COURSE OUTLINE

1. General Info

FACULTY/SCHOOL	Maritime and Industrial Studies		
DEPARTMENT	Maritime Studies		
LEVEL OF STUDY	*Undergraduate*		
COURSE UNIT CODE	NAS 127	**Semester**	8th
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*	General Knowledge, Scientific expertise,
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	English
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.unipi.gr/courses/NAS127/

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*

The course aims to familiarize students with the fundamentals of ship technological performance. The basic principles of Ship Resistance and Propulsion and Internal Combustion Engines (ICE) are described, and conventional and alternative ship propulsion and energy supply systems are presented. The course also aims to provide basic knowledge in relation to (conventional and alternative) marine fuels. Basic knowledge is provided to familiarize students with the area of ship energy efficiency with the available design, technical, functional and market-based solutions for ship energy efficiency. In the practical part, students learn to make calculations of fuel consumption, air emissions and energy efficiency indicators.

Upon successful completion of the course, the student will be able to:

- To understand key parameters that affect the performance of the ship.
- Recognize the (conventional) ship power transmission system and understand alternative propulsion and power transmission systems.
- To have knowledge of the basic principles of Resistance and Propulsion of a ship.
- Apply simple algorithms for fuel consumption and gas emission calculations.
- Understand the regulatory framework structure of international shipping related to ship energy efficiency.
- Know the different categories of energy efficiency and energy transition solutions for ships.

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* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *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

3. COURSE CONTENT

1. **Intro**
   - The ship's power transmission system
   - Basic principles of operation of internal combustion engines (ICE)
   - Conventional and alternative propulsion systems
2. **Basic Principles of Ship Resistance – Propulsion**
   - Ship Resistance Components
   - Effect of resistance on ship performance
   - Power Definitions, Efficiency Coefficients
3. **Marine fuels**
   - Fuel categories and properties
   - Storage/management onboard
   - Specific fuel consumption and air emissions, calculations
   - Alternative fuels
4. **Energy Efficiency – Energy Transition**
   - Design, technical and operational solutions for energy efficiency and energy transition of ships
   - Regulatory framework (IMO, EU)
   - Ship Energy Efficiency Management System (SEEMP)
   - Calculations with energy efficiency indicators (EEDI, EEXI, CII)

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	24
Problem solving/practice	6
Study and analysis of bibliography	20
Project	60
Unguided Study	36
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-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*	Written final exam that includes: 1. Multiple-choice test 2. Short Answer Questions 3. Solving exercises/problems The assessment also includes: 4. Written Assignment 5. Public Presentation

5. SUGGESTED BIBLIOGRAPHY:

-Προτεινόμενη Βιβλιογραφία :

- Instructor's Notes
- Marine Internal Combustion Engines, Hybrid, Electric Power Units, Ship Technology and Systems, 2024, A.L. Polyzakis, Publications PHC, ISBN: 978-618-5731-08-3
- Basic principles of ship propulsion. N. Kyrtatos, 2007. NTUA Notes
- https://www.zerocarbonshipping.com/
- https://www.emsa.europa.eu/we-do/sustainability/environment.html
- Ship Energy Effciency Measures – ABS publication
- Energy Efficiency – Measures and Technologies. DNV publications www.dnv.com/mp
- Energy Transition Outlook – Maritime Forecast 2050. DNV publications www.dnv.com/mp

-Συναφή επιστημονικά περιοδικά:

- 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