COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Naval Architecture		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	NAOME1362	**SEMESTER**	8th
COURSE TITLE	**DYNAMICS AND VIBRATIONS OF MARINE STRUCTURES**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS (ECTS)**
Lectures	5	6

COURSE TYPE *general background, specialbackground, specialised 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/NA202

(2) COURSE GOALS / LEARNING OUTCOMES

Subject module teaches aspects in dynamics and vibrations ship structures as shown below:

- *Free* and *forced* vibrations in *one degree of freedom*.
- *Response of linear dynamical systems under harmonic excitation.*
- The effect of *damping* in ship vibrations
- Ship Hull-girder, shaft, propeller and engine vibrations is ships.

The methodology of using FEA methods for assessing the ship vibrations is also explained.

By successful completion of the module, students will be able to:

- Calculate typical vibration problems and have a deep insight in the vibrations experienced by the ship structures.

Students will learn how to search and analyse data in order to compose solutions required for decision making and develop their critical thinking. Such will be also accomplished by course assignment.

(3) COURSE CONTENT / SYLLABUS

Subject module discusses the following aspects:

1) Introduction of Dynamical Systems
2) Types of Dynamical Systems and types of External Excitations
3) Second Order Linear Differential Equations for Ship Vibrating Problems and Equations of Motion
4) Discretization Means of Vibrating Structures
5) Vibrations of Dynamical Systems in One Degree of Freedom
6) Vibrations of Dynamical Systems in Multi-Degrees of Freedom
7) Free Vibrations with and without Damping
8) Forced Vibrating Dynamical Systems under Harmonic Excitation
9) Forced Vibrating Dynamical Systems under Periodic Excitation
10) Vibrations under Impact Loads
11) Fourier & Laplace Transformations
12) Continuous Vibrating Systems
13) Harmonic Vibration Analysis
14) Vibration Measurements and Required Vibration Limits of Structures
15) Axial, Torsional and Whirling Shaft Vibrations. Shaft Alignment Procedure
16) FEA assessment techniques for Ship Vibration
17) Hull-Girder Ship Vibrations
18) Main Engine, Propeller and Wheelhouse Vibrations

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• Support learning through the electronic e-class platform.
• Specialized Software Ansys</td></tr>
<tr><td>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</td><td>
<table>
<tr><th>Activity</th><th>Workload (hours)</th></tr>
<tr><td>Lecturing</td><td>65</td></tr>
<tr><td>Assignments</td><td>39</td></tr>
<tr><td>Self-Study</td><td>52</td></tr>
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<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>156</td></tr>
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<tr><td>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</td><td>Semester exams including problem solving (70%).
Course assignment(s) (30%).</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

Bibliography:

1. Thomson, W.T., (1988), Theory of Vibration with Applications, Unwin Hyman LTD.
2. Meirovitch, L., (1975), Elements of Vibration Analysis, McGraw-Hill,
3. Lin, Tian Ran (2009) Vibration of ship structures and its control. VDM Publishing House, Germany
4. Anil K. Chopra, (2017), Dynamics of Structures, 5th Edition, University of California at Berkeley, Prentice Hall
5. Beards C.F. (1996): Structural Vibration: Analysis and Damping, Arnold.
6. Dietmar Gross, Werner Hauger, Jörg Schröder, Wolfgang A. Wall & Sanjay Govindjee (2011): Engineering Mechanics 3: Dynamics, Springer
7. ABS (2018): Guidance on Ship Vibration.
8. ABS (2019): Guidance Notes on Shafting Alignment.
9. ABS (2017): Guidance Notes on Noise and Vibration Control for Inhabited Spaces.
10. Lloyds Register (2006): Guidance Notes on Ship Vibration and Noise.
11. Lloyd's Register of Shipping (2015): General Overview of Ship Structural Vibration Problems, Guidance Notes.
12. Asmussen I., Menzel W. & Mumm H. (2001): Ship Vibration, GL – Technology.
13. IMO Resolution A.468(XII): Code on Noise Levels on Board Ships.
14. IMO Resolution MSC.337(91): Adoption of the Code on Noise Levels on Board Ships.
15. Masaki M., Tatsuhiro O., Yasuhisa O. and Yu Takeda (2009): Practical Design of Hull Structures, Springer Publishers
16. Vorus W.S. (1988): Vibration, Principles of Naval Architecture Vol.II (Lewis E. Editor), SNAME.
17. Anil V. Rao (2009): Mechanical Vibrations, University of Florida.

Journals:

1. Marine structures, ELSEVIER
2. Journal of Ship Research, SNAME
3. Marine Technology, SNAME