U N I V E R S I T Y O F S P L I T

FACULTY OF ELECTRICAL ENGINEERING, MECHANICAL ENGINEERING AND NAVAL ARCHITECTURE

DETAILED PROPOSAL OF THE STUDY PROGRAMME

GRADUATE UNIVERSITY STUDY NAVAL ARCHITECTURE

SPLIT, March 2017.

CONTENTS

GENERAL INFORMATION OF HIGHER EDUCATION INSTITUTION

Name of higher education institution	Faculty of electrical engineering, mechanical engineering and naval architecture
Address	Ruđera Boškovića 32, Split
Phone	021 305 777
Fax	021 305 776
E-mail	dekanat@fesb.hr
Internet address	http://www.fesb.hr

GENERAL INFORMATION OF THE STUDY PROGRAMME

Name of the study programme	Naval Architecture		
Provider of the study programme	Faculty of electrical engineering, mechanical engineering and naval architecture		
Other participants	-		
Type of study programme	Vocational study programme ☐	University study programme ☒	
Level of study programme	Undergraduate ☐	Graduate ☒	Integrated ☐
	Postgraduate ☐	Postgraduate specialist ☐	Graduate specialist ☐
Academic/vocational title earned at completion of study	Master of engineering in Naval Architecture; mag. ing. nav. arch.		

1. INTRODUCTION

1.1. Reasons for starting the study programme

The proposed Master of Science programme in Naval Architecture is a study that is an extension to already existing Bachelor programme in Naval Architecture at FESB. The interest of students and industry for this study is large, since almost all the students wish to forward to master level and industry lacks more educated professionals. This is a conclusion from student surveys, held every year at FESB, as well as their feedback, once they enter the labor market. The industry lacks this profile of engineers since there has not been unemployed naval architects for years in Split-Dalmatia County, according to the reports of the Employment Bureau (https://statistika.hzz.hr). Experience at FESB, for years now, shows that almost all of the naval architecture students at undergraduate study (Bachelor level) have been approached during study by some shipbuilding or other companies in the field, so once they finish study they actually don't enter the labor market but start working immediately upon graduation.

However this level of education has shown to be deficient for industry and the continuous and rapid development of naval architecture, as well as continuous improvement of human knowledge require the matching process in education. In development of teaching process and curricula at FESB, the worldwide trends in higher education as well as industry needs are being actively monitored. Advanced concepts, methods and technologies, such as finite element method, computational fluid dynamics, 3D geometry modeling, structural reliability, advanced materials and technologies, which until recently had only been in development, have just become part of common engineering practice, primarily due to the rapid development and the increased application of computers. Modern naval architects must have a deep understanding of specific naval topics such as stability, seakeeping, maneuverability, resistance and propulsion, modeling and analysis of ocean waves and loads and the design of all types of vessels and floating structures. In order to acquire the necessary knowledge and apply new methods and concepts master naval architect must possess considerable knowledge of mathematics and basic engineering sciences such as structural mechanics and fluid mechanics. All of the above is included in a comprehensive graduate study program of Naval Architecture and aims to ensure that the future masters of naval architecture will be quality professionals in their field and will be able to respond to current and future requirements of the profession. By studying this program they will develop skills of critical and creative thinking to solve new and complex problems, the skills of independent and team work abilities taking a stand and taking responsibility and ability to make professional and business decisions at all levels of decision-making. The proposed study aims to educate engineers for the shipbuilding industry, maritime industry as well as for state and public institutions.

1.2. Relationship with the local community (economy, entrepreneurship, civil society, etc.)

Split is a strong industry and university center of Split-Dalmatia County with eight large and medium-sized shipyards, Croatian Register of Shipping, dozens of manufacturers of small boats, yachts and sailboats as well as equipment manufacturers. Most of them require

knowledge and skills of naval architects offered in the proposed graduate study. Additionally a number of companies is linked to the shipbuilding industry in various ways (material manufacturers, fishing industry, etc.) and also in need of qualified professionals. The situation in the labor market resulted with the fact that the capacity of undergraduate study of naval architecture at FESB has been filled for several years in a row. In the recent years the local industry expressed a special interest in so-called small shipbuilding (design and production of boats, yachts and sailboats), resulting in students often enrolling elective courses that are in any way associated with this industry.

The Development Strategy of Split-Dalmatia County highlights a need to create measures for the preservation of existing industries and encourages attracting of new large investors, particularly in the field of shipbuilding. The Strategy points out that one of the most important contributors to the regionals' income is production of small boats with a share of 6.2%. The Strategy adds that "It (shipbuilding) should be considered to be a significant part of gross value added in other industries (plastics production, fishing industry, and others.), so it has a multiplier effect, with more broader importance than just share in GVA ". In the Strategy the shipbuilding industry ("large" and "small'') is also highlighted as the most important activity regarding the number of employed people with 4,475 workers and a market share of 24.9% in the total number of labor force in the county.

The SWOT analysis presented in the Strategy highlights the opportunity, "the increase in demand for specialized types of ships suits our shipyards because of the quality production and this gives advantages over the competition." The same analysis also defines the threat: "Non-compliance of education programs with the needs of the labor market (shortage of certain educational programs and insufficient quality of existing programs)."

The Strategy recognizes the problem of regional economic development "except in the area of exports of ships, the county's economy has negligible value of exports of goods of medium and high level technology" and developmental needs "…to encourage the development of clusters or functional linkage between industry and education as well as cooperation with scientific research institutions."

As a major strategic goal County highlights the development of competitive economy, and as a priority it points out creation of a competitive knowledge-based system. One of the measures is the development of clusters, including the Shipbuilding Cluster. The second strategic goal is human resource development and increasing the quality of life with one of the measures - to relate educational programs with the new needs of the economy and with the expected result of the development models, i.e. to encourage students to study the natural sciences and engineering.

The proposed graduate university study Naval Architecture would be the only program of its kind in the region and aligned with the Development Strategy of Split-Dalmatia County.

1.3. Compatibility with requirements of professional organizations

There is no official naval architecture professional organization in Croatia. This study programme is accordance with preliminary defined education standards and occupations proposed by recently formed Professional group of shipbuilding, mechanical engineering and metal processing industry and members of the Naval Architecture Department at FESB regularly participate in group's work.

1.4. Name possible partners outside the higher education system that expressed interest in the study programme

FESB has signed agreements on cooperation in the promotion of scientific and educational activities and has implemented joint projects with a number of organizations from the business and public sectors such as: Brodosplit Shipyard (DIV Group), Brodotrogir Shipyard, Split Technology Centre, Adria Winch, AD Boats, Adria-Mar, Croatian Register of Shipping, Damor, Adriaprop, Manas, Ericsson Nikola Tesla, HEP, Split-Dalmatia County, The Department of Defense, Energy Institute "Hrvoje Pozar", Croatian Academic and research Network - CARNet, Siemens, Microsoft Hrvatska, HSTec, Solvis, Odašiljači i veze, Manas, etc.

1.5. Financing

The study will be funded by The Ministry of Science, Education and Sports of Croatia.

1.6. Comparability of the study programme with other accredited programmes in higher education institutions in the Republic of Croatia and EU countries

Scientists and teachers from the FESB are actively involved in numerous national and international projects that contribute to the development of scientific knowledge in shipbuilding and other fields and have a good cooperation with renowned national and international research institutions. The study of Naval Architecture at the Faculty is organized according to the Bologna principles and should have three stages: undergraduate, graduate and post-graduate, with all the courses valued according to the ECTS system. The proposed graduate university study of Naval Architecture is a continuation of the existing undergraduate study and aims that students acquire theoretical, practical and professional knowledge and competences for lifelong acquisition of new knowledge and skills in the field of naval architecture and marine engineering. The scheme of this study has been suggested based on the analysis of studies of Naval Architecture in Croatian and European universities and in accordance with the needs of modern shipbuilding industry and particularly Croatian shipbuilding industry. The study program complies with the Croatian Qualifications Framework Law and the development of the curriculum has been guided by the recommendations of the Agency for Science and Higher Education (AZVO) as well as recommendations of international professional associations (SNAME, etc.) and accreditation agencies ASIIN, SEFI and others. The program's content and competencies, as well as the application of modern teaching methods, is in some parts comparable to studies of naval architectures and marine engineering at Croatian (Zagreb, Rijeka) and prestigious European universities like, KTH - Royal Institute of Technology, Sweden (www.kth.se) and University of Southampton, Great Britain (http://www.southampton.ac.uk).
The programme is structured in 4 semesters distributed during two year study. The mandatory courses present the core of the study and contain the fundamental engineering knowledge and skills for this level of education as well as specific naval architecture topics.

The programme offers a number of elective courses, which in terms of volume (number of credits), make up more than two-thirds of the study. With assistance of teachers the students can choose a set of elective courses, according to their personal interest and preferences, which will provide deeper, specialist, knowledge in specific naval architecture areas like ship design, marine hydrodynamics, marine structures or small shipbuilding. The last, fourth semester is intended for making master thesis, the subject of which is coordinated with the chosen set of elective courses.
The content and organization of the programme, modeled based on the similar programs at universities in the EU, insures that after graduation the students will have all the necessary knowledge and competences of a master of science in naval architecture and they will be able to shape their specialist profile.

1.7. Openness of the study programme to student mobility (horizontal, vertical in the Republic of Croatia, and international)

The FESB has passed the Quality Assurance Manual, which defines mobility and international cooperation including criteria and conditions of student transfer from related study programs. Conducting mobility falls under the Rules of the international mobility of students, teaching and non-teaching staff and the faculty provides conditions for mobility of students in the European higher education area (Erasmus, Erasmus Mundus, CEEPUS, etc.). In accordance with the relevant personal preferences and orientations, students can pursue postgraduate and related studies, primarily engineering and the FESB and other faculties in Croatia. Vertical mobility at FESB includes openness to postgraduate studies of marine technology or mechanical engineering. Graduate students can also continue to doctoral studies of naval architecture at universities at Zagreb and Rijeka or at the universities in the EU. In terms of horizontal mobility the graduate university study of naval architecture is open to student mobility between similar studies in Croatia. Students will be allowed to study part of the program (1 or 2 semesters) at one of the relevant institutions in Croatia or abroad, in accordance to the Bologna system of studying, within the ERASMUS program or similar programs for student mobility. Compliance of the proposed program with the ECTS points system, the Croatian Qualifications Framework Law as well as the recommendations of the Bologna and accreditation agency ASIIN, allows a clear recognition of qualifications that students get by studying graduate study of naval architecture at FESB, which enables their mobility to domestic and foreign universities.

1.8. Compatibility of the study programme with the University mission and the strategy of the proposer, as well as with the strategy statement of the network of higher education institutions

Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture passed the Development Strategy, at the Faculty Council meeting held on 2nd November 2011. The strategy complies with the development strategy of the University of Split, which is the basic document of the University. The Strategy Development of FESB is available on https://www.fesb.hr/o-fakultetu/dokumenti (in Croatian). Faculty Development Strategy

represents the basic document of the Faculty in which are clearly described some of the key tasks for further development, indicated the persons responsible, deadlines and performance indicators for each task.
The Faculty coordinates its activities with modern trends, which consists of a continuous and systematic improvement of all areas of action: the establishment, organization and implementation of study programs. The Strategy is based on the Development strategy of the University, taking into account its own specificities. Both The strategy of the FESB and the university are in accordance with the requirements of the University Network of higher education institutions and study programs in Croatia. The proposed programme is in accordance with the Strategy of the Faculty and additionally it has been modeled after similar studies in the EU, taking into consideration our specificities.
Graduate university study Shipbuilding in also accordance with the Strategy of University of Split for period 2015 - 2020 (mission, vision and strategic direction). The mission and vision of the University of Split in setting strategic goals have been guided by the following strategic documents:
• European strategy for smart, sustainable and inclusive growth in Europe 2020,
• Strategic documents of the European Research Area (EuropeanResearchArea ERA),
• Strategic documents of the European Higher Education Area (EuropeanHigherEducationArea, EHEA)
• Strategy for Education, Science and Technology Croatian.
This curriculum is aligned with the strategic document network of higher education institutions and study programs in the Republic of Croatia, which encourages establishing study programs in the STEM area.

1.9. Current experiences in similar study programmes

FESB has more than 50 years of experience in teaching undergraduate, graduate and doctoral programs. Faculty of Electrical Engineering in Split was founded in 1960 when it had established a first graduate program of Electrical engineering. In 1968. the study programme of Naval Architecture had started, having, initially, only four semesters of undergraduate level. The programs have been upgrading and expanding and The Faculty became the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB) in 1974 with graduate study in Mechanical engineering and undergraduate study in Naval Architecture. Since 1979. the faculty has been carrying out vocational study in naval architecture in parallel with undergraduate study. That is a professional study, which is more practice oriented in contrast to more research and scientific oriented undergraduate study. Since 2013. the professional study was extended to 3 years/6 semesters (180 ECTS points) – the same as the undergraduate study. Continuous work on the development of curricula resulted in the organization of a number of academic programs at the undergraduate, graduate and postgraduate studies. The current curriculum of undergraduate study of naval architecture was adopted in 2000. and includes 6 semesters. It has been upgraded by a number of elective course and coordinated with Bologna declaration (in 2005.) as well as Croatian laws, regularly over the years. Upon completion students are awarded with the title Bachelor of Naval Architecture. Student may continue to Master programme in Naval Architecture at University of Rijeka and University of Zagreb. So far, 86 students completed

professional studies and another 38 completed the study after adaptation according to Bologna declaration. 29 students have finished the undergraduate study since Bologna introduction. A number of students forwarded to master studies of naval architecture in Rijeka or Zagreb, but a number of them, particularly from vocational studies, continued to Master programme of Mechanical engineering at FESB. One of the main reasons for continuing to mechanical engineering was the lack of interest for traditional naval architecture studies in Rijeka and Zagreb. The proposed programme is strongly related to student interests, which in turn are related to labor market demands. On FESB all the conditions for the realization of graduate study of Naval Architecture are met; the required number of teachers and support staff with the appropriate scientific and professional qualifications and ensured adequate space and equipment to meet the needs of quality studying.

2. DESCRIPTION OF THE STUDY PROGRAMME

2.1. General information

Scientific/artistic area of the study programme	Technical sciences
Duration of the study programme	2 years (4 semesters)
The minimum number of ECTS required for completion of study	120
Enrolment requirements and admission procedure	Undergraduate degree in Naval architecture at the FESB or Naval architecture studies at other universities in Croatia and abroad with acquired at least 180 ECTS credits. In some cases it will be mandatory to enroll and pass specific courses defined by faculty's committee, prior to enrolling Master study...

2.2. Learning outcomes of the study programme

The learning outcomes of the programme are linked directly with the learning outcomes of individual courses. The learning outcomes and competences are in accordance with the Croatian Qualifications Framework Law.

