COURSE OUTLINE

1. General Info

FACULTY/SCHOOL	Maritime and Industrial Studies		
DEPARTMENT	Maritime Studies		
LEVEL OF STUDY	*Undergraduate*		
COURSE UNIT CODE	NAS 465	**Semester**	4th
COURSE TITLE	Ship Technological Efficiency		

INDEPENDENT TEACHING ACTIVITIES 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	**WEEKLY TEACHNG HOURS**	**CREDITS**
	4	6
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	English
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.unipi.gr/courses/NAS465/

2. LEARNING OUTCOMES

Learning Outcomes

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. It is necessary to consult: Συμβουλευτείτε το APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and APPENDIX B*
- *Guidelines for writing Learning Outcomes*

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

1. To explain and critically assess the main challenges of ship decarbonisation and the global policy framework for reducing greenhouse gases (GHGs) in maritime transport
2. To identify and evaluate technologies of alternative forms of energy and zero-carbon fuels for shipping.
3. To analyse and compare technological options for reducing emissions on board ships against specific criteria (safety, cost, environmental performance, technological maturity, including carbon capture systems, hybrid technologies and wind-assisted propulsion solutions.
4. To develop and publicly present a project that applies innovative concepts of decarbonization or digitalization in maritime applications, demonstrating interdisciplinary reasoning and teamwork.
5. To effectively communicate technical, environmental and regulatory concepts related to the decarbonisation of ships through written reports and oral presentations.

General Competences

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?

Search for, analysis and synthesis of data and information using appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Teamwork
Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking

Working in an international environment *Working in an interdisciplinary environment* *Introduction of innovative research*	*Development of free, creative and inductive thinking ……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.) …….*

- Search, analyze and synthesize data and information, using the necessary technologies
- Promoting free, creative and inductive thinking
- Generating new research ideas
- Critical thinking
- Decision-making
- Group/Teamwork
- Project planning
- Adapting to new situatioms

3. COURSE CONTENT

The course aims to deepen students in ship decarbonisation in accordance with the international objectives for the gradual reduction of greenhouse gases from ships.
Students prepare projects and present them publicly in thematic areas related to the decarbonization of shipping. The assignments are prepared in groups and consist of a written text with scientific references that are presented publicly in class. The work is progressing collaboratively and has a common structure as follows:

1. Technology Description
2. Environmental Performance (Life Cycle)
3. Cost and availability
4. Integration trajectory in shipping (present and forecasts)
5. Technology readiness level
6. Safety
7. Impact on Ship Design and Operation
8. Regulatory restrictions

The solutions under study concern technological transition through alternative forms of energy (wind assisted propulsion, hybrid and full electric ships, nuclear power), alternative fuels (low and zero carbon fuels) and abatement technologies (carbon capture and storage onboard).

4. TEACHING METHODS - ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc..*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Supporting the learning process through presentation of ppt files and audiovisual material. Learning process support through e-class and through Microsoft TEAMS
COURSE DESIGN *Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc. The study hours for each learning activity as well as the hours of selfdirected study are given following the principles of the ECTS.*	

Activity/Method	***Semester workload***
Lectures	10
Project development	80
Study and analysis of bibliography	30
Public presentation	6
Educational visits	4
Essay writing	20
Total	***150***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-*	The assessment includes: Written assignment Public presentation Oral examination

ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc. *Specifically defined evaluation criteria are stated, as well as if and where they are accessible by the students*	

5. SUGGESTED BIBLIOGRAPHY:

-Suggested Bibliography :

- Instructor's notes
- https://www.zerocarbonshipping.com/
- https://www.emsa.europa.eu/we-do/sustainability/environment.html
- Energy Efficiency – Measures and Technologies. DNV publications www.dnv.com/mp
- Energy Transition Outlook – Maritime Forecast 2050. DNV publications www.dnv.com/mp
- Maritime Decarbonisation. Practical Tools Case Studies and Decarbonisation Enablers. Springer 2023. ISBN 978-3-031-39936-7 https://doi.org/10.1007/978-3-031-39936-7
- https://www.clarksons.net/n/#/portal
- https://ww2.eagle.org/en/Products-and-Services/sustainability.html
- https://www.lr.org/en/knowledge/research/fuel-for-thought
- https://globalmaritimeforum.org/decarbonisation/
- https://www.iea.org/energy-system/transport/international-shipping

-Related scientific journals:

- Ocean Engineering Journal https://www.sciencedirect.com/journal/ocean-engineering
- International Journal of Naval Architecture and Ocean Engineering https://www.sciencedirect.com/journal/international-journal-of-naval-architecture-and-ocean-engineering
- Transportation Research Part D: Transport and Environment. https://www.sciencedirect.com/journal/transportation-research-part-d-transport-and-environment
- Journal of Marine Science and Engineering. https://www.mdpi.com/journal/jmse
- Journal of Cleaner Production https://www.sciencedirect.com/journal/journal-of-cleaner-production
- Marine Pollution Bulletin Journal. https://www.sciencedirect.com/journal/marine-pollution-bulletin