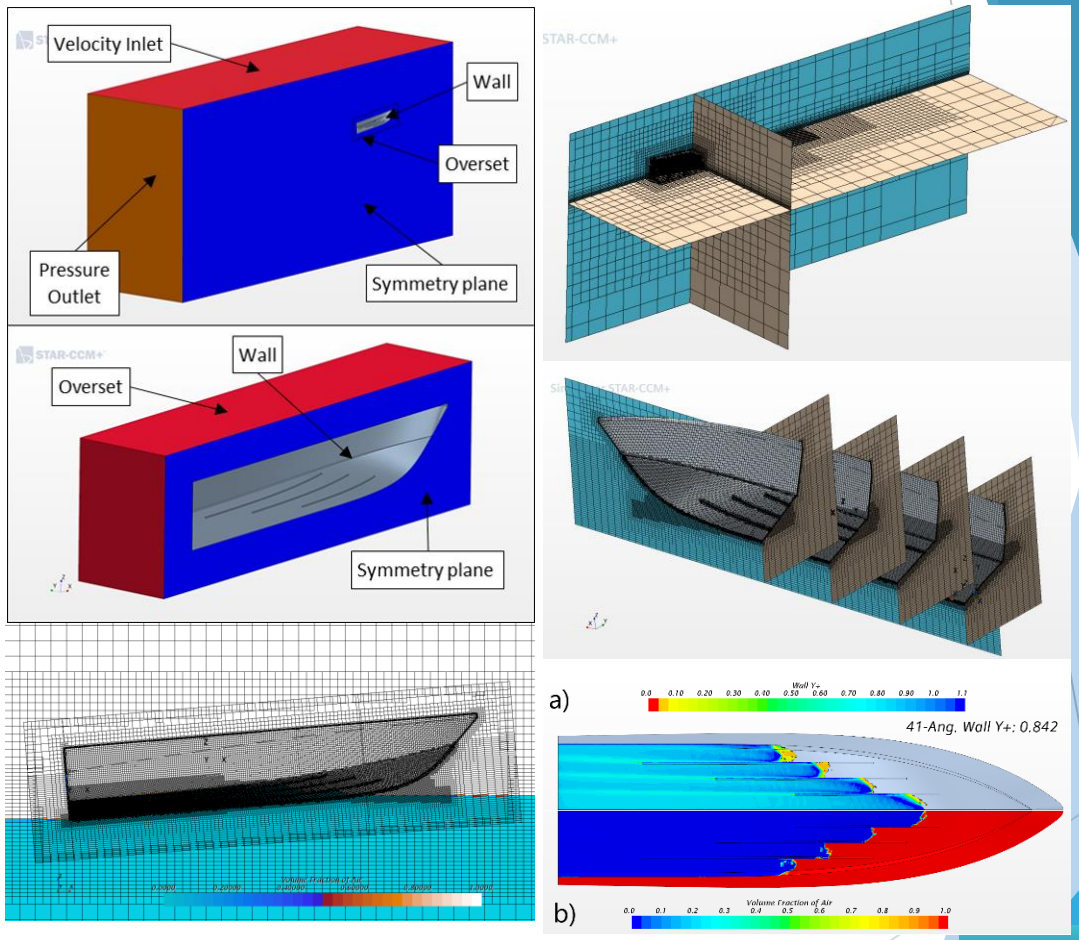
Teaching & learning formats and methods

- Seminars
  - Biweekly seminar on reading circles
  - Weekly tutorial/help-desk sessions
- Reading Notes/ circle (RC)
  - 6 Biweekly reading reports (individual and group memos)
- Course Project (technical report)
  - Boundary conditions
  - Discretisation schemes
  - Local features of the mesh
  - Turbulence models
  - Verification & Validation against model test data
- Peer review
- Work Diary
- Final presentation



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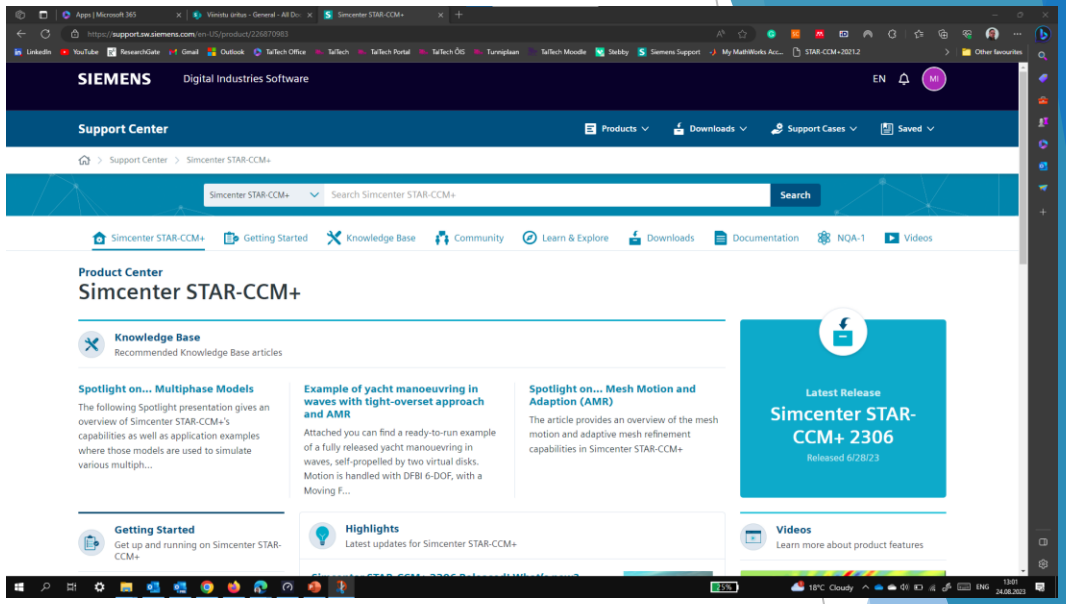
Learning resources & Assessment

