Table S2.6.4. Form for the preparation of the course information sheets

Name of the subject: *Ships' Alternative Fuels and Propulsion*

Code of the subject	Status of the subject	Semester	Number of ECTS credits	Class load
	Elective	I	10	3L+1E+0P

Study programme for which it is organized:
Academic Postgraduate Doctoral Studies on Maritime Faculty, Study Programme Maritime Sciences, 3 years (6 Terms), 180 ECTS credits

Dependency by other subjects:
No prerequisites for course enrolment and attending.

Objectives of studying this subject:
The subject aims to teach students about types of alternative marine fuels and perspectives of its use in ships. Also, it is foreseen to teach students about types and functioning principles of alternative ship propulsion plants.

Contents of the subject (teaching units, forms of students' individual work, forms of testing) presented per working weeks in the academic calendar:

Preparatory week	Preparation and semester enrolment.
I week	Introduction to marine fuels. Use of alternative fuels in shipping sector.
II week	Biofules. Biodiesel. Quality standards for biodiesel. Resources for production of biodiesel. Production of biodiesel. Perspectives of use of biodiesel in shipping. Storage and transport of biodiesel.
III week	Biofuels. Bioethanol. Resources for production of bioethanol. Production of bioethanol. Perspectives of use of bioethanol in shipping. Storage and transport of bioethanol.
IV week	Biofuels. Bio-methanol. Resources for production of bio-methanol. Production of bio-methanol. Perspectives of use of bio-methanol in shipping. Storage and transport of bio-methanol.
V week	LNG. Physical properties of LNG. Perspectives of use of LNG in shipping. Storage and transport of LNG.
VI week	Other alternative marine fuels in use in ships.
VII week	**Seminar paper I.** Instructions for preparation of Seminar paper.
VIII week	Introduction to ship propulsion plants. Use of alternative ship propulsion plants.
IX week	Dual fuel ship engines. Perspectives of DF ship engines in shipping.
X week	Spark gas ship engines. Perspectives of DF ship engines in shipping.
XI week	Electrical propulsion plants for ships.
XII week	Hybrid propulsion plants for ships.
XIII week	**Seminar paper II.**
XIV week	Use of Wind propulsion systems on ships.
XV week	Use of Solar propulsion systems on ships.

Methods of education:
Lectures, seminar papers, practical exercises, learning, performing individual practical exercises, debates, consultations.

Students' load

Weekly	In Semester
10 credits x 40/30 = 13hours + 20 minutes **Structure:** **3** hours of lectures **1** hours of exercise **0** hours of practical work **9** hours 2**0** minutes of individual work, including consultations	**Teaching and the Final Exam:** 13h + 20 min. x 16 = 199h + 30 minutes **Necessary preparation before Term starting (admin., enrolment, verification):** 2 x (13h + 20 min) = 26h + 40min **Total hours for the course:** 10 x 30 = 300h **Additional hours for preparing correction of final exam, including the taking of the exam:** 0 do 73h and 50 minutes **Structure of the students' duties: 199**h + 20 min.(lectures) + 26h + 40min + 73h and 50 minutes(additional work)

Students' obligations during the teaching:
Students are required to attend classes (lectures and exercises) and to take Preliminary Exams and the Final Exam.

Literature:

1. Gajendra Babu i Subramanian, Alternative transportation fuels, ISBN 978-1-4398-7282-6, 2013 by Taylor & Francis Group, LLC.
2. D. Woodyard, Pounder's Marine Diesel Engines and Gas Turbines (9th Edition) ISBN 978-0-7506-8984-7.
3. Diesel Engines For Ship Propulsion And Power Plants Volume I & II. K. Kuiken Target Global Energy ISBN 978-90-79104-02-4.

Learning outcomes (complied with the outcomes for the study programme):

1. Identify and classify the types of alternative marine fuels;
2. Define resources, production processes and essential characteristics of alternative marine fuels;
3. Identify and classify the types of alternative ship propulsion plants;
4. Define the functioning principles of alternative ship propulsion plants;
5. Correlate alternative marine fuels and ship propulsion plants.

Forms of tests and evaluation:

1. Seminar paper I, from 0 to 25 points.
2. Seminar paper II, from 0 to 25 points.
3. Final exam, 0 to 50 points.

Passing mark is obtained if the student collects at least 50 points.

Name and surname of teacher and associate:

Phd. Danilo Nikolić, teacher – Full professor

Particularities needed to be emphasized for the subject:

Note (if needed):