KNOWLEDGE AND UNDERSTANDING

1. Apply relevant scientific principles and relevant engineering methods for formulating, analyzing and solving engineering problems.
2. To demonstrate a broad knowledge and understanding of naval architecture topics and significantly deepened knowledge in certain areas of the field.
3. Analyze and solve problems with scientific approach, including problems incompletely defined with conflicting specifications / requirements.
4. Recognize, summarize and formulate complex problems arising from the new information in the field of naval architecture.
5. Develop new and innovative products, processes and methods.
6. Identify, find and retrieve the required information.
7. Criticize and evaluate different technical solutions and a variety of design options for systems and components.
8. Explore and evaluate the application of modern technologies and emerging technologies.
9. Introduce themselves fast and focused with new and unfamiliar information.
10. Assess the applicable techniques based on acquired knowledge and argue their limits.
11. Identify non-technical effects of engineering activities and integrate them into the work activities in a responsible manner.

12. Demonstrate an insight into current research and development in the field of naval architecture.

SKILLS (COGNITIVE, PSYCHOMOTORIC, SOCIAL)

13. The ability to, from a holistic perspective, critically, independently and creatively identify, formulate and deal with complex problems in naval architecture.
14. The ability to plan, organize and perform, using appropriate methods and tools, advanced tasks within specified parameters and to evaluate this work.
15. The ability to analyze and evaluate the complex phenomena and problems and to model, simulate and predict solutions even on a basis of limited information.
16. The ability to manage complex environmental conditions by changing decisions and developing new methods.
17. Capability to imagine, design and make small marine vehicles.
18. Value the effectiveness of the experiment to solve problems.
19. Ability to involve in multidisciplinary teamwork and contribute to teamwork and cooperation in groups of different composition in unpredictable conditions,
20. Ability to analyze and reasonably debate on the conclusions of completed tasks and the knowledge on which the conclusions are based, and also in writing, in national and international context, with different social and professional groups.

SELF-SUFFICIENT (INDEPENDENCE)

21. The ability of self-contained anticipation and decision-making on complex issues in the main field of study, taking into account relevant scientific, economic, social, environmental and ethical aspects.
22. The ability of independent project management in the field of naval architecture.
23. The ability to independently plan and implement appropriate methods within given framework and restrictions in unpredictable conditions.

RESPONSIBILITY

24. The ability to assume personal responsibility in individual and teamwork for the successful execution of tasks.
25. The ability to identify the possibilities and limitations of science and technology and the future needs for knowledge in the field of naval architecture by taking responsibility for the continuous updating of personal knowledge and improving skills.
26. To demonstrate professional and ethical responsibility in the unpredictable conditions.

2.3. Employment possibilities

The need for professionals with competencies covered in this programme are considerably larger than the number of educated professionals, both in the region and in the whole of

Croatia. According to the statistics of the Croatian Employment Bureau, in the period from 2000. to 2015, the number of unemployed naval architects has constantly been very small, usually only a few every year. According to the FESB's research most students of naval architecture find a job immediately after graduation.

2.4. Possibilities of continuing studies at a higher level

After completing the Master of Science programme in Naval Architecture at FESB students may continue their education on doctoral studies of Mechanical Engineering at FESB, track Marine Technology.They are eligible to enroll doctoral study of Naval Architecture at the Faculty of Mechanical Engineering and Naval Architecture in Zagreb or at the Faculty of Engineering.

2.5. Name lover level studies of the proposer or other institutions that qualify for admission to the proposed study

Students of undergraduate study of Naval Architecture at FESB have no additional requirements. Students of undergraduate study of Mechanical Engineering and undergraduate study of Industrial Engineering at FESB are required to take elective course Introduction to Naval Architecture in the 1st semester of master programme.

2.6. Structure of the study

The study is organized in semesters and lasts 4 semesters, two semesters per academic year. Each semester has 30 credits.
Program ends with the defense of thesis. Admission items are listed in the table of each case. Lectures (L) are conducted in groups of up to 100 students, auditory exercises (AE) and seminars (S) in groups of 30 students, and laboratory exercises (LE) in groups of 10 students, and construction exercises (CE) in groups of 6 students.
The study has a set of core courses that provide with necessary knowledge in application of advanced engineering topics with addition of project management course. The study offers a deeper knowledge and a strong focus, through a number of elective courses, in the various topics: marine hydrodynamics and propulsion, marine structures, ship design, boat and craft design and production. In addition there is a number of elective courses that can broaden knowledge in the field including subjects like electrical systems, equipment, mechatronics, vibrations, maintenance, etc. The intention is to offer the structure of the study that is flexible with a variety of specialization, while maintaining a common framework which ensures that all the aspects of the profession are covered.

2.7. Guiding and tutoring through the study system

During his studies, students have access to all services of the Faculty. In order to timely and effective information students are sent notices and information via e-learning portals.

2.8. List of courses that the student can take in other study programmes

Students may enroll mandatory and/or elective courses from other graduate studies at FESB. The list of available courses is compiled, for every academic year, by the FESB's Committee for Mechanical Engineering, Naval Architecture and Industrial Engineering studies, Also, students may, optionally, enroll courses from other studies at FESB, above the regular load of 30 ECTS points per semester.

2.9. List of courses offered in a foreign language as well (name which language)

Defined for each course individually (in the course table).

2.10. Criteria and conditions for transferring the ECTS credits

Transfer and recognition of credits may be transferred among different university or professional studies. Criteria and conditions of ECTS credits transfer are regulated in document *Pravilnik o studijima I sustavu studiranja na Sveučilištu u Splitu* (in Croatian).

2.11. Completion of study

Final requirement for completion of study	Final thesis ☐ Diploma thesis ☒	Final exam ☐ Diploma exam ☐
Requirements for final/diploma thesis or final/diploma/exam	The condition for entry degree thesis is realized by achieving 60 ECTS credits.	
Procedure of evaluation of final/diploma exam and evaluation and defense of final/diploma thesis	Thesis Committee evaluates thesis and a public defense before the Panel on the defense of thesis.	

2.12. List of mandatory and elective courses

List of courses								
Year of study: 1								
Semester: 1								
STATUS	CODE	COURSE	HOURS IN SEMESTER					ECTS
			L	S	AE	LE	CE	
Mandatory		Marine engines	30	0	30	0	0	6
	FESL10	Finite element method	30	0	15	0	15	5
	FETJ01	Project management	30	0	30	0	0	4
		Special materials and shipbuilding technologies	30	0	0	30	0	5
	Total		120	0	75	30	15	20
Elective		Ship computational geometry	30	0	0	15	0	5
	FESL01	Fluid flow	30	0	15	15	0	5
		Marine electrical engineering	30	0	0	15	0	5
		Wooden ships	30	0	0	0	30	5
	L = lecture, S = seminar, AE = auditory exercise, LE = laboratory, CE = constructive exercise							
	The students have to choose two electives.							

	List of courses								
	Year of study: 1								
	Semester: 2								
STATUS	CODE	COURSE	HOURS IN SEMESTER					ECTS
			L	S	AE	LE	CE	
Mandatory		Mechanics of ship structure	45	0	30	0	0	7
		Marine hydrodynamics	45	0	15	15	0	8
	Total		90	0	45	15	15	15
Elective		Sailboats	30	0	0	0	15	5
		Computational fluid dynamics	30	0	30	0	0	5
		Composite ships	30	0	0	15	0	5
		Mechanics of composite materials	30	0	30	0	0	5
		Shipyard design	30	0	30	0	0	5
	FESL05	Optimization methods	45	0	0	15	0	5
	L = lecture, S = seminar, AE = auditory exercise, LE = laboratory, CE = constructive exercise								
	Students choose three elective courses.								

List of courses								
Year of study: 2								
Semester: 3								
STATUS	CODE	COURSE	HOURS IN SEMESTER					ECTS
			L	S	AE	LE	CE	
Mandatory		Ship design	45	0	0	15	0	8
	Total		45	0	0	15	0	8
Elective		Hydrodynamics of high-speed ships	30	0	0	30	0	6
		Boat production	30	0	30	0	0	6
		Advanced marine vehicles	30	0	0	15	0	4
		Marine propulsors	30	0	0	30	0	6
		Boat and craft equipment	30	0	0	15	0	4
		Ship structural analysis	30	0	30	0	0	6
		Safety of marine structures	30	0	30	0	0	6
	FETL04	Maintenance	45	0	0	15	0	5
		Vibrations and vibration control	30	0	0	30	0	6
	L = lecture, S = seminar, AE = auditory exercise, LE = laboratory, CE = constructive exercise							
	Students choose 22 ECTS points in elective courses. Students may enroll, as an elective course, any available mandatory and/or elective course of the same level available according to the annual plan.							

List of courses								
Year of study: 2								
Semester: 3								
STATUS	CODE	COURSE	HOURS IN SEMESTER					ECTS
			L	S	AE	LE	CE	
Obvezni	FEXX02	Master thesis						30
	Total							
	L = lecture, S = seminar, AE = auditory exercise, LE = laboratory, CE = constructive exercise							
	There is no electives.							

2.13. Course description

NAME OF THE COURSE	Advanced marine vehicles						
Code		Year of study	2				
Course teacher	Branko Blagojević	Credits (ECTS)	4				
Associate teachers	Josip Bašić	Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	0	15	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Introduction to the specific issues of various kind of advanced marine vehicles, including hydrofoils, SWATH, ACV, SES, WIG and underwater vehicles.		
Course enrolment requirements and entry competences required for the course	Marine hydrodynamics. Mechanics of ship structure.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Illustrate specific features of advanced marine vehicles including hydrofoils, SES, ACV, SWATH, WiG and submersible vehicles. – Estimate the resistance, propulsive power required and weight distribution in the early stages of the project (individual project task). – Integrate the technical concepts as well as scientific methods and approaches adopted during the study in the design of an advanced vehicle (project task). – Argue (defend) estimated operational properties and their feasibility for a chosen kind of advanced vehicle for a specific purpose (project task). – Discuss the role, scope and limits of the rules of classification societies and other regulations in the design of an advanced marine vehicles.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	
	Introduction. Overview of types of advanced marine vehicles. Categorization. Project process. Project space. Von Karman Gabrielli diagram.	2	
	Catamarans and multihulls: properties, advantages and disadvantages.	2	
	Hydrofoils: properties, advantages and disadvantages.	2	
	SWATH: properties, advantages and disadvantages.	2	
	ACV and SES: properties, advantages and disadvantages.	2	
	Other types of advanced vehicles: WiG, ROV, AUV.	2	
	Rules of classification societies and other regulations and the application in the design of advanced vessels.	2	
	Loads. Hydroelastic effects.	2	
	Hull materials. Structural arrangement.	2	
	Design approach.	2	
	Specific issues: stability, resistance, seakeeping.	2	
	Types of propulsion and machinery in advanced marine vehicles.	2	
	Efficiency of the propulsion system.	2	
	A visit to design office.	2	

	A visit to shipyard.	2	
	Project work with (CFD/computer lab).		15

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ individual assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☒ individual project (other)
Student responsibilities	Finished project task.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	2	Research	0,5	Practical training	
	Experimental work		Report		Individual work	1
	Essay		Seminar essay		Lab exercises	
	Tests		Oral exam	0,5		
	Written exam		Project	2	(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment is carried out during class lectures and exercises. Each student receives a project assignment, which may be a separate project task or part of a larger project. Work on the project includes independent work and research. Results of the project is handed over to digital form and presented (oral exam). At the presentations, all students enrolled in the course are involved in discussion and their knowledge is evaluated. Exam: presentation and oral defense of the project.

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Blagojević B. Advanced marine vehicles and high-speed ships. Textbook/lecture notes, FESB 2014.		www.fesb.hr/elearning
	McKesson CB. The Practical Design of Advanced Marine Vehicles. College of Engineering, University of New Orleans, 2009.		Internet

Optional literature (at the time of submission of study programme proposal)	– Dubrovsky V, Matveev K, Sutulo S. Small Waterplane Area Ships. ISBN13: 978-09742019-3-1. – Dubrovsky V. Ships with Outriggers. isbn 0-9742019-0-1. – Dubrovsky VA, Lyakhovitsky AG. Multi-Hull Ships. ISBN 09644311-2-2. – Burcher R, Rydill L. Concepts in Submarine Design. Cambridge University Press, Ocean Technology Series 2, 1994. ISBN: 0 521 41681 7. – Literature depending on a project task.
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.
Other (as the proposer wishes to add)	Available in English language.

NAME OF THE COURSE	Boat production						
Code		Year of study	2				
Course teacher	Boris Ljubenkov	Credits (ECTS)	5				
Associate teachers		Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	30	0	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Objective of the course is to introduce students with basic knowledge about production process of small ship.		
Course enrolment requirements and entry competences required for the course			
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	– Describe methods for boat production (small ship production). – Define machines, tools and transport devices in a workshop and define their arrangement and material flows. – Design workshop for small ship production. – Question survey methods and procedures for boat production. – Make technological documentation for small ship building and estimate costs. – Suggest the best material and building technology for a given project based on economic and environmental issues.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	
	Definition of small ship.	2	
	Classification rules and regulations for small ship building	4	
	Small ship building technology. Usage of different building materials.	8	
	Shipbuilding production process design.	6	
	Arrangement of working areas in a workshop for small ship production. Material flows.	4	
	Arrangement of working areas in a workshop for small ship repair.	2	
	Survey methods and procedures during the ship building or ship repair.	2	
	Content		AE hours
	Shipbuilding workshop concept design. Input information.	2	
	Calculation methods for necessary technological equipment, working areas and areas of interim products store calculation	10	
	Make drawings of the workshop for small ships building	8	
	Project costs estimation	6	
	Project presentation and corrections	4	

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work		☒ individual assignments ☒ multimedia ☐ laboratory ☐ work with mentor ☐ individual project (other)			
Student responsibilities	Class attendance, tests, project presentation and oral exam.					
Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	1	Research		Practical training	1
	Experimental work		Report		Individual work	
	Essay		Seminar essay		Lab exercises	
	Tests	1	Oral exam	1	(Other)	
	Written exam		Project	1	(Other)	
Grading and evaluating student work in class and at the final exam	Continuous assessment during class. Two tests during the semester. Examination: oral exam					

	Title	**Number of copies in the library**	**Availability via other media**
Required literature (available in the library and via other media)	Rules of the classification societies		internet
	Markovina, R.: Posebni materijali i tehnologije gradnje u maloj brodogradnji, predavanja, FESB, 2008.	1	
	Ljubenkov, B.: Konstrukcija kompozitnih brodova- materijali i tehnologije gradnje, interna skripta, FESB, 2015.	1	
Optional literature (at the time of submission of study programme proposal)	– Mavrić, I.: Osnivanje brodogradilišta, skripta, FSB Zagreb		
Quality assurance methods that ensure the acquisition of exit competences	Student survey in order to evaluate teachers. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.		
Other (as the proposer wishes to			

add)	