- Student will be provided with:
  - Licence keys for STAR-CCM+
  - Siemens support account (for knowledge base)
  - TalTech HPC cluster account (for simulations)
- Reading material
  - Oleg Zikanov, Essential Computational Fluid Dynamics, 2010
  - Lars Larsson & Hoyte C. Raven, Principles of Naval Architecture Series - Ship Resistance and Flow,(2010)
  - Scientific papers available Moodle
  - Articles in Siemens knowledge base



Assessment tool	Mark
Course project report	60 %
Peer review	10 %
Reading notes	10 %
Work diary	10 %
Final presentation	10 %
Total	**100%**

"5" excellent 91-100
"4" very good 81-90
"3" good 71-80
"2" satisfactory 61-70
"1" poor 51-60
"0" fail less than 51

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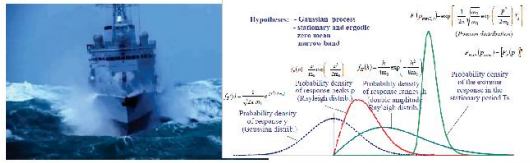
Lessons learned

- North VS South
  - Northern European teaching is significantly more application oriented compared to the theoretical teaching at Southern European Universities.
  - Southern European universities prefer oral examination.
- Moodle test & course project instead of uniform home assignments.
  - Moodle test are a great for self-assessment
  - Problem solving is evaluated in the written exam
- Reading circles and notes enhance learning
- Cheat sheets



Ship Seakeeping

Ermina Begovic

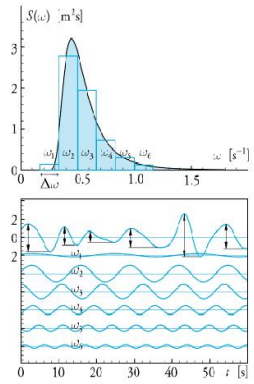
Abstract: Ship Mission, Environment, Ship Responses and Seakeeping Performance criteria are four principal terms to describe seakeeping behavior of the ship and offshore structures in design and operational studies. The course will give you knowledge of the mathematical models, overview of numerical and experimental methods and will equip you with tools to perform the seakeeping analysis and evaluate ship operability at the design stage.

Contents of the Course

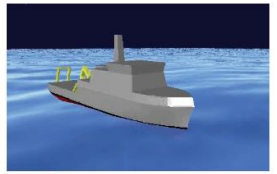
L1 – L4 Regular Waves. In these lectures we will repeat Airy and Stokes wave theories, introduce velocity potential and define wave parameters

L5 – L6 Irregular wave as stochastic process. In these lectures we will introduce statistical analysis of wave record, introduce PDF of wave amplitudes and apply probability of exceedance.

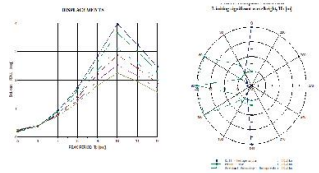
L7 - L9 Spectral analysis. In these lessons we will learn and apply Fourier analysis, define Power Density Spectrum and Ideal sea spectra. We will calculate spectral moments and connect them with the statistical analysis.



L10 – L15 Ship Responses in Regular Waves. In these lectures we will learn and calculate radiation and diffraction forces acting in linearized seakeeping. We will calculate ships' elementary, absolute and relative motions.



L16 – L20 Ship Responses in Irregular Seas. We will learn frequency mapping, apply variance preserving method and calculate ship responses in irregular waves. We will define and calculate performance criteria and ship operability.



L21 - 24 Experimental assessment of Seakeeping and Nonlinear Phenomena. In these lessons we will measure ship responses in towing tank and learn data analysis. We will discuss slamming, water on deck, propeller emergence and added resistance.

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University of the Aegean

UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

FSB University of Zagreb Faculty of Mechanical Engineering and Naval Architecture

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