

## COURSE OUTLINE

### (1) General information

<b>FACULTY/SCHOOL</b>	Maritime and Industrial Studies		
<b>DEPARTMENT</b>	Maritime Studies		
<b>LEVEL OF STUDY</b>	Undergraduate		
<b>COURSE UNIT CODE</b>	NA84	<b>SEMESTER</b>	Winter semester elective
<b>COURSE TITLE</b>	Zero Carbon Shipping		
<b>INDEPENDENT TEACHING ACTIVITIES</b> <i>in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits</i>		<b>WEEKLY TEACHING HOURS</b>	<b>CREDITS</b>
		4	6
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
<b>COURSE TYPE</b> Background knowledge, Scientific expertise, General Knowledge, Skills Development	Scientific expertise		
<b>PREREQUISITE COURSES:</b>	Compulsory: Ship Technology (1 <sup>st</sup> semester) Recommended: Ship Systems (3 <sup>rd</sup> semester)		
<b>LANGUAGE OF INSTRUCTION:</b>	English		
<b>LANGUAGE OF EXAMINATION/ASSESSMENT:</b>			
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	Yes		
<b>COURSE WEBSITE (URL)</b>			

### (2) LEARNING OUTCOMES

<p><b>Learning Outcomes</b></p> <p>The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.</p> <p>It is necessary to consult:</p> <p><b>APPENDIX A</b></p> <ul style="list-style-type: none"> <li>• Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.</li> <li>• Descriptive indicators for Levels 6, 7 &amp; 8 of the European Qualifications Framework for Lifelong Learning and</li> </ul> <p><b>APPENDIX B</b></p> <ul style="list-style-type: none"> <li>• Guidelines for writing Learning Outcomes</li> </ul>
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<b>General Competences</b> <i>Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?</i>	
<i>Search for, analysis and synthesis of data and information by the use of appropriate technologies,</i> <i>Adapting to new situations</i> <i>Decision-making</i> <i>Individual/Independent work</i> <i>Group/Team work</i> <i>Working in an international environment</i> <i>Working in an interdisciplinary environment</i> <i>Introduction of innovative research</i>	<i>Project planning and management</i> <i>Respect for diversity and multiculturalism</i> <i>Environmental awareness</i> <i>Social, professional and ethical responsibility and sensitivity to gender issues</i> <i>Critical thinking</i> <i>Development of free, creative and inductive thinking</i> <i>.....</i> <i>(Other.....citizenship, spiritual freedom, social awareness, altruism etc.)</i> <i>.....</i>
Decision making Introduction of innovative research Environmental awareness Critical thinking	

### (3) COURSE CONTENT

Description & techno-economic assessment of:	
<ul style="list-style-type: none"> <li>- zero carbon or carbon neutral marine fuels:               <ul style="list-style-type: none"> <li>o hydrogen &amp; ammonia</li> <li>o bio-fuels (with or without CCS)</li> <li>o synthetic carbon fuels (with or without CCS)</li> </ul> </li> <li>- all electric ship (battery storage)</li> <li>- onboard renewable energy systems               <ul style="list-style-type: none"> <li>o solar (PV)</li> <li>o wind (direct propulsion &amp; electric generation)</li> </ul> </li> </ul>	

### (4) TEACHING METHODS--ASSESSMENT

<b>MODES OF DELIVERY</b> <i>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</i>	In-class lecturing or Online	
<b>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</b> <i>Use of ICT in teaching, Laboratory Education, Communication with students</i>	Yes	
<b>COURSE DESIGN</b> <i>Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis</i>	<b>Activity/Method</b>	<b>Semester workload</b>
	Lectures & Interactive teaching	13 lect. x 4 hrs = 52 hrs

<p><i>of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.</i></p> <p><i>The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.</i></p>		
	Self-directed study	98 hrs
	<b>Total</b>	<b>150 hours</b>
<p><b>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</b></p> <p><i>Detailed description of the evaluation procedures:</i></p> <p><i>Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other.....etc.</i></p> <p><i>Specifically defined evaluation criteria are stated, as well as if and where they are accessible by the students.</i></p>	<p>Multiple choice tests</p> <p>Problem solving</p>	

##### (5) SUGGESTED BIBLIOGRAPHY:

<p><i>-Suggested bibliography:</i></p> <p>- Lecturer's notes</p> <p><a href="https://openknowledge.worldbank.org/handle/10986/35436">https://openknowledge.worldbank.org/handle/10986/35436</a></p>	--
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