

## COURSE OUTLINE

### (1) GENERAL

<b>SCHOOL</b>	School of Engineering		
<b>ACADEMIC UNIT</b>	Department of Naval Architecture		
<b>LEVEL OF STUDIES</b>	Undergraduate		
<b>COURSE CODE</b>	NAMOE1215	<b>SEMESTER</b>	3 <sup>rd</sup>
<b>COURSE TITLE</b>	<b>MACHINE ELEMENTS</b>		
<b>INDEPENDENT TEACHING ACTIVITIES</b>		<b>WEEKLY TEACHING HOURS</b>	<b>CREDITS (ECTS)</b>
<b>Lectures and case studies</b>		4	5
<b>COURSE TYPE</b> <i>general background, specialbackground, specialised general knowledge, skills development</i>	Special background		
<b>PREREQUISITE COURSES:</b>	MECHANICS II		
<b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>	Greek		
<b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>	Yes		
<b>COURSE WEBSITE (URL)</b>	<a href="https://eclass.uniwa.gr/courses/NAFP118/">https://eclass.uniwa.gr/courses/NAFP118/</a>		

### (2) COURSE GOALS / LEARNING OUTCOMES

This course aims at introducing the students to the general topology and the main characteristics of typical Machine Elements as used in naval installations. The purpose of the course is to analyze the main machine elements in order to calculate and correctly select the type of element needed for each naval application. The analysis includes the analysis of its geometry, construction materials, usual stresses, calculation and design methods, methods of construction and methods of operation in a ship's mechanical system or generally in a floating construction.

### (3) COURSE CONTENT / SYLLABUS

1. Connectors (screws, bolts). Calculations, bolt pre-tensioning. Tightening torque of bolts.
2. Power transfer elements. Spindles, (strength, spindle deformation, critical speed). Spines, belts, pulleys, chains.
3. Components for load lifting (flexible and steel cables, properties, calculation, Pulleys and drums of steel cables).
4. Power connectors (couplings, mechanical and hydraulic clutches).
5. Gears (tooth modeling, basic tooth law, tooth shape, involute curve construction, and strength and tooth calculation).
6. Rolling and sliding bearings (description, types, lubrication, and selection).
7. Springs (description, types, calculations)
8. Pressure tanks (design calculations)
9. Basic principles of vibrations and dynamic position of axial ship system.
10. Axial ship system alignment. (Calculation of reactions in bearings, preparation of alignment plan)

11. Design of the ship speed reduction propulsion unit.

#### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>DELIVERY</b> Face-to-face, Distance learning, etc.	Face-to-face	
<b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b> Use of ICT in teaching, laboratory education, communication with students	<ul style="list-style-type: none"> <li>• Use of ICT in teaching.</li> <li>• Support learning through the electronic e-class platform.</li> </ul>	
<b>TEACHING METHODS</b> <i>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</i>	<b>Activity</b>	<b>Workload (hours)</b>
	Lectures	52
	Project	26
	Technical essay assignments	26
	Study of Lectures	39
	Course total	<b>143</b>
<b>STUDENT PERFORMANCE EVALUATION</b> <i>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</i>	<p>i) Written final examination (80%) that includes solving problems related to the theory.</p> <p>ii) Evaluation of technical group work reports (20%).</p> <p>The grade corresponding to each technical report will be available to the student on the e-class platform.</p>	

#### (5) ATTACHED BIBLIOGRAPHY

- Στεργίου Ι, Στεργίου Κ.: Στοιχεία Μηχανών Ι Σύγχρονη Εκδοτική. Αθήνα 2004
- Παπαδόπουλος Α. Χρήστος, Στοιχεία Μηχανών, Εκδόσεις Τζιόλα, 2013
- Robert L. Norton, Design of Machinery: An Introduction To The Synthesis and Analysis of Mechanisms and Machines, Fifth Edition, McGraw Hill, 2011
- Steven R. Schmid, Bernard J. Hamrock, Bo. O. Jacobson, Fundamentals of Machine Elements, Third Edition, CRC Press, 2013
- Robert L. Norton, Machine Design: An Integrated Approach, 5<sup>th</sup> Edition