NAME OF THE COURSE	Boat and craft equipment						
Code		Year of study	2				
Course teacher	Boris Ljubenkov	Credits (ECTS)	4				
Associate teachers		Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	0	15	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Objective of the course is to introduce students with basic knowledge about outfit elements and systems on a small ship.		
Course enrolment requirements and entry competences required for the course			
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	– Explain outfit characteristics for different kind of small ships. – Make drawings of small ship equipment systems. – Specify equipment for a specific small ship according classification society rules and regulations (project). – Choose a special equipment for a special craft type.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	
	Classification rules and regulations for small ship equipment.	4	
	Characteristics of anchoring and mooring equipment.	2	
	Characteristics of rescuing equipment.	2	
	Characteristics of steering equipment.	2	
	Characteristics of fire protection equipment.	2	
	Characteristics of navigation and communication equipment.	2	
	Characteristics of superstructure outfitting.	2	
	Fishing boats equipment.	4	
	Sailing boats equipment.	2	
	Yachts equipment.	2	
	Firefighting ship equipment.	2	
	Reconstruction and maintenance of the traditional wooden ship	4	
	Content		LE hours
	Classification rules and regulations for small ship equipment. Outfitting of the small ship – project.		2
	Small ship equipment specification.		6
	Make drawings of small ship equipment systems		6
	Project presentation		1

<table>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ on line in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☒ individual assignments
☐ multimedia
☐ laboratory
☐ work with mentor
☒ individual project (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Class attendance, tests, project presentation and oral exam.</td></tr>
<tr><td rowspan="6">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td>1</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Lab exercises</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td>1</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td>1</td><td>(Other)</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continuous assessment during class. Two tests during the semester. Examination: oral exam</td></tr>
<tr><td rowspan="5">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="3">Nicolson I.: The Boat Data Book, 6th edition, Adlard Coles Nautical, 2009., London</td><td>1</td><td colspan="2"></td></tr>
<tr><td colspan="3">Ask T.: 'Handbook of Marine Surveying, 2nd edition, Sheridan House, 2007., London</td><td>1</td><td colspan="2"></td></tr>
<tr><td colspan="3">Rules of the classification societies</td><td>1</td><td colspan="2">internet</td></tr>
<tr><td colspan="3"></td><td></td><td colspan="2"></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">Pike D.: Fishing Boats and their Equipment, 3rd edition, Blackwell Science, 1992.
Delić, S.: Oprema krstaša, Bibiloteka more, 2008., Zagreb
Naujok M.: Boat Interior Construction, Sheridan House Inc., 2002., SAD</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">Student survey in order to evaluate teachers. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

NAME OF THE COURSE		Composite ships					
Code		Year of study	1				
Course teacher	Branko Blagojević	Credits (ECTS)	5				
Associate teachers	Klement Jadrešić	Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	0	0	15
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION			
Course objectives	Introduce students to the function of ship structural components made of composite materials. Introduction to methods for dimensioning composite made structural elements and structure as whole, taking into account the rules of classification societies and other regulations and standards.		
Course enrolment requirements and entry competences required for the course			
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Assess strength of composite structure for various types of ships and boats, either single skin or sandwich structure, using the rules of classification societies and other standards (e.g. ISO) as well as FEA software and compare results. – Select the hull material for a particular ship (project task), taking into account all relevant factors including the long-term cost-effectiveness and impact on the environment. – Criticize structural arrangement of a given composite ship from a structural strength point of view. – Discuss the function and interaction of composite structural components.		
Course content broken down in detail by weekly class schedule (syllabus)	Introduction. Overview and examples of built composite ships.	L hours	CE hours
	Description of typical composite ship structural elements. Sketches and drawings for various kind of vessels.	2	
	Basic theory of mechanics of composite materials.	2	
	Loads on ship structure.	2	
	Application of composite beams and girders in ship structure. Loads and failure modes.	2	
	Single-skin panels. Loads and failure modes.	2	
	Sandwich panels. Loads and failure modes.	2	
	Overview of the procedures and design methods of classification societies.	2	
	ISO standards for ships up to 24m.	2	
	Safety factors.	2	
	Comparison of composite and metal structures of a fast ship (steel, aluminum). Advantages and disadvantages.	2	
	Material selection. Seminar/workshop.	2	
	Structural arrangement. Seminar/workshop.	2	
	Design approach for fast ships. Seminar/workshop.	2	
	A visit to design office/shipyard	4	
	Work on the project task – teachers' assistance (lab/classroom).		15

<table>
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☒ exercises
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☐ partial e-learning
☒ field work</td><td colspan="3">☒ individual assignments
☐ multimedia
☐ laboratory
☐ work with mentor
☒ individual project (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Class attendance. Finished project task.</td></tr>
<tr><td rowspan="6">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>0,5</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Lab exercises</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td>0,5</td><td></td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td>2</td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continuous assessment is carried out during lectures, exercises, seminars, and through consultations with regard to resolving project issues. The project task (preliminary structural design of composite ship) is submitted in digital form. Examination: oral presentation/defense of the project.</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="3">Blagojević B. Structural design of composite ships (in Croatian). Textbook/Lecture notes, FESB, 2012.</td><td></td><td colspan="2">www.fesb.hr/elearning</td></tr>
<tr><td colspan="3">Rules of the classification societies</td><td></td><td colspan="2">Internet</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">– Shenoi A. Composite Materials in Maritime Structures. Vol.I and Vol.II, Cambridge University Press, 1993.
– Zenkert D. An Introduction to Sandwich Structures. Student Edition. KTH Stockholm. 2005.
– Gerr D. The Elements of Boat Strength. International Marine, McGraw-Hill 2000, ISBN: 0-07-023159-1.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content.
Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6">Available in English language with use of adequate literature (i.e. optional literature instead of required literature in Croatian language).</td></tr>
</table>

NAME OF THE COURSE	Computational Fluid Dynamics						
Code		Year of study	1				
Course teacher	Branko Klarin	Credits (ECTS)	5				
Associate teachers		Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	30	0	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Students will gain knowledge about the reliability based design of ships and offshore structures. Introduction to complete Navier-Stokes equation, energy equations, physical meaning of the parts. Knowledge of discretization methods and numerical solving of discretized equations. Introduction to grid's properties. Main and common preprocess, processes and post process procedures for CFD software.		
Course enrolment requirements and entry competences required for the course	None.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Describe the full Navier Stokes equations and energy eq. – Explain the discretization procedures and numerical solution of discretized equations. – Identify the main causes of reduced physicality CFD simulations. – Apply CFD computer programs for calculating 2D flow (stress and changes of internal energy in the fluid). – Model the problem of flow of viscous flows with heat exchange for use of commercial codes. – Critically evaluate the results.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	AE hours
	The main flow equation.	2	2
	Classification of the differential equations.	2	2
	Boundary conditions of the equation.	2	2
	Discretization of diff. eq. with Finite Difference Method.	2	2
	The method of the final volume. Error discretization.	2	2
	The generation networks and network types.	2	2
	Stability.	2	2
	Numerical diffusion.	2	2
	Algorithms solving of discretized equations.	2	2
	Installation of boundary conditions.	2	2
	Application of the potential flow incompressible fluid, flow of ideal fluid and viscous flow.	2	2
	Application of the potential flow incompressible fluid, flow of ideal fluid and viscous flow.	2	2
	Application of the potential flow incompressible fluid, flow of ideal fluid and viscous flow.	2	2
Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises	☒ individual assignments ☐ multimedia ☐ laboratory	

<table>
<tr><td>Student responsibilities</td><td colspan="6">Class attendance.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>3</td><td>Research</td><td>1</td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Lab exercises</td><td></td></tr>
<tr><td>Tests</td><td>1</td><td>Oral exam</td><td>0,5</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>0,5</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">During the semester will take two tests. The first colloquium will be held after 7 weeks of classes, the second after the next 6 weeks. Each colloquium carried out as written exam (3 numerical task, to 10 theoretical test questions and to 4 active response from the theory) for 105 minutes. A condition for a positive evaluation of the Colloquium is more than 50% max. points from numerical and theoretical part at every colloquium with laboratory practice and submitted reports from laboratory exercises. The final exam students take material from a non-passed preliminary exams. The final score concludes after the second final exam. Students who have not passed the exam after two final exams take a makeup exam in the autumn term. On the exam Correctional whole material. The exam is written with max. 5 numerical task and max. 15 theoretical issues for a total of 150 minutes.</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="3">Hirsch, C. Numerical Computation of Internal and External Flows, Wiley, 1987.</td><td>3</td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">–</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">Keeping records of his attendance. The annual analysis of the performance of the examination. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content.</td></tr>
<tr><td>Other ()</td><td colspan="6"></td></tr>
</table>

NAME OF THE COURSE	Finite Element Method						
Code	FESL10	Year of study	1				
Course teacher	Željan Lozina	Credits (ECTS)	5				
Associate teachers	Damir Sedlar Ivan Tomac	Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	15	0	15
Status of the course	Mandatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	The course objective is to provide the necessary theoretical and practical background for FEM implementation in engineering practice and additionally support for advanced studies within the field of finite elements and structural mechanics.
Course enrolment requirements and entry competences required for the course	None
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Understand the basic theory behind the finite element method a. Strong and weak formulation b. Virtual work and variation formulation c. Basics of the approximate solution of PDE – Use the finite element method for the solution of practical engineering problems – Use a commercial FE-package – Analyze more advanced topics within the field of finite elements and structural mechanics.

Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	AE hours
	Basic concepts, 1D. Truss element. Direct approach.	2	2
	Virtual work and problem formulation (1D) Discretization.	2	2
	Function approximation concepts, approximation basis (1D). Strong formulation.	2	2
	Weak formulation. Correlation with virtual work (1D). FEM discretization.	2	2
	Interpolation functions in FEM: mapping, isoparametric elements. (1D)	2	2
	Potential problems in 2D and 3D: Laplace and Poisson equation.	2	2
	Gauss theorem. Green equation. Weak formulation for potential problems and FEM in 2D.	2	2
	Shape function and isoparametric elements in 2D.	2	2
	Theory of elasticity in 2D – overview. Virtual work formulation.	2	2
	Discretization of weak formulation and corresponding virtual work formulation, CST.	2	2
	Elasticity in 3D, Termo-elasticity. Axisymmetric problems.	2	2
	Selected topics in FEM: Dynamics	2	2
	Selected topics in FEM: Elastic stability	2	2

<table>
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☒ exercises
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<tr><td>Student responsibilities</td><td colspan="6">Class attendance.</td></tr>
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<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>2</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Lab exercises</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td>1</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continuous assessment during class. Exam: individual and group. Exam: the theoretical and practical (application software). Examination: oral (presentation of tasks assigned for independent work and discussion about research related to the topic of the tasks).</td></tr>
<tr><td rowspan="2">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="3">Ž. Lozina: Introduction in finite element methods, FESB. (in Croatian)</td><td></td><td>e-learning</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">– K.-J. Bathe: Finite Element Procedures, Prentice Hall Inc., 1996.
– Thomas J.R. Hughes: The Finite Element Method, Dover Publications Inc., 2000.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content.
Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6">Available in English language.</td></tr>
</table>

NAME OF THE COURSE	Fluid flow						
Code		Year of study	1				
Course teacher	Zoran Milas	Credits (ECTS)	5				
Associate teachers		Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	15	15	
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Introduction to relations of stresses in fluids and main equations of real fluid flows. Understanting of flows with low Re number. Expanding knowledge about boundary layer. Introduction to turbulence modelling. Razumijevanje bitnih značajki tokova s niskim Re brojem. Produbljivanje znanja o graničnom sloju i primjene teorije graničnog sloja. Uvod u modeliranje turbulencije. Analyisis of wake flow. Undestanding limitation for potential flow assumpiton. Understanding relation of lif coefficients and draf coefficients about profile geometry.		
Course enrolment requirements and entry competences required for the course			
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Apply Navier Stokes eq. For analysis of developed laminar flows. – Analyse pressure distribution, tangential stresses. – Calculate stream diffusion. – Critically assess pressure drop in porous layer. – Apply method of potential flow superposition. – Use experimental data of lift coefficients and drag coefficients and be able to correct them according to the profile shape – Choose turbulence model.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	AE hours
	Stresess, Navier equation. Rotation and deformation.	2	1
	Stokes equations, Navier-Stokes eq.	2	1
	Hagen-Poiseuille flow, porous layer.	2	1
	Couette flow, Reynolds eq.	2	1
	Stokes flow, settling.	2	1
	Boundary layer eq., Blasiuss solution for boundary layer, friction coefficient.	2	1
	Drag, flow separation, Karman wake, Karman integral for boundary layer.	2	1
	Karman eq. - solving methods.	2	1
	Potetntial flow, Magnus effect.	2	1
	Kutta-Jukowsky for one profile and profile series. Mass increase. Lift theory.	2	1
	Flow around edges, vorticity. Coefficient of induced drag.	2	1
	Introduction to turbulence modelling. Prandtl model. Complex turbulence models.	2	1
	Logarithmic velocity profile, stream and trail.,	2	1
	List of laboratory exercises	LE	

		hours	
	Pressure drop for developed flow	2	
	Porous layer	2	
	Air filtration	2	
	Viscometry	2	
	Viscous dampingr	2	
	Profile resistance	1,5	
	Flow around half-body	1,5	

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☒ field work	☒ individual assignments ☐ multimedia ☒ laboratory ☐ work with mentor ☐ individual project (other)
Student responsibilities	Class attendace.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Lectures	3	Research		Practical training	
	Experimental work		Report		Individual work	1,3
	Essay		Seminar essay		Lab exercises	0,4
	Tests	0,2	Oral exam		(Other)	
	Written exam	0,1	Project		(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment during class. Exam: individual and group. Exam: the theoretical and practical (application software). Examination: oral (presentation of tasks assigned for independent work and discussion about research related to the topic of the tasks).	

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Milas Z. Strujanje fluida, FESB, Split, 2015	5	
	Virag Z. Mehanika fluida 2. FSB, Zagreb	5	

Optional literature (at the time of submission of study programme proposal)	– White, F. M.: Viscous Fluid Flow, McGraw Hill, New York, 2005
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.
Other (as the proposer wishes to add)	Available in English language.

NAME OF THE COURSE	Hydrodynamics of high-speed ships						
Code		Year of study	2				
Course teacher	Branko Blagojević	Credits (ECTS)	6				
Associate teachers	Josip Bašić	Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	0	30	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION			
Course objectives	Knowledge of the principles of designing an efficient high-speed ship from the standpoint of resistance. Ability to define problems and choose tools and methods to solve and analyze the flow around the ship in order to determine the total resistance of the hull. Introduction to methods of predicting dynamic stability and maneuverability of monohulls, multihulls and hydrofoils.		
Course enrolment requirements and entry competences required for the course	Marine hydrodynamics. Computational fluid dynamics.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Describe different components of resistance of high-speed ships and explain their origin. – Estimate high-speed ships' resistance by empirical methods and by CFD method on a computer. – Compare and discuss the results of different methods applied to solve a specific problem. – Argue on the impact of changes to the hull design on hydrodynamic performance of a high-speed ship.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	CE hours
	Introduction. Overview and application of high-speed ships. Hydrodynamic properties of high-speed ships. Operational and design constraints. Basic equations and principles of ship hydrodynamics.	2	
	Boundary layer in the flow around the ship. Flow separation. Resistance components.	2	
	Frictional/viscous resistance.	2	
	Wave resistance and wash.	2	
	Air resistance. Spray resistance. Other resistance components.	2	
	Wake flow.	2	
	Overview of model tests. Insight into experimental procedures for assessment of hydrodynamic performance of fast ships.	2	
	Loads on high-speed ships and hydroelastic effects. Slamming, whipping, springing.	2	
	Seakeeping. Maneuverability.	2	
	CFD methods for use in assessing the performance/resistance of high-speed ships.	4	
	Hull form design and modifications from the minimum drag standpoint.	2	
	Design options to reduce resistance.	2	
	Field work – visits to shipyards, model basins, etc.	4	
	Laboratory		LV

			hours
	Work in computer laboratory with special computer programs.		30

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ individual assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☒ individual project (other)
Student responsibilities	Class attendance. Finished project task.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	2	Research	0,5	Practical training	
	Experimental work		Report		Individual work	1
	Essay		Seminar essay		Lab exercises	
	Tests		Oral exam	0,5		
	Written exam		Project	2	(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment is carried out during class lectures and exercises. Each student receives a project assignment, which may be a separate project task or part of a larger project. Work on the project includes independent work and research. Results of the project is handed over to digital form and presented (oral exam). At the presentations, all students enrolled in the course are involved in discussion and their knowledge is evaluated. Exam: presentation and oral defense of the project.

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Blagojević B. Ship hydrodynamics. FESB, 2010.		e-learning
	Blagojević B. Hydrodymics of fast and advanced vehicles. Lecutres, FESB, 2015.		e-learning
	Faltinsen OM. Hydrodynamics of high-speed marine vehicles. Cambridge Un.Press, 2005.	3	

Optional literature (at the time of submission of study programme proposal)	– Larsson L, Hoyte CR. Ship Resistance and Flow. The Society of Naval Architects and Marine Engineers (SNAME), Jersey City, NJ, USA, 2010. ISBN: 978-0-939773-76-3. – Bertram V. Practical Ship Hydrodynamics. Elsevier, 2nd edition, 2012. ISBN: 978-0-08-097150-6. – Molland AF, Turnock SR, Hudson DA. Ship Resistance and Propulsion. Cambridge University Press, 2011, ISBN 978-0-521-76052-2.
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.
Other (as the proposer wishes to add)	Available in English language.

NAME OF THE COURSE	Marine electrical engineering						
Code		Year of study	1				
Course teacher	Slavko Vujević	Credits (ECTS)	5				
Associate teachers		Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	0	15	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Specialized knowledge about marine electric power system, electrical equipment and installations.
Course enrolment requirements and entry competences required for the course	None.
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – describe the basic principles of marine electrical power generation, – describe the basic principles of marine electrical power transmission and distribution, – describe the basic principles of marine electrical power consumption, – describe the marine high voltage electric power system, – define the electrical devices protection and safety measures for use of electrical devices, – compare the features of marine electrical power systems and terrestrial electrical power systems, – use the marine electrical engineering normative documents, – Requirements of classification societies and requirements of national maritime administrations.

Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	LE hours
	Characteristics of marine electric power system. Marine electric power sources.	2	3
	Ship electric propulsion.	4	3
	Marine electrical power transmission and distribution.	6	3
	Electrical energy consumption.	4	3
	Ship instrumentation.	2	
	Marine high voltage electric power system.	4	
	Electric shock hazard. Electrical devices protection and safety measures for use of electrical devices. Maritime safety and maritime safety measures.	2	3
	IEC and ISO marine electrical engineering standards. Requirements of classification societies. Requirements of national maritime administrations.	2	

Format of instruction	☒ lectures ☐seminars and workshops ☐exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐individual assignments ☒ multimedia ☒ laboratory ☐ work with mentor ☐ individual project (other)
Student	Class attendance.	

<table>
<tr><td>responsibilities</td><td colspan="6"></td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2.0</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>2.0</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Lab exercises</td><td>0.5</td></tr>
<tr><td>Tests</td><td>0.3</td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>0.2</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continuous assessment during class. Exam: individual and group. Exam: the theoretical and practical (application software). Examination: oral (presentation of tasks assigned for independent work and discussion about research related to the topic of the tasks).</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="3">Vujević, S., "Marine Electrical Engineering - Lecture Notes", University of Split, FESB, Split, 2011. (Lecture notes in electronic form - in Croatian)</td><td></td><td colspan="2">e-learning</td></tr>
<tr><td colspan="3">Milković, M., "Marine Electrical Machines and Equipment", University of Dubrovnik, Dubrovnik, 2005. (in Croatian)</td><td>5</td><td colspan="2"></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">– Hall, D.T., "Practical Marine Electrical Knowledge - Third Edition", Witherby & Co Ltd, 2014.
– McGeorge, H.D., "Marine Electrical Engineering and Practice - Second Edition", Butterworth-Heinemann, 1993.
– Skalicki, B. and Grilec, J., "Marine Electrical Equipment", University of Zagreb, FSB, Zagreb, 2000. (in Croatian)</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content.
Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

NAME OF THE COURSE	Marine engines						
Code		Year of study	1				
Course teacher	Gojmir Radica	Credits (ECTS)	6				
Associate teachers	Dario Bezmalinović Ivan Tolj Tino Sumić	Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	30	0	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Students will gain knowledge about the basic principles of marine propulsion and auxiliary machineries and devices, about the methods of their applications, basic knowledge about parameters calculations.		
Course enrolment requirements and entry competences required for the course			
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Analyze basic principles of marine propulsion and auxiliary machineries and devices, – Critically discuss about selection of main propulsion engine and auxiliary machinery for requested application, energy demand and according to rules and regulation, – Choose elements of propulsion system, fuel, oil, cooling systems and exhaust and ventilation system.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	AE hours
	Marine propulsion systems development. Steam boilers.	2	2
	Marine steam turbines.	2	2
	Marine gas turbines.	2	2
	Marine propulsion engines.	2	2
	Engine combustion.	2	2
	Scavenging and exhaust.	2	2
	Turbochargers.	2	2
	Main parameters of marine engines	2	2

	Application of marine engine. Test bed and sea trial.	2	2
	Fuel, oil, cooling systems.	2	2
	Marine auxiliary engines, pumps, compressors.	2	2
	Propeller systems.	2	2
	Diesel-electric propulsion. Combined propulsion systems. IMO regulation.	2	2

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ individual assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☐ individual project (other)
Student responsibilities	Class attendance.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	2	Research		Practical training	
	Experimental work		Report		Individual work	2,7
	Essay		Seminar essay		Lab exercises	
	Tests	0,2	Oral exam		(Other)	
	Written exam	0,1	Project		(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment during class.

	Title	**Number of copies in the library**	**Availability via other media**
Required literature (available in the library and via other media)	Radica G. Predavanja iz predmeta Brodski propulzijski sustavi		e-learning
	Grljušić M. Pogonski pomorski sustavi. Interna skripta, FESB, 2001.	5	
	Šneller S, Parat Ž. Pogon broda II. Sveučilište u Zagrebu, FSB, 1999.	5	

Optional literature (at the time of	– Harrington, R.L., "Marine Engineering", SNAME, N.J. USA, 1992. – Haarlas, M., "Steam and Gas Turbines for Marine Propulsion", Naval Institute Press, Annapolis, Maryland, 1987.

submission of study programme proposal)	– Parat, Ž., "Brodski motori s unutarnjim izgaranjem", Sveučilište u Zagrebu, FSB,2005. – Ozretić, V., "Brodski pomoćni strojevi i uređaji", Split Ship Management, Split, 2004.
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.
Other (as the proposer wishes to add)	Available in English language.

NAME OF THE COURSE	Marine hydrodynamics						
Code		Year of study	1				
Course teacher	Jasna Prpić-Oršić Dario Ban	Credits (ECTS)	8				
Associate teachers		Type of instruction (number of hours)	P	S	AE	LE	CE
			45	0	15	15	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION			
Course objectives	To introduce students to knowledge, skills and competencies regarding ship motions on regular and irregular waves, together with maneuverability in deep and shallow waters. Students will learn how to calculate simple sea-keeping and maneuvering ship particulars.		
Course enrolment requirements and entry competences required for the course	-		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	– Describe regular and irregular waves in frequency domain. – Analyze irregular waves using statistic methods. – Analyze ship motions on waves. – Estimate ship loads from waves. – Evaluate ship's sea-keeping particulars. – Estimate and evaluate ship's maneuvering particulars.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	
	Basic theory of ship dynamics.	3	1
	Ship models with one and more degrees of freedom.	3	1
	The motion of floating body with one DOF.	3	1
	Environmental loads on ships and off-shore structures: wind, sea currents and waves.	3	1
	Potential theory. Hydrodynamic added mass and damping.	3	1
	Linear wave theory.	3	1
	Ship waves as stochastic process. Sea waves statistics.	3	1
	Stochastic processes and their application for linear systems. Broad–band and narrow–band processes.	3	1

	Fourier series: application in response calculation in frequent domain. Ship equations of motion in frequent domain. Ship responses on harmonic waves.	3	1
	Strip theory. Response amplitude operators. Ship responses on sea waves.	3	1
	Morison equation and its application in off-shore objects analysis.	3	1
	Dynamic effects on waves. Polar diagrams. Operability. Sea-keeping of small ships.	3	1
	Ship equations of motion in time domain. Cummins equation of motion. Fosen's vector equation of motion.	3	1
	Maneuverability tests. Ship Maneuverability Criteria; Nomoto's maneuvering model, Norrbin's maneuverability measure.	3	1
	Motion stabilization. The effect of motions on passengers and crew.	3	1
	Exprimental measuring and generating waves – FESB tank and shipyards. Rolling test in FESB tank and 'in-situ'. Recommended procedures for seakeeping and maneuverability tests – ITTC.		15

Format of instruction	☒ lectures ☒ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ individual assignments ☒ multimedia ☐ laboratory ☐ work with mentor ☒ individual project (other)
Student responsibilities	Finished project task.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	3	Research	1,5	Practical training	1
	Experimental work		Report		Individual work	1.5
	Essay		Seminar essay		Lab exercises	
	Tests		Oral exam			
	Written exam		Project	1	(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment is carried out during class lectures and exercises. Each student receives a project assignment, which may be a separate project task or part of a larger, joint, project. Work on the project includes independent work, research and lab work. Results of the project are handed over in digital form and presented (oral exam). At presentations, all students enrolled in the course are involved in discussion and their knowledge is evaluated. Exam: presentation and oral defense of the project.

<table>
<tr><td rowspan="5">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>Bhattacharayya, R.: Dynamics of Marine Vehicles, Wiley & Sons, USA, 1978.</td><td></td><td>1</td></tr>
<tr><td>Faltinsen, O. M: Hydrodynamics of High-speed Marine Vehicles, Cambridge University Press, 2005</td><td></td><td>1</td></tr>
<tr><td>Newman, J. N.: Marine Hydrodynamics, MIT Press, 1977.</td><td></td><td>1</td></tr>
<tr><td>T. I. Fosen: Handbook of Marine Craft Hydrodynamics and Motion Control, Wiley, 2011.</td><td></td><td>1</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">– Matošin, Š.: Pomorstvena svojstva broda u funkciji karakteristika broda, Doktorska disertacija, Zagreb, 1986.
– Tabain, T.: Izabrana poglavlja iz teorije pomorstvenosti, Zagreb, 1976.
– Bertam, V.: Practical Ship Hydrodynamics, Butterworth-Heinemann, UK, 2000.
– Literature dependent on project task.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content.

Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3">Available in English language.</td></tr>
</table>

NAME OF THE COURSE	Marine propulsors						
Code		Year of study	2				
Course teacher	Branko Blagojević	Credits (ECTS)	6				
Associate teachers	Josip Bašić	Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	0	30	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	To introduce students to various types of propulsors their working principles as well as advantages and disadvantages. Students should understand how to choose the adequate propulsor for a particular ship and estimate its' performance.		
Course enrolment requirements and entry competences required for the course	Marine engines. Marine hydrodynamics.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Demonstrate the principle of operation of various types of ship propulsors on examples. – Select a propulsor for a given ship (project task). – Evaluate propellers' performance using empirical, analytical and numerical methods.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	
	Definition of propulsion power. The efficiency of propulsion.	2	
	Hydrodynamic theory of propulsion.	2	
	The theory of two-dimensional underwater wings and solution methods.	2	
	The theory of 3D underwater wings and solution methods.	2	
	The forces on the propeller.	2	
	The physics of cavitation. Types of cavitation.	2	
	FP Propellers: geometry, design.	2	
	Contra rotating propellers. Surface-piercing propellers. Supercavitating propellers.	2	
	Waterjets propulsion. HyLife propulsion. Other types of propulsion.	4	

	The strength of the propeller. Material selection.	2	
	Fluid flow around the propeller. Numerical methods for evaluating the efficiency of the propeller.	4	
	A visit to design office/shipyard.	4	
	Work on project task with teacher assistance (computer lab).		30

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ individual assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☒ individual project (other)
Student responsibilities	Finished project task.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	2	Research	0,5	Practical training	
	Experimental work		Report		Individual work	1
	Essay		Seminar essay		Lab exercises	
	Tests		Oral exam	0,5		
	Written exam		Project	2	(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment is carried out during class lectures and exercises. Each student receives a project assignment, which may be a separate project task or part of a larger, joint, project. Work on the project includes independent work, research and lab work. Results of the project are handed over in digital form and presented (oral exam). At presentations, all students enrolled in the course are involved in discussion and their knowledge is evaluated. Exam: presentation and oral defense of the project.

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Blagojević B. Ship hydrodynamics. FESB, 2010.		e-learning
	Carlton J. Marine Propellers and Propulsion. 2012, ISBN 9780080971230.	2	
	Gerr D. Propeller Handbook. International Marine, Camden, 2001. ISBN 0-07-157323-2.	2	

Optional literature (at the time of submission of study	– Bose N. Marine Powering Prediction and Propulsors. SNAME, 2008. ISBN 0-939773-65-1. – Kerwin JE, Hadler JB. Propulsion. SNAME, 2010. ISBN 978-0-939773-83-1. – Specific literature related to the project task.

programme proposal)	
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.
Other (as the proposer wishes to add)	Available in English language.

NAME OF THE COURSE	MECHANICS OF COMPOSITE MATERIALS						
Code		Year of study	1				
Course teacher	Frane Vlak	Credits (ECTS)	5				
Associate teachers	Marko Vukasović	Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	30	0	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Introduction with mechanics of composite materials, failure modes of different composite materials, failure criteria and solution methods.		
Course enrolment requirements and entry competences required for the course	None.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Estimate mechanical properties of composite materials based on analytic and numerical solutions – Discuss about possibilites of composite materilas application with respect to the failure modes – Apply the finite element method in the analysis of the ship composite girders and plating.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	AE hours
	Introduction. Review of material properties and methods.	2	2
	Micromechanics.	2	2
	Macromechanics.	2	2
	Failure modes of lamina and laminates.	2	2
	Failure criteria: maximum stress, maximum strain, Tsai-Hill, Tsai-Wu	2	2
	Theory of composite panels. Anisotropy.	2	2
	Panel failure modes: tensile and compressive failure.	2	2
	Interlaminar stress. Shear stress.	2	2
	Delamination. Other failure modes.	2	2
	Fatigue.	2	2
	The finite element method in the composite analysis.	4	4
	Application of the finite element method in the composite ship structural analysis.	2	2
Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ individual assignments ☐ multimedia ☐ laboratory ☒ work with mentor ☐ individual project (other)	
Student responsibilities	Class attendance. Finished project task.		

Screening student work *(name the proportion of ECTS credits for each*	Class attendance	2.5	Research		Practical training	
	Experimental work		Report		Individual work	3

activity so that the total number of ECTS credits is equal to the ECTS value of the course)	Essay		Seminar essay		Lab exercises	
	Tests	0.2	Oral exam	0.3		
	Written exam	0.1	Project		(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment during class. Exam: individual and group. Exam: the theoretical and practical (application software). Examination: oral (presentation of tasks assigned for independent work and discussion about research related to the topic of the tasks).		
Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Zenkert D, Battley. Foundations of fibre composites. KTH, 2008.	2	
Optional literature (at the time of submission of study programme proposal)	– Shenoi RA, Wellicome JF. Composite Materials in Maritime Structures: Volume 1, Fundamental Aspects. Cambridge University Press, 1993. ISBN 978-0-521-08993-7. – Shenoi RA, Wellicome JF. Composite Materials in Maritime Structures: Volume 2, Practical Considerations. Cambridge University Press, 1993. ISBN 978-0-521-08994-4. – Zenkert D. Sandwich Structures, KTH, 2008. – Marine Composites, Eric Greene Associates, Inc., 1999. (http://www.ericgreeneassociates.com/images/MARINE_COMPOSITES.pdf)		
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.		
Other (as the proposer wishes to add)	Available in English language.		

NAME OF THE COURSE	MECHANICS OF SHIP STRUCTURE						
Code		Year of study	1				
Course teacher	Radoslav Pavazza	Credits (ECTS)	7				
Associate teachers	Frane Vlak Branka Bužančić-Primorac	Type of instruction (number of hours)	P	S	AE	LE	CE
			45	0	30	0	0
Status of the course	Mandatory.	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Introduction with methods of mechanical analysis of ship structures. Introduction with methods of analysis of thin-walled structures.					
Course enrolment requirements and entry competences required for the course	None.					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Apply the force method and displacement method in the analysis of the frames, grillages and space ship structures – Explain the influence of the shear on beam bending and its application in the analysis of the ship girders and the effective breadth definition – Apply theory of bending with influence of shear in analysis of ship structures – Apply the method of initial parameters in the analysis of ship structures – Analyze distribution of the stresses over contour of the open and closed thin-walled cross sections – Explain the methods of the analysis of the bending of thin plates – Apply the solutions for the bending of thin plates in the analysis of the ship plating – Explain the methods of the stability checking of the columns.					
Course content broken down in detail by weekly class schedule (syllabus)	Content				L hours	AE hours
	Analysis of the frames, grillages and space ship structures.				9	6
	Theory of the bending with influence of the shear. Effective breadth concept.				6	4
	Distribution of the stresses over contour of open and closed thin-walled cross-sections.				6	4
	Method of initial parameters in the analysis of ship structures.				6	4
	Theory of the bending of thin rectangular plates.				3	2
	Methods of the analysis of thin rectangular plates.				3	2
	Bending of thin rectangular plates, applications.				2	2
	Basis of the stability of the columns.				4	2
Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work		☒ individual assignments ☐ multimedia ☐ laboratory ☒ work with mentor ☐ individual project (other)			
Student responsibilities	Class attendance. Finished project task.					
Screening student work *(name the*	Class attendance	3	Research		Practical training	

proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)	Experimental work		Report		Individual work	3.5
	Essay		Seminar essay		Lab exercises	
	Tests	0.2	Oral exam	0.3		
	Written exam	0.1	Project		(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment during class. Exam: individual and group. Exam: the theoretical and practical (application software). Examination: oral (presentation of tasks assigned for independent work and discussion about research related to the topic of the tasks).		
Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Uršić J. Čvrstoća broda I", FSB, Zagreb, 1972.	5	
	Uršić J. Čvrstoća broda II", FSB, Zagreb,1983.	5	
	Uršić J. Čvrstoća broda III", FSB, Zagreb,1992.	5	
	Alfirević I.: Nauka o čvrstoći 2, ¸Golden marketing, Zagreb, 1999.	5	
	Alfirević I.: Linearna analiza konstrukcija, FSB Zagreb, Zagreb, 1999.	4	
	Pavazza R.: Uvod u analizu tankostjenih štapova. Kigen, Zagreb, 2007.	2	
	Hughes, O.F. and J.K. Paik: Ship Structural Design and Analysis, Wiley, SNAME, 2010	2	
	A.E. Mansour, D.Liu: Strength of Ships and Ocean Structures, SNAME, 2008.	1	
Optional literature (at the time of submission of study programme proposal)	– Det Norske Veritas. Load & Strength Manual. 1977. – Bai Y. Marine Structural Design. Elsevier, 2003.		
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.		
Other (as the proposer wishes to add)	Available in English language.		

NAME OF THE COURSE	OPTIMIZATION METHODS						
Code		Year of study					
Course teacher	Damir Vučina	Credits (ECTS)					
Associate teachers	Igor Pehnec Ivo Marinić-Kragić	Type of instruction (number of hours)	P	S	AE	LE	CE
			45	0	0	15	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	- Learn theoretical background, methods and algorithms of engineering optimization - Develop skills of applying computers in numerica engineering optimization - Develop competences to apply numerical tools for engineering problems
Course enrolment requirements and entry competences required for the course	
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Formulate engineering problems for numerical optimization – Model the set of decision variables, constraints and excellence functions for engineering problems – Develop flowcharts for different optimization methods – Apply non-gradient methods (HJ, NM, ..) to engineering problems – Apply gradient methods (NS, CG, N, BFGS..) to engineering problems – Solve constrained non-linear programming problems – Apply evolutionary procedures and metaheuristics (GA, ACO, SA, NM,..) to engineering problems – Apply optimization methods to network problems, shortest path, minimum spanning tree, .. – Develop and test own programs in C and MATLAB

Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	AE hours
	1. Introduction, basic theoretical background	3	1
	2. Basic terms, standard optimization model, optimality	3	1
	3. Descent and feasible directions, Lagrangian, KKT conditions, models	3	1
	4. Linear programming, standard model, simplex method	3	1
	5. Nonlinear problems In 1D, interval halving, golden section, polynomial interpolation methods, reduction of nD to 1D line search	3	1
	6. Unconstrained nonlinear programming (nD), direct zero-order methods, Hooke-Jeeves, Powell, Neder Mead Simplex, random search	3	1
	7. Unconstrained nonlinear programming (nD), gradient methods, steepest descent, conjugate gradients, Newton method, Quasi-Newton methods, DFP, BFGS	3	1
	8. Nonlinear programming, general constrained problems, transformation methods, penalty functions, augmented Lagrangian formulation	3	1
	9. Nonlinear programming, general constrained problems, direct methods, feasible directions, generalized reduced gradients, sequential linear programming, sequential quadratic programming,	3	1
	10. Basic evolutionary methods, metaheuristics, genetic algorithms,	3	1

	simulated annealing, ...		
	11. Substitute models, response surfaces, neural networks	3	1
	12. Problems with discrete variables, modeling, branch and bound, GA-s, network problems	3	1
	13. Modeling of engineering optimization problems, application. Selection of algorithms. Development of programs and scripts in C and MATLAB.	3	1

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	individual assignments ☐ multimedia x laboratory ☐ work with mentor ☐ individual project (other)
Student responsibilities	Class attendance. Finished individual assignment tasks.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	3	Research		Practical training	
	Experimental work		Report		Individual work	2
	Essay		Seminar essay		Lab exercises	
	Tests		Oral exam			
	Written exam		Project		(Other)	

Grading and evaluating student work in class and at the final exam	Grade(%) = 0,5*M1 + 0,5*M2 M1, M2 – percentage at mid-term exam and final exam respectively

	Title	**Number of copies in the library**	**Availability via other media**
Required literature (available in the library and via other media)	- D. Vučina, 'Metode inženjerske numeričke optimizacije', Sveučilište u Splitu, FESB 2005		
	- J. S. Arora, “Introduction to Optimum Design”, McGraw Hill, 1989		
	- I.Pehnec, Materijali za laboratorijske vježbe		

Optional literature (at the time of submission of study programme proposal)	- G. Vanderplaats, "Numerical Optimization Techniques for Engineering Design", - Vanderplaats Research and Development, 1999 - A. D. Belegundu, T. R. Chandrupatla, “Optimization Concepts and Applications in Engineering”, Prentice Hall, 1999 - S.S. Rao, “Engineering Optimization”, Wiley Interscience, 1996 - D.E. Goldberg, "Genetic algorithms in search, optimization and machine learning", Addison Wesley, 1989 - S. Haykin, "Neural Networks", Prentice Hall International, 1999
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content.
Other (as the proposer wishes to add)	Available in English language.

NAME OF THE COURSE	Project management						
Code	FETJ01	Year of study	1				
Course teacher	Ivica Veža	Credits (ECTS)	4				
Associate teachers	Marko Mladineo	Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	30	0	0
Status of the course	Elective	Percentage of application of e-learning					

COURSE DESCRIPTION

Course objectives	Students learn to: – plan and manage projects – be able to calculate the profitability of the project and return on investment (ROI)
Course enrolment requirements and entry competences required for the course	
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Analyze the requirements of the customer (VOC) – Formulate main objectives of project and rank them – Develop the main activities of the project and the structure of the distribution of work - (Work Breakdown Structure) – Plan time (to determine the critical path) – Plan capacities (specify bottlenecks and balancing activities) – Plan costs and risks – Apply the acquired knowledge and skills from the contents of the completion of cases to solve a specific task – Combine and apply their knowledge and skills in teamwork

Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	AE hours
	Introduction and basic terms	2	2
	Term and definition of projects and project management	2	2
	Project - vision, strategy, goals (examples - automotive and shipbuilding industries).	2	2
	The strategy and project management. Multi project management.	2	2
	Basics of organization. Project organizational structure.	2	2
	Phase of the project (initiation of projects, project selection, project planning, project management, project completion)	2	2
	Methods for project planning.	2	2
	Quality management (planning, improvement and quality control)	2	2
	Cost management. Continuous improvement - Kaizen.	2	2
	Risk management.	2	2
	Psycho-social component of project management. Project manager.	2	2
	Teamwork.	2	2
	Communication and motivation on the team. Methods for enhancing creativity.	2	2

<table>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☒ exercises
☐ on line in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☒ individual assignments
☐ multimedia
☐ laboratory
☒ work with mentor
☐ individual project (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Class attendance.</td></tr>
<tr><td rowspan="6">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td>0</td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>1,5</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Lab exercises</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td>0</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td>2,5</td><td>(Other)</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">During the semester, students are introduced into the stages of the project management, and parallel on laboratory exercises how to develop their own project. The students will work in teams, with a minimum number of two and maximum number of three students, in which they how to create and manage their own projects. During the course each team determines the content of the project and the main objectives. After that, they develop the main activities of the project and structure of labor division (WBS); plan the time for each of the activities of and determine the critical path; plan capacity and determine bottlenecks and balancing capacity. And finally determine the costs, calculate the profitability of the project (ROI) and analyze risks. At the colloquium and exam students present their works, which are evaluated (grade M).
On the other hand, students have colloquium on Technique of network planning (AV) - 1 written colloquium at the end of the semester.
• AV - colloquies Technique of network planning
• M - points to the project.
The final score (in percentage) is formed according to the formula:
Rating (%) = 0.30 AV + 0.70 M</td></tr>
<tr><td rowspan="5">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="3">Veža, I., Bilić, B., Gjeldum, N., Mladineo, M., “Upravljanje projektima”, FESB, Split, 2011.</td><td></td><td>e-learning portal</td></tr>
<tr><td colspan="3">Majstorović, V. Projektni menadžment, Sveučilište u Mostaru, Mostar, 2010.</td><td>5</td><td></td></tr>
<tr><td colspan="3">Omazić, M.A. Projektni menadžment, Sinergija, Zagreb, 2005.</td><td>5</td><td></td></tr>
<tr><td colspan="3"></td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">– A Guide to the Project Management Body of Knowledge. PMBOK Guide, Project Management Institute, Newtown Square, 2004.
– Wysocki RK, McGary R. Effective Project Management: Traditional, Adaptive, And Extreme. John Wiley & Sons, 2003.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit</td><td colspan="6">The annual analysis of examination efficiency. Student’s survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated about the</td></tr>
</table>

competences	relevance of the course content.
Other (as the proposer wishes to add)	Available in English language.

NAME OF THE COURSE	ENGINEERING MAINTENANCE						
Code		Year of study	2				
Course teacher	Jani Barle	Credits (ECTS)	5				
Associate teachers	Stipe Perišić	Type of instruction (number of hours)	P	S	AE	LE	CE
			45	0	15	0	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION			
Course objectives	Upon completion the student will be able to critically evaluate and compare various concepts related to technical system life assessment, usage, maintenance and safety.		
Course enrolment requirements and entry competences required for the course			
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: 1. Evaluate different actions and suggest maintenance strategy. 2. Comment maintenance procedures and risks associated with usage. 3. Link different reliability and availability modeling concepts. 4. Estimate availability and maintenance costs. 5. Compare impacts on technical system endurance.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	AE hours
	The role and scope of the maintenance engineering. Historical aspects, principles and applications of maintenance actions (corrective, preventive, predictive, proactive). RCM and TPM strategies. Bathtub curve.	3	
	Maintenance role by example.		1
	Standards (IEC EN 61508). Maintenance assets register. Technical performance indicators. Failure, failure cause, failure mode and consequence. Failure Mode and Effect Analysis (FMEA) and Root Cause Analysis (RCA).	3	
	EMEA examples.		1
	An overview of the failure modes. Human errors in maintenance. Nonparametric life estimate procedures and parametric life models.	3	
	Nonparametric life estimate procedures - 1.		1
	Reliability and availability data sources, standards and recommendations. Analysis of complete and censored data.	3	
	Nonparametric life estimate procedures - 2.		1
	Parametric reliability models of component. Constant and time-dependent failure models (Exponential, Weibull, Log-normal). Probability plots. Maximum likelihood. Confidence interval.	3	

	Parametric life estimate - 1.		1
	Reliability of systems. Reliability block diagrams (RBD): serial configuration and redundancy models.	3	
	Parametric life estimate - 2.		1
	Maintainability and Availability. Overview of the factors that influences maintainability.	3	
	Maintainability by example.		1
	Repairable systems. Markov model fundamentals. Load-sharing. System deterioration models with and without repair. Counting processes (HPP and NHPP).	3	
	Repairable systems examples.		1
	Data sources and/or expert judgments. Burn-In. Bayesian analysis in formal safety assessment (FSA).	3	
	Reliability data sources by example.		1
	The role and applications of technical diagnostics. Procedure, types, indicators and sensors.	3	
	Technical diagnostics by example.		1
	Physical reliability models. Accelerated testing and burn-in procedures.	3	
	Covariate damage models.		1
	Planning, purchasing and storage of maintenance-related actions and inventory.	3	
	Width and depth of spare parts stock.		1
	Optimal preventive maintenance scenarios and models. Maintenance information system, documents and organization structure.	3	
	Numerical analysis of optimal preventive maintenance model.		1

Format of instruction	☒ lectures ☒ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ individual assignments ☒ multimedia ☒ laboratory ☐ work with mentor ☐ individual project (other)
Student responsibilities	Class attendance, tests, project presentation and oral exam.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	2,0	Research		Practical training	
	Experimental work		Report	0,5	Individual work	2,0
	Essay		Seminar essay		Lab exercises	0,3
	Tests	0,2	Oral exam		(Other)	
	Written exam		Project		(Other)	

<table>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="3">There are two colloquium midterms. The first colloquium is done by written examination on basic issues covered within the first seven weeks. The second colloquium is seminal paper on selected and more advenced toppic.
The final score is:
$$Score\ (\%) = 0,35 \cdot A_1 + 0,35 \cdot A_2 + 0,20 \cdot A_3 + 0,10 \cdot A_4$$
• colloquium 1: A_1 = 50 – 100 %,
• colloquium 2 (seminal paper): A_2 = 50 – 100 %,
• oral exam: A_3 = 50 – 100 %.
• class attendance: A_4 = 70 – 100 %.
Score Grade
50% - 62% sufficient (2)
63% - 76% good (3)
77% - 88% very good (4)
89% - 100% excellent (5)</td></tr>
<tr><td rowspan="4">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>Barle, J.: Reliability in maintenance management, (student handbook in Croatian: Pouzdanost u funkciji održavanja tehničkih sustava), FESB, Split, 2009.</td><td></td><td>e-learning portal</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">Rausand, M.; Høyland, A., "System Reliability Theory: Models, Statistical Methods, and Applications", 2nd ed., Wiley-Interscience, 2003.
Ebeling, C., "An Introduction To Reliability and Maintainability Engineering", McGraw-Hill, 1996.
Rausand, M., "Reliability of Safety-Critical Systems: Theory and Applications", Wiley, 2014.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">Student survey in order to evaluate teachers. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>

NAME OF THE COURSE	Sailboats						
Code		Year of study	1				
Course teacher	Branko Blagojević	Credits (ECTS)	5				
Associate teachers	Klement Jadrešić	Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	0	0	15
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Understanding fundamental principles of sailing. Understanding the process of sailboat design and performance assessment.		
Course enrolment requirements and entry competences required for the course			
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Explain the fundamental concept of sailing. – Describe various sources of hull resistance and estimate resistance and speed using specific software. – Optimize sailing performance within defined limits. – Calculate the strength of a mast.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	lecture hours	hours
	The fundamental concept of sailing. Overview of parameters influencing sailboat performanc	2	
	Sailboat hull form.	2	
	Forces and moments. Loads.	2	
	Stability.	2	
	Design methods.	2	
	Hull materials. Structural design.	2	
	Hydrdodynamics: visocus resistance, friction resistance, wave resisitance.	2	
	Roughness, added resistance on waves, other resistances.	2	

	Seakeeping.	2	
	Sails. Aerodynamic forces.	2	
	Masts.	2	
	Interaction of masts and sails in weak and strong winds.	2	
	Assessment of performance. VPP programs.	2	
	Field work on a sailboat.	2	
	Visit to shipyards.	2	
	Work on the project with assistance (in the lab/classroom).		15

Format of instruction	☒ lectures ☒ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☒ field work	☐ individual assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☒ individual project (other)
Student responsibilities	Class attendance. Finished project task.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	1	Research		Practical training	
	Experimental work		Report		Individual work	1
	Essay		Seminar essay		Lab exercises	
	Tests		Oral exam	1		
	Written exam		Project	2	(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment is carried out during lectures, seminars and through consultations with regard to resolving project issues. The project task, preliminary sailboat design, is submitted in digital form. Examination: oral presentation of the project.

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Hamlin C. Preliminary Design of Boats and Ships. Cornell Maritime Press, 1989.	1	
	Larsson L, Eliasson ER. Principles of Yacht Design. Adlard Coles Nautical, 2000. ISBN 0-7136-5181-4.	2	

Optional literature (at the time of submission of study programme proposal)	– Fossati F. Aero-hydrodynamics and the Performance of Sailing Yachts: The Science Behind Sailing Yachts and Their Design. Adlard Coles Nautical, 2009. ISBN-10: 1408113384. – Doane CJ. The Modern Cruising Sailboat: A Complete Guide to Its Design, Construction and Outfitting. McGraw-Hill, 2009. ISBN 978-0-07-147810-6. – Estes C.W. 3D modeling for the Marine industry. – Spectre P.H. 100 boats design reviewed.		
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.		
Other (as the proposer wishes to add)	Available in English language.		

NAME OF THE COURSE	Safety of marine structures						
Code		Year of study	2				
Course teacher	Branko Blagojević	Credits (ECTS)	6				
Associate teachers	Branka Bužančić-Primorac	Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	30	0	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Students will get knowledge into rationalnally-based structural design of marine structures. Students will learn to apply probability, reliability and risk methods in analysis of marine structures.		
Course enrolment requirements and entry competences required for the course	Finite element method. Mechanics of ship structure.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Calculate response of marine structure using FEM on a computer. – Assess reliability for a particular part of marine structure. – Choose the most appropriate methodology for reliability analysis of a given structural element. – Discuss the advantages and limitations of probability approach, FORM, SORM and other simulation methods. – Evaluate different design solutions regarding to the reliability and safety of the structural element. – Design structure taking into account various priorities.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	AE hours
	Rationally-bases structural design.	2	
	The methodology of limit states.	2	
	The definition of limit states: serviceability, ultimate, fatigue, accidental (SLS, ULS, FLS, ALS).	2	2
	Definitions and stochastic variables.	2	
	Application of limit states method in the design of ship structures - design criteria of the various classification societies.	2	8
	Methods for analysis of uncertainty.	2	

	Probabilistic methods. Reliability in marine structural design.	2	
	FORM method. SORM methods.	2	4
	Monte Carlo and other simulation methods.	2	2
	Safety factors of ship structures.	2	
	Robustness and redundancy of ship structural elements.	2	
	Application of specialized software in the calculations, analysis and dimensioning of ship structural elements. Advantages and disadvantages.	2	12
	Analysis of reliability and risk in the design of marine structure.	2	
	A visit to design office.	2	
	A visit to shipyard.	2	

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ individual assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☐ individual project (other)
Student responsibilities	Class attendance. Finished individual assignment tasks.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	2	Research	1	Practical training	
	Experimental work		Report		Individual work	2
	Essay		Seminar essay		Lab exercises	
	Tests		Oral exam	1		
	Written exam		Project		(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment during class. Exam: individual and group. Examination: oral (presentation of finished tasks).		
Required literature (available in the	**Title**	**Number of copies in the library**	**Availability via other media**

library and via other media)	Blagojević B. Reliability of ship structures. Textbook/Lecture notes, FESB 2012.		e-learning
Optional literature (at the time of submission of study programme proposal)	– Manosur A, Liu D. Strength of Ships and Ocean Structures. SNAME 2008. ISBN: 0-939773-66-X. – Okumoto Y, et.al. Design of Ship Hull Structures - A Practical Guide for Engineers. Springer 2009. ISBN: 978-3-540-88444-6.		
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.		
Other (as the proposer wishes to add)	Available in English language.		

NAME OF THE COURSE	Shipyard design						
Code		Year of study	2				
Course teacher	Boris Ljubenkov	Credits (ECTS)	5				
Associate teachers		Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	30	0	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Objective of the course is to introduce students with principles of new shipyard design or reconstruction and technological renewal of existing shipyard.		
Course enrolment requirements and entry competences required for the course	Not exist		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	– Explain elements of shipyard design spiral – Explain characteristics of shipbuilding technological process – Describe functions and characteristics of hydro-technical objects for lifting/falling and pulling of floating objects. – Make calculation of necessary machines, tools and transport devices in a shipyard – Make shipyard layout.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	
	Shipyard development	2	
	Shipyards types, structure and location	4	
	Characteristics of shipbuilding technological process. Workshop types. Material flows.	8	
	Shipyard design spiral elements.	2	
	New shipyard design characteristics.	2	
	Characteristics of technological renewal of existing shipyard	2	
	Specificities of river shipyard design	2	
	Hydro-technical objects in shipbuilding	8	
	Content		AE hours
	Shipbuilding workshop concept design. Input information.	2	
	Production program analysis. Definition of shipbuilding technology.	4	
	Calculation methods for necessary technological equipment, working areas and areas of interim products store calculation	8	
	Shipyard conceptual design. Shipyard layout.	12	
	Project presentation	4	
Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ individual assignments ☒ multimedia ☐ laboratory ☐ work with mentor ☒ individual project (other)	
Student	Class attendance, work on project and presentation and oral exam.		

responsibilities						
Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	1	Research		Practical training	
	Experimental work		Report		Individual work	
	Essay		Seminar essay		Lab exercises	
	Tests	1	Oral exam	1	(Other)	
	Written exam		Project	2	(Other)	
Grading and evaluating student work in class and at the final exam	Continuous assessment during class. Two tests during the semester. Project presentation. Examination: oral exam					

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Mavrić, I.: Osnivanje brodogradilišta, skripta, FSB Zagreb	1	
	Storch R.L., Hammon C.P., Bunch M.H., Moore R.C.: Ship Production, SNAME, 2007.	1	

Optional literature (at the time of submission of study programme proposal)	– Proceedings of the Symposium - SORTA
Quality assurance methods that ensure the acquisition of exit competences	Student survey in order to evaluate teachers. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.
Other (as the proposer wishes to add)	

NAME OF THE COURSE	Ship Computational Geometry						
Code		Year of study	1				
Course teacher	Dario Ban	Credits (ECTS)	5				
Associate teachers		Type of instruction (number of hours)	P	S	AE	LE	CE
			45	0	15	0	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	To introduce students to knowledge, skills and competencies regarding ship's computational geometry methods. This course is about numerical and analytical methods of outer and inner ship's spaces description, suitable for direct calculation of geometric, hydrostatic ship properties and belonging wave loads, with application in calculation of ship stability, hydrodynamics and in ship design.
Course enrolment requirements and entry competences required for the course	-
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	– List numerical calculation methods used in ship computational geometry, – Notice and describe basic ship's computational geometry tasks, – Apply analytical ship's computational geometry methods based on meshless radial basis function methods in ship geometry description, – Apply meshless RBF methods in geometric problems of finding intersection between ship and wave environment, and calculation of ship's hydrostatic and hydrodynamic particulars, – Compare numeric with analytic ship computational geometry methods, – Calculate geometric and hydrostatic particulars for outer and inner ship spaces for arbitrary list angles, and required degrees of freedom, – Build panotcarena pantoclinas for geometric, hydrostatic and hydrodynamic ship particulars, – Apply ship panotcarena pantoclinas in ship stability and ship resistance calculations, – Analyze and compare alternative ship geometries using scaling of obtained panotcarena pantoclinas.

Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	
	Ship computational geometry basics. Main computational problems of ship's computational geometry	3	
	Numerical methods for ship geometry description, for inner and outer ship compartments	3	
	The calculation of ship-waves Intersection for plane and curved, regular waves	3	
	The calculation of geometric, hydrostatic and hydrodynamic ship particulars	3	
	Direct analytical calculation of 5 basic integrals of ship hydrostatics, wetted surface of immersed ship body, and free surface integrals for arbitrary list angle	3	
	Mathematical spaces. Manifolds	3	
	Multivariant spaces and its application in RBF ship geometry description	3	
	Complete geometric, hydrostatic and hydrodynamic ship spaces	3	

	Complete ship position space with extreme conditions estimation	3	
	The calculation of geometric, hydrostatic and hydrodynamic ship panotcarena pantoclinas for inner and outer compartments for chosen number of parameters and degrees of freedom	3	
	Holonomic motion constraints and their application in ship motions calculations	3	
	Direct calculation of ship stability for arbitrary list angles using n-parametric panotcarena pantoclinas	3	
	The calculation of ship resistance using panotcarena pantoclinas of ship's wetted surface	3	
	CDIO Project seminar	3	
	CDIO Project seminar	3	
	Work on project task with teacher assistance (computer lab).		15

Format of instruction	☒ lectures ☒ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ individual assignments ☒ multimedia ☐ laboratory ☐ work with mentor ☒ individual project (other)
Student responsibilities	Finished project task.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	2	Research	0.5	Practical training	0.5
	Experimental work		Report		Individual work	1
	Essay		Seminar essay		Lab exercises	
	Tests		Oral exam			
	Written exam		Project	1	(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment is carried out during class lectures and exercises. Each student receives a project assignment, which may be a separate project task or part of a larger, joint, project. Work on the project includes independent work, research and lab work. Results of the project are handed over in digital form and presented (oral exam). At presentations, all students enrolled in the course are involved in discussion and their knowledge is evaluated. Exam: presentation and oral defense of the project.

	Title	**Number of copies in the library**	**Availability via other media**
Required literature (available in the library and via other media)	Ban, D.: Analytical ship geometry description using global radial basis function interpolation, PhD thesis, Rijeka, 2012.		1
	Fletcher, J.: The geometry of ships, SNAME, 2009.	1	1
	H. Nowacki, H.; Bloor, M. I. G.; Oleksiewitz, B.: Computational Geometry for Ships, World Scientific, 1995.	1	1
	Newman, J. N.: Marine Hydrodynamics, MIT Press, 1977.		1

Optional literature (at the time of submission of study programme proposal)	– Fasshauer, G. E..: Meshfree Approximation Methods – Uršić, J.: Stabilitet broda, Zagreb, 1991. – Faltinsen, O. M: Hydrodynamics of High-speed Marine Vehicles, Cambridge University Press, 2005 – Literature dependent on project task.
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.
Other (as the proposer wishes to add)	Available in English language.

NAME OF THE COURSE	Ship Design							
Code		Year of study	2					
Course teacher	Dario Ban	Credits (ECTS)	8					
Associate teachers		Type of instruction (number of hours)	P	S	AE	LE	CE	
			45	0			30	
Status of the course	Mandatory	Percentage of application of e-learning	0					

COURSE DESCRIPTION			
Course objectives	To introduce students to knowledge, skills and competencies regarding ship design based on project requirement and relating transport problem in operating environment.		
Course enrolment requirements and entry competences required for the course	Marine hydrodynamics. Project management. Mechanics of ship structure.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	– Analyze ship design principles taking into account production, economic and safety properties, as well as environmental protection and sustainability principles. – Identify, analyse and solve given transport problem. – Rely sustainability and environmental protection principles with design methods in ship building, – Defend specific attitude about specific engineer problems and solutions in ship design, – Plan and organize ship design process, – Communicate within the multidisciplinary team to efficiently solve engineering problems (group project task). – Determine the best communication form and technique and present project problems and results to multidisciplinary workgroup, in front of students and teachers (group project task). – Evaluate project solution based on project demand and project restrictions (individual project task).		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	
	Design process. Project computational methods.	3	
	Transport problem. Project demand. Project philosophies.	3	
	Identification, analysis and simulation of ship's operational requirements.	3	
	Environmental restrictions of maritime transport on ship design.	3	
	Economic, social, political, ethical and health restrictions and requirements on ship design.	3	
	Mathematic principles of ship design. Project space.	3	
	Multi-objective design. Approximating, surrogate methods in ship design.	3	
	Designing for ship's life-cycle.	3	
	Reliability, redundancy, safety and survivability for ships.	3	
	Environment friendly and sustainable development design principles.	3	
	Classification society’s rules and international regulation bodies requirements in ship design.	3	
	Analysis, synthesis and evaluation of ship design.	3	
	CDIO project seminar		
	CDIO project seminar		
	Environmental loads on ships.	3	
	Work on project task with teacher assistance (computer lab).		30

<table>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☒ exercises
☐ on line in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☒ individual assignments
☒ multimedia
☐ laboratory
☐ work with mentor
☒ individual project (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Finished project task.</td></tr>
<tr><td rowspan="6">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2.5</td><td>Research</td><td>1.5</td><td>Practical training</td><td>1</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>1</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Lab exercises</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td></td><td></td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td>2</td><td>(Other)</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continuous assessment is carried out during class lectures and exercises. Each student receives a project assignment, which may be a separate project task or part of a larger, joint, project. Work on the project includes independent work, research and lab work. Results of the project are handed over in digital form and presented (oral exam). At presentations, all students enrolled in the course are involved in discussion and their knowledge is evaluated. Exam: presentation and oral defense of the project.</td></tr>
<tr><td rowspan="4">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="3">Hamlin C. Preliminary Design of Boats and Ships. Cornell Maritime Press, 1989.</td><td></td><td>e-learning</td></tr>
<tr><td colspan="3">Principles of Naval Architecture, Vol. I, II, III, SNAME, 1988.</td><td>2</td><td></td></tr>
<tr><td colspan="3">Bosnić A. Osnivanje broda, FSB, Zagreb, 1990.</td><td>2</td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">– Gerr D. The Elements of Boat Strength: For Builders, Designers, and Owners. International Marine/Ragged Mountain Press, 1999.
– De Lorme MF. Small Craft Papers. SNAME papers 1985-2002.
– Watson DGM. Practical Ship Design. Elsevier 2002. ISBN 0-08-042999-8.
– Veenman H, Zonen NV. Design and Economical Considerations on Shipbuilding and Shipping. Report of the post graduate course, 1956. Royal Institution of Engineers (The Netherlands).
– Specific literature related to the project task.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content.
Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6">Available in English language.</td></tr>
</table>

NAME OF THE COURSE	Special materials and shipbuilding technologies						
Code		Year of study	1				
Course teacher	Boris Ljubenkov	Credits (ECTS)	5				
Associate teachers		Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	0	30	0
Status of the course	Mandatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Objective of the course is to introduce students to the principles of composite, aluminum and stainless steel shipbuilding technology.
Course enrolment requirements and entry competences required for the course	
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	The students will be able to: – Ilustrate, on examples, advantages/disadvantages of application of composites, aluminum alloys and stainless steel in shipbuilding. – Suggest method for testing material properties, for various materials. – Make simple ship structural elements of composite materials. – Plan and conduct test of a specific property of composite material. – Analyze test results for composite materials. – Compare technology of aluminum shipbuilding, composites shipbuilding and steel shipbuilding regarding economic and environmental aspects.

Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	
	Introduction in composites. Composites in shipbuilding.	2	
	Composite materials. Fibers and resins.	2	
	Characteristics of the fibers and resins which are usually in shipbuilding.	2	
	Sandwich structures and characteristics.	2	
	Composite production methods – hand lay up	2	
	Composite production methods – vacuum infusion	2	
	Composite production methods comparison	2	
	Classification rules and regulations for composite ship building	2	
	Composite material testing methods	2	
	Aluminum alloys used in shipbuilding characteristics	2	
	Aluminum cutting, forming and welding	2	
	Aluminum ship building technology	2	
	Stainless steel used in shipbuilding characteristics	2	
	Stainless steel cutting, forming and welding	2	
	Stainless steel ship building technology	2	
	Content		AE Hour
	Materials for composite production. Theory of hand lay-up method.		2
	Laminate and sandwich structure production by hand lay-up method.		2

	Materials for composite production. Theory of vacuum infusion method.		2
	Laminate and sandwich structure production by vacuum infusion method.		2
	Work on project. Project presentation.		22

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ individual assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☒ individual project (other)
Student responsibilities	Class attendance; work on project and presentation and oral exam.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	2	Research	1	Practical training	
	Experimental work		Report		Individual work	2
	Essay		Seminar essay		Lab exercises	
	Tests		Oral exam	1	(Other)	
	Written exam		Project		(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment during class. Two tests during the semester. Project presentation. Examination: oral exam

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Hull D.: An introduction to composite materials, Cambridge University Press, Cambridge, 1981.	1	
	Greene E.: Marine Composites, Eric Greene Associates, 1999.	1	
	Pollard S.F.: Boatbuilding with Aluminum, International Marine Camden, Maine, 1993.	1	

Optional literature (at the time of submission of study programme proposal)	– Barbero E.J.: Introduction to composite materials design, CRC Press, 2011. – Gurit: Guide to Composites, www.gurit.com – Journal of Shipbuilding
Quality assurance methods that ensure the acquisition of exit competences	Student survey in order to evaluate teachers. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.

Other (as the proposer wishes to add)	

NAME OF THE COURSE	SHIP STRUCTURAL ANALYSIS						
Code		Year of study	2				
Course teacher	Radoslav Pavazza	Credits (ECTS)	6				
Associate teachers	Frane Vlak Branka Bužančić-Primorac	Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	30	0	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Introduction with theory of torsion of beams with thin-walled open cross-sections and its application in torsional analysis of ships with large deck openings. Introduction with applications of the finite element analysis of ship structural parts and ship hull with emphasis on the theory underlying the analysis.
Course enrolment requirements and entry competences required for the course	Mechanics of ship structure. Finite element method.
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Explain the theory of torsion of thin-walled beams – Explain the geometrical properties of thin-walled cross-sections subjected to torsional loads – Apply theory of torsion in the analysis of ship structural parts – Apply theory in the torsional analysis of ships with large deck openings – Explain the methods of the stability checking of the plates and stiffened panels – Apply the finite element method in the analysis of the ship structural parts and ship hull.

Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	AE hours
	Theory of torsion of thin-walled beams	4	2
	Geometrical properties of thin-walled cross-sections under torsional loads	2	4
	Analysis of the ship structural parts under torsional loads	2	2
	Analysis of the stresses and displacements of the ships with large deck openings under torsional loads	2	2
	Buckling of the plates and stiffened panels	4	4
	The finite element method: types of the finite elements	2	0
	Ship structural analysis using the finite element method	10	12

Format of instruction		
	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ individual assignments ☐ multimedia ☐ laboratory ☒ work with mentor ☐ individual project (other)
Student responsibilities	Class attendance. Finished project task.	

Screening student work *(name the proportion of ECTS credits for each activity so that the*						
	Class attendance	2.5	Research		Practical training	
	Experimental work		Report		Individual work	3
	Essay		Seminar essay		Lab exercises	

total number of ECTS credits is equal to the ECTS value of the course)	Tests	0.2	Oral exam	0.3		
	Written exam	0.1	Project		(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment during class. Exam: individual and group. Exam: the theoretical and practical (application software). Examination: oral (presentation of tasks assigned for independent work and discussion about research related to the topic of the tasks).		
Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Uršić J. Čvrstoća broda I", FSB, Zagreb, 1972.	5	
	Uršić J. Čvrstoća broda II", FSB, Zagreb,1983.	5	
	Uršić J. Čvrstoća broda III", FSB, Zagreb,1992.	5	
	Sorić J. Metoda konačnih elemenata“, Golden Marketing, Zagreb, 2004.	3	
	Senjanović I. Metoda konačnih elemenata u analizi brodskih konstrukcija. Sveučilište u Zagrebu, Zagreb, 1998.	3	
	Pavazza R. Uvod u analizu tankostjenih štapova. Kigen, Zagreb, 2007.	2	
	A.E. Mansour, D.Liu: Strength of Ships and Ocean Structures, SNAME, 2008.	1	
	Hughes, O.F. and J.K. Paik: Ship Structural Design and Analysis, Wiley, SNAME, 2010	2	
Optional literature (at the time of submission of study programme proposal)	– Det Norske Veritas. Load & Strength Manual. 1977. – Bai Y. Marine Structural Design. Elsevier, 2003.		
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.		
Other (as the proposer wishes to add)	Available in English language.		

NAME OF THE COURSE		Vibrations and vibration control					
Code		Year of study	2				
Course teacher	Željan Lozina	Credits (ECTS)	6				
Associate teachers	Damir Sedlar Ivan Tomac	Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	30	0	0
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Develop understanding basics of electromechanical systems as well as capacity for modelling and implementation of electromechanical systems.		
Course enrolment requirements and entry competences required for the course	None		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – explain basics and apply basic signal processing – Explain and apply sensors of position, displacement, velocity acceleration and force. – Explain basics and practically implement electro mechanic actuators and motors. – analyze electromechanical system with negative loopback – implement model of electromechanical system in time and frequency domain as well as in state space – perform simple identification of the system – perform measurement using software for measurement (LabVIEW) – analyze and apply simple control system (PID controller)		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	AE hours
	Signal processing basics.	2	2
	Sensors od position, displacement, velocity, acceleration and force (LVDTs, encoders, velometers, accelerometers, eddy current sensors and switches,…	2	2
	Electrodynamic actuators and motors and control of actuators and motors.	2	2
	Model of electromechanical system in time.	2	2
	Analytical mechanics approach.	2	2
	Lagrange equations.	2	2
	Concept of direct, indirect and inverse analysis.	2	2
	State space.	2	2
	Systems with negative loopback. Analysis of accuracy and stability.	2	2
	System Identification.	2	2
	Frequency domain analysis.	2	2
	Concept of direct indirect and inverse analysis.	2	2
	Analysis of selected system.	2	2

<table>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ on line in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☒ individual assignments
☐ multimedia
☐ laboratory
☐ work with mentor
☐ individual project (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Class attendance.</td></tr>
<tr><td rowspan="6">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>2</td><td>Research</td><td>1</td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>2</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Lab exercises</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td>1</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continuous assessment during class. Exam: individual and group. Exam: the theoretical and practical (application software). Examination: oral (presentation of tasks assigned for independent work and discussion about research related to the topic of the tasks).</td></tr>
<tr><td rowspan="5">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="3">Handouts</td><td></td><td>e-learning</td></tr>
<tr><td colspan="3">e-learning portal</td><td></td><td></td></tr>
<tr><td colspan="3"></td><td></td><td></td></tr>
<tr><td colspan="3"></td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">– S. Cetinkunt: Mechatronics, John Wiley and Sons, 2007.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content.
Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6">Available in English language.</td></tr>
</table>

NAME OF THE COURSE	Wooden ships						
Code		Year of study	1				
Course teacher	Boris Ljubenkov	Credits (ECTS)	5				
Associate teachers	Roko Markovina	Type of instruction (number of hours)	P	S	AE	LE	CE
			30	0	0	0	30
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Objective of the course is to introduce students with basic knowledge about Croatian shipbuilding schools of wooden ships and building technologies of wooden ships.		
Course enrolment requirements and entry competences required for the course	Not exist.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	– Explain characteristics of Croatian shipbuilding schools of wooden ships – Choose tools and materials for wooden ship building. – Describe wooden ship building technology. – Apply international conventions, norms, rules and regulations for wooden ship building. – Define methods for hull and equipment protection. – Explain procedure of wooden ship reconstruction.		
Course content broken down in detail by weekly class schedule (syllabus)	Content	L hours	
	Mediterranean and Adriatic shipbuilding heritage.	2	
	Adriatic shipbuilding schools and typical wooden ships.	4	
	Glossary of wooden shipbuilding terms.	2	
	Wooden ship building methods.	8	
	Materials and tools in wooden shipbuilding.	2	
	Classification society rules and regulations for wooden ship building.	2	
	Traditional wooden ship gajeta building technology.	2	
	Methods and procedures for wooden ship protection.	4	
	Reconstruction and maintenance of the traditional wooden ship.	4	
	Content		CE hours
	Traditional wooden ship building or reconstruction – project.		2
	Classification society rules and regulations, building methods, materials, tools and ship protection.		6
	Make technical and technological drawings.		20
	Project presentation		2
Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☒ field work	☒ individual assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☒ individual project (other)	
Student responsibilities	Class attendance, project presentation and oral exam.		

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	1	Research		Practical training	1
	Experimental work		Report		Individual work	
	Essay		Seminar essay		Lab exercises	
	Tests		Oral exam	1	(Other)	
	Written exam		Project	2	(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment during class and exercises. Examination: oral exam

	Title	**Number of copies in the library**	**Availability via other media**
Required literature (available in the library and via other media)	Markovina, R.: ARS NAVALIS 1, sveučilišni udžbenik u pripremi, FESB	1	
	Kerber, L.: Tradicionalne brodice hrvatskog Jadrana, Architectura navalis Adriatica, Tehnički muzej, 2002., Zagreb	1	
	Bernardi, T.: Brodske linije, skripta, FSB, 1967., Zagreb	1	

Optional literature (at the time of submission of study programme proposal)	Kozličić, M.: Tradicionalno brodovlje hrvatskog Jadrana, Književni krug Split, 1993.
Quality assurance methods that ensure the acquisition of exit competences	Student survey in order to evaluate teachers. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.
Other (as the proposer wishes to add)	

NAME OF THE COURSE	MASTER THESIS						
Code		Year of study	2				
Course teacher		Credits (ECTS)	30				
Associate teachers		Type of instruction (number of hours)	P	S	AE	LE	CE
Status of the course	Mandatory	Percentage of application of e-learning					

COURSE DESCRIPTION

Course objectives	To integrate, deepen and broaden knowledge of topics within courses in graduate study. To deevelop skills for application of engineering and scientific work metodologies in solving complex engineering problems. To get deeper insight in development and research in the field of naval architecture. To independently and self-sufficiently solve problem in different work conditions. Writing and presentation skills of project results.
Course enrolment requirements and entry competences required for the course	According to the regulatory documents of the FESB and University of Split.
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: – Use literature, databases and other sources of information. – Choose adequate methods and procedures for solving engineering problems. – Apply theoretical, technical knowledge and practical skills to efficiently solve engineering problems. – Publicly present and discuss project/work results. – Significantely deepen knowledge of the topics in the filed of NA. – Critically, independetly and cratively identify, formulate and work on complex NA problems. – Plan, prepare and apply adequate methods and tools, within given limitations. – Create, analyse, critically assess and evaluate different technical solutions. – Independently identify and classify problems within given topic in master thesis. – Contribute to research and development, within field of NA, by publishing reports. – Appraise ethical and environmental apsects of research and development process.
Format of instruction	☐ lectures ☐ seminars and workshops ☐ exercises ☐ *on line* in entirety ☐ partial e-learning ☒ field work ☒ individual assignments ☐ multimedia ☒ laboratory ☒ work with mentor ☒ individual project (other)
Student responsibilities	Thesis presentation and defence.

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance		Research		Practical training	
	Experimental work		Report		Individual work	
	Essay		Seminar essay		Lab exercises	
	Tests		Oral exam		(Other)	

	Written exam		Project		(Other)	
Grading and evaluating student work in class and at the final exam	Continuous assessment.					
Required literature (available in the library and via other media)	**Title**			**Number of copies in the library**	**Availability via other media**	
Optional literature (at the time of submission of study programme proposal)						
Quality assurance methods that ensure the acquisition of exit competences	Student survey in order to evaluate teachers. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.					
Other (as the proposer wishes to add)						

3. STUDY PERFORMANCE CONDITIONS

3.1. Places of the study performance

Buildings of the constituent part (name existing, under construction and planned buildings)	
Identification of building	FESB
Location of building	Ruđera Boškovića 32, Split
Year of completion	1980. Phase I, 2008. phase II
Total square area in m^2	29.477

3.2. List of teachers and associate teachers

Course	Teachers and associate teachers
Advanced Marine Vehicles	prof. Branko Blagojević Associates: Josip Bašić, assistant
Boat and craft equipment	prof. Boris Ljubenkov Associates: prof. Roko Markovina
Boat Production	prof. Boris Ljubenkov Associates: Klement Jadrešić, assistant
Composite ships	prof. Branko Blagojević Associates: Klement Jadrešić, assistant
Computational fluid dynamics	prof. Branko Klarin
Finite element analysis	prof. Željan Lozina Associates: prof. Damir Sedlar, Ivan Tomac, assistant
Fluid flow	prof. Zoran Milas
Hydrodynamics of high-speed craft	Prof. Branko Blagojević, Associates: Josip Bašić, assistant
Maintenance	prof. dr. sc. Jani Barle Associates: Stipe Perišić, assistant
Marine electrical engineering	Prof. Slavko Vujević Associates: -
Marine engines	Prof. Gojmir Radica Associates: Dario Bezmalinović, assistant
Marine hydrodynamics	prof. Dario Ban
Marine Propulsors	Prof. Branko Blagojević
Mechanics of composite materials	prof. Frane Vlak Associates: Marko Vukasović, assistant
Mechanics of ship structures	Prof. Radoslav Pavazza, Associates: prof. Frane Vlak; Branka Bužančić-Primorac, assistant
Safety of Ship Structures	prof. Branko Blagojević Associates: Branka Bužančić-Primorac, assistant
Sailboats	Prof. Branko Blagojević
Optimization methods	prof. Damir Vučina Associates: Igor Pehnec, assistant
Project management	prof. Ivica Veža

	Associates: Marko Mladineo, assistant
Ship Computational Geometry	Prof. Dario Ban
Ship Design	prof. Dario Ban
Ship structural analysis	prof. Radoslav Pavazza Associates: prof. Frane Vlak; Branka Bužančić-Primorac, assistant
Shipyard Design	Prof. Boris Ljubenkov
Special materials and shipbuilding technologies	prof. Boris Ljubenkov Associates: Klement Jadrešić, assistant
Vibrations and vibration control	prof. Željan Lozina Associates: prof. Damir Sedlar, Ivan Tomac, assistant
Wooden ships	prof. Boris Ljubenkov Associates: prof. Roko Markovina
Master thesis	

3.3. Curriculum vitae of the course teachers

First and last name and title of teacher	Dario Ban, assistant professor
The course he/she teaches in the proposed study programme	Ship Design, Marine Hydrodynamics, Ship computational geometry
GENERAL INFORMATION ON COURSE TEACHER	
Address	Antuna Gustava Matoša 11, 21000 Split
Telephone number	091 430 5994
E-mail address	darioban@fesb.hr
Personal web page	
Year of birth	1968.
Scientist ID	213451
Research or art rank, and date of last rank appointment	Scientific associate, 24. 10. 2012.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Assistant professor, 23. 01. 2013.
Area and field of election into research or art rank	Technical sciences, Naval Architecture.
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	FESB
Date of employment	2006.
Name of position (professor, researcher, associate teacher, etc.)	Assistant professor
Field of research	Naval architecture
Function	
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	Technical faculty, University of Rijeka

Place	Rijeka
Date	2012.
INFORMATION ON ADDITIONAL TRAINING	
Year	
Place	
Institution	
Field of training	
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English: 5 Italian: 2
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	Courses at FESB (undergraduate level): - Ship geometry, - Stability of ships, - Ship design
Authorship of university/faculty textbooks in the field of the course	– Blagojević B, Dario B. VISIO. ISBN: 978-953-290-003-3, FESB, 2008. – Ban D. Ship geometry. Lectures, 2014. https://elearning.fesb.hr – Ban D. Ship Stability. Lectures, 2013. FESB, https://elearning.fesb.hr – Ban D. Ship Design. Lectures, FESB, 2013.
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	– Ban D, Bašić J, Šetka V. Hydrodynamic instability of High-Speed Craft (HSC). Proceedings of the 22nd Symposium on Theory and Practice of Shipbuilding. 6-8 October, Trogir, Croatia, 185-192, 2016. – Ban, Dario; Ljubenkov, Boris. Global ship hull description using single RBF, IMAM 2015, Ed. C.G.Soares, R.Dejhalla, D.Pavletić, CRC Press 2015. – Ban, Dario; Bašić, Josip. Analytic solution of basic ship hydrostatics integrals using polynomial radial basis functions, Brodogradnja 66(3), 2015. 15-37. – Ban, Dario; Blagojević, Branko; Čalić, Bruno. Analytic solution of global 2D description of ship geometry with discontinuities using composition of polynomial radial basis functions, Brodogradnja 65(2), 2014. 1-22. – Medaković, J; Ban, D; Blagojević, B. A Comparison of Hull Resistances of a Mono-Hull and a SWATH Craft. // International Journal of Engineering, Science and Innovative Technology. 2

	(2013) , 4; 155-162.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	– Blagojević, Branko; Ban, Dario; Ljubenkov, Boris; Jadrešić, Klement. Integrated Active Learning in Naval Architecture Studies // Proceedings of 21st Symposium on Theory and Practice of Shipbuilding / Rijeka, 2014. 565-573.
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	– Autonomous surface craft design; hydrofoils and SWATH, 2015. – Autonomous adaptive control of underwater unmanned marine vehicles. 2013. – 2015.
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?	– 'Training for teachers and administration staff'. EU project ME4CataLogue, 2014. – Seminar/workshop 'Application of the CDIO (Conceive Design Implement Operate) method in engineering studies'. 2012.
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	Jani Barle, professor
The course he/she teaches in the proposed study programme	Maintenance
GENERAL INFORMATION ON COURSE TEACHER	
Address	Sveučilište u Splitu, Fakultet elektrotehnike, strojarstva i brodogradnje Ruđera Boškovića 32, 21000 Split, Croatia
Telephone number	+385 (21) 305930
E-mail address	Jani.Barle@fesb.hr
Personal web page	https://nastava.fesb.hr/nastava/nastavnici/detalji/barle
Year of birth	1964
Scientist ID	186172
Research or art rank, and date of last rank appointment	
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Professor 2011.
Area and field of election into research or art rank	Technical sciences, Mechanical engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Sveučilište u Splitu, Fakultet elektrotehnike, strojarstva i brodogradnje
Date of employment	1991
Name of position (professor, researcher, associate teacher, etc.)	Professor
Field of research	Reliability
Function	Professor
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	FSB
Place	Zagreb
Date	1998.
INFORMATION ON ADDITIONAL TRAINING	
Year	1996.
Place	Padova - Italy
Institution	Dipartimento di Ingegneria Meccanica
Field of training	Experimental methods
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English: 5 German: 3 Italian: 2
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study	Courses at FESB, undergraduate level: Ship repair and maintenance. Graduate level: Maintenance, Maintenance of technical systems,

programme)	Integrity and reliability of technical systems
Authorship of university/faculty textbooks in the field of the course	– Barle, J., "Pouzdanost u funkciji održavanja tehničkih sustava", textbook, FESB, Split 2009.
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	– Barle, Jani; Ban, Dario; Ladan, Marina. Maritime component reliability assessment and maintenance using Bayesian framework and generic data // Advanced ship design for pollution prevention / Guedes Soares, C. ; Parunov, J. (ur.). London : Taylor & Francis Group, 2010. Str. 181-188. – Barle, Jani; Grubišić, Vatroslav; Radica, Danko. Service strength validation of wind-sensitive structures, including fatigue life evaluation. // Engineering structures. 32 (2010) , 9; 2767-2775. – Barle, Jani; Grubišić, Vatroslav; Vlak, Frane. Failure analysis of the highway sign structure and the design improvement. // Engineering failure analysis. 18 (2011) , 3; 1076-1084. – Barle, J; Đukić, P; Ban, D. Verification of Number of Cycles for Fatigue Life Estimation of Wind-Sensitive Structures // 7th ICCSM / Virag, Z. ; Kozmar, H. ; Smojver, I. (ur.). Zagreb: STUDIO HRG for Croatian Society of Mechanics, 2012. 233-234. – Barle, Jani; Wolf, Hinko; Đukić, Predrag. Experimental verification of the dynamic model for a wind turbine tower // 30th Danubia-Adria: Symposium on Advances in Experimental Mechanics / Alfirević, Ivo ; Semenski, Damir (ur.). Zagreb : Croatian Society of Mechanics, 2013. 219-220
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	– Barle, Jani; et al. Izrada kataloga znanja, vještina i kompetencija za studije strojarstva u Republici Hrvatskoj // Zbornik radova međunarodne stručne konferencije ME4CataLOgue / Kozak, D., Barle, J., Markučič, D., Pavletić, D., Matičević, G, Vranešević M. N., Rosandić, Ž, Damjanović, D. (ur.)., Sl.Brod 2015. – "Hrvatski katalog znanja, vještina i kompetencija za studije strojarstva zasnovan na ishodima učenja (za preddiplomski, diplomski i doktorski studij)", Strojarski fakultet u Slavonskom Brodu Sveučilišta J. J. Strossmayera u Osijeku, 2015., Kozak, D., Barle, J.,et al.(ur.), ISBN 978-953-6048-78-6
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?	– IPA IV project ME4CataLOgue “Further development and implementation of the Croatian Qualifications Framework (CQF)”, 2013-2015.
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	Branko Blagojević, professor
The course he/she teaches in the proposed study programme	Advanced marine vehicles, Safety of ship structures, Hydrodynamics of high-speed ships, Composite ships, Marine propulsors
GENERAL INFORMATION ON COURSE TEACHER	
Address	Ruđera Boškovića 9
Telephone number	091 430 5995
E-mail address	bblag@fesb.hr
Personal web page	www.fesb.hr/~bblag
Year of birth	1968.
Scientist ID	212434
Research or art rank, and date of last rank appointment	Scientific advisor, 11.05.2011.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Professor, 07.2015.
Area and field of election into research or art rank	Technical sciences, Naval Architecture.
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of electrical engineering, mechanical engineering and naval architecture
Date of employment	1996.
Name of position (professor, researcher, associate teacher, etc.)	Professor
Field of research	Naval architecture (Structure, Hydrodynamics, Design of Advanced Marine Vehicles, Composite Ships)
Function	Head of Naval Architecture
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	Faculty of mechanical engineering and naval architecture

Place	Zagreb
Date	2005.
INFORMATION ON ADDITIONAL TRAINING	
Year	2007.
Place	Lisbon, Portugal
Institution	Instituto Superior Tecnico (IST)
Field of training	Advanced ship design, reliability and safety of ship structures
Year	2008. – 2009. and 2012.
Place	Stockholm, Sverige
Institution	Royal Institute of Technology (KTH)
Field of training	Composite ships, High-speed ship hydrodynamics and structural design.
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English (5) Swedish (2)
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	Course teacher at FESB (undergraduate level): - Ship structural design. - Advanced marine vehicles and high-speed ships. - Resistance and propulsion/ Ship Hydrodynamics. - Composite ships. - Offshore structures.
Authorship of university/faculty textbooks in the field of the course	– Blagojević B. Graphics in Naval Architecture. FESB. 2017. – Blagojević B, Dario B. VISIO. Textbook/manual. ISBN: 978-953-290-003-3, FESB, 2008. – Blagojević B. Structural design of composite ships. Textbook, 2012. https://elearning.fesb.hr – Blagojević B. Computer graphics in ship design. Textbook, 2011. FESB, https://elearning.fesb.hr – Blagojević B. Ship resistance and propulsion. Textbook, 2010. FESB, https://elearning.fesb.hr – Blagojević B. Manual for calculation of ship resistance. Manual, 2006. FESB, https://elearning.fesb.hr – Blagojević B. Manual for calculation of ship propulsion. Manual, 2006. FESB, https://elearning.fesb.hr

	– Blagojević B. Manual for hull form design. Manual, 2001. FESB, https://elearning.fesb.hr
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	– Andrun M, Šarić B, Bašić J, Blagojević B. CFD Analysis of Surface-Piercing Hydrofoil Ventilation Inception. Proceedings of the 22nd Symposium on Theory and Practice of Shipbuilding. 6-8 October, Trogir, Croatia, 153-162, 2016. – Garcia-Amorena Garcia D.O, Blagojević B. Variabale geometry propeller for high speed marine propulsion. Proceedings of the 22nd Symposium on Theory and Practice of Shipbuilding. 6-8 October, Trogir, Croatia, 117-126, 2016. – Bašić J, Blagojević B. Hydrodynamic performance of autonomous underwater vehicle with a swivel tail // Towards Green Marine Technology and Transport / CRC Press, 2015. 3-10. – Medaković J, Ban D, Blagojević, B. A Comparison of