

# Experimental Methods in Naval Architecture

Prof. Ermina BEGOVIC



UNIVERSITÀ DEGLI STUDI DI NAPOLI  
**FEDERICO II**

Partner universities:



University of the Aegean



University of Zagreb  
Faculty of Mechanical Engineering  
and Naval Architecture



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# Experimental Methods in Naval Architecture

- ▶ 6 ECTS (150h)
- ▶ Work load: 48 hours of frontal lessons + 102 self-study
- ▶ Prerequisites/ co-requisites:
  - ▶ Ship Stability - Resistance - Propulsion - Seakeeping
- ▶ Master Level elective course

# Objectives

- ▶ To provide the physics of the phenomena and the hypothesis and simplification used in the experimental approach
- ▶ To make students capable to perform the data analysis of the measured variables and the prediction of the ship hydrodynamic characteristics based on the measures data set

# Intended Learning Outcome (ILO)

- ▶ Learn and understand phenomena of ship behaviour in calm water and waves
- ▶ Understand possibilities and importance of experimental approach
- ▶ Identify the “ideal” experimental” set up
- ▶ Understand experimental data analysis and related uncertainties

# Teaching and learning formats and methods

- ▶ Development is promoted through the following teaching and learning methods:
  - ▶ The student attends the class presentations and laboratory activities
  - ▶ The student independently watches recommended video and discuss them in class
  - ▶ Combination of practical lessons and frontal lessons to get wide overview of different experimental facilities worldwide and procedures
  - ▶ Students write technical report with all assignments

# Learning resources, readings, references

- ▶ Lecture notes
- ▶ Sverre Steen, Lecture notes TMR7: Experimental Methods in Marine Hydrodynamics, FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY - NTNU, 2014
- ▶ Different scientific papers available on the professor homepage

# Assignments and homeworks

- ▶ Assignment 1: Scaling laws and analysis of “nonconventional” test set up (fish farm cage, wind offshore turbine, etc.)
- ▶ Assignment 2: Analysis of hydrodynamic performances in calm water
- ▶ Assignment 3: Wave spectra calibration
- ▶ Assignment 4: Seakeeping testing in regular and irregular waves

# Assessment

- ▶ Final mark is obtained as combination of the project reports and final oral exam

Assessment tool	Mark
Oral exam	25 %
Project presentation	25 %
Technical report	50 %
Total	100%



# Lecture topics

- ▶ Introduction and objectives of the course
- ▶ Resistance tests in calm water (2 lessons)
- ▶ Open water propeller and self propulsion tests (3 lessons)
- ▶ Cavitation tests (2 lessons)
- ▶ Ship Responses in Regular Waves (3 lessons)
- ▶ Ship Responses in Irregular Waves ( 2 lessons)
- ▶ Roll Decay assessment in calm water and irregular sea (2 lessons)
- ▶ Testing in Harsh Environment, Mooring, WEC performances (3 lessons)

# Course projects

- ▶ Students will attend experimental activities in Marine Hydrodynamics Laboratory
- ▶ Students will learn from scientific press about advanced testing activities in the world
- ▶ Students will analyse data, prepare the report and deliver the presentation