## COURSE OUTLINE

## (1) GENERAL

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|---|---|---|---|
| **SCHOOL** | School of Engineering | | |
| **ACADEMIC UNIT** | Department of Naval Architecture | | |
| **LEVEL OF STUDIES** | Undergraduate | | |
| **COURSE CODE** | NAOME1350 | **SEMESTER** | 8th |
| **COURSE TITLE** | Seakeeping and maneuvering | | |
| **INDEPENDENT TEACHING ACTIVITIES** | | **WEEKLY TEACHING HOURS** | **CREDITS (ECTS)** |
| **Lectures** | | 5 | 6 |
| **Laboratory** | | | |
| | | | |
| **COURSE TYPE** *general background, specialbackground, specialized, general knowledge, skills development* | Specialized | | |
| **PREREQUISITE COURSES:** | | | |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | Greek | | |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | Yes (in English) | | |
| **COURSE WEBSITE (URL)** | https://eclass.uniwa.gr/courses/NA101/ | | |

## (2) COURSE GOALS / LEARNING OUTCOMES

The aim of the course is to understand the stochastic description of sea waves and the induced ship's and the floating structures responses.

Upon successful completion of the course the students will be able to:

1. Understand the concept of the energy spectrum of sea waves and calculate the spectral parameters describing the sea condition.
2. Understand and calculate ship dynamic responses to sea waves and their impact on crew and passengers.
3. Utilize the results of the assessment of the dynamic behavior in optimal design of the hull to limit the responses.
4. Compare different designs in terms of their dynamic behavior in given sea states.
5. Understand concepts and design parameters related to course stability and maneuvering.

## (3) COURSE CONTENT / SYLLABUS

Regular waves. Linear Theory. Dispersion relation. Wave energy. Ship waves.

Irregular waves. Stochastic description of sea waves. Wave energy spectrum. Spectral parameters and their estimation.

Ship responses in regular waves. Equations of motion in frequency domain. Diffraction and radiation problems. Hydrodynamic loads. Added mass and dumping. Wave excitation forces and moments. Response amplitude operators. Ship with forward speed in regular waves. Strip theory.

Ship responses to irregular waves. Seakeeping tests. The input-output problem. Spectra and statistical parameters of responses. Slamming, wetness. Influence of ship motions on passengers and crew. Seakeeping criteria. Effect of hull shape on seakeeping.

Ship maneuvering. Equations of motion. Stability of motion. Hydrodynamic derivatives of hull and rudder. Nomoto Equation. Maneuvering in calm sea. Maneuvering tests.

## (4) TEACHING and LEARNING METHODS - EVALUATION

**DELIVERY**
Face-to-face, Distance learning, etc.

Face-to-face

**USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY**
Use of ICT in teaching, laboratory education, communication with students

- Use of ICT in teaching.
- Support learning through the electronic e-class platform.

**TEACHING METHODS**
*The manner and methods of teaching are described in detail.*
*Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.*
*The student's study hours for each learning activity are given as well as the hours of non- directed study according to the principles of the ECTS*

| *Activity* | *Workload (hours)* |
|---|---|
| Lectures | 52 |
| Exercises | 13 |
| Homework assignments | 26 |
| Study of Lectures | 65 |
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| Course total | **156** |

**STUDENT PERFORMANCE EVALUATION**
*Description of the evaluation procedure*
*Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other*

Written examination (70%) on:

- questions of theoretical content
- solution of mathematical problems

Individual Homework assignments (30%)

## (5) ATTACHED BIBLIOGRAPHY

Books


1. Faltinsen, O. M. (1990). Sea Loads on Ships and Offshore Structures. Cambridge, UK: Cambridge University Press. ISBN 0-521-45870-6.
2. Faltinsen, O. M. , 2006, Hydrodynamics of High-Speed Marine Vehicles. Cambridge University Press. ISBN 0-521-84568-8.
3. Matusiak J., 2013, Dynamics of a Rigid Ship, Aalto University publication series , ISBN 978-952-60-5205-2.
4. J.N. Newman, 1977, “Marine Hydrodynamics”, The MIT Press, 1977.
5. W. G Price, 1974, Probabilistic theory of ship dynamics, Publisher: Chapman and Hall, 1974, ISBN 10: 0412124300 ISBN 13: 9780412124303
6. K.J. Rawson, E.C. Tupper, 2001, “Basic ship theory”, Butterwort-Heinemann.
7. E.V. Lewis, (Ed.), 1989, “Principles of Naval Architecture, Vol. III: Motions in waves and controllability”, The Society of Naval Architects and Marine Engineers.


Journals


1. Applied Ocean Research, ISSN: 0141-1187
2. European J. Mech. B/Fluids, ISSN: 0997-7546
3. Journal of Engineering for the Maritime Environment, ISSN 14750902
4. J. of Fluids and Structures, ISSN: 0889-9746
5. Journal of Fluid Mechanics, ISSN: 0022-1120 (Print), 1469-7645 (Online)
6. Journal of Offshore Mechanics and Arctic Engineering, 08927219
7. Marine Systems & Ocean Technology, ISSN: 1679-396X (Print) 2199-4749 (Online)
8. Ocean Engineering, ISSN: 0029-8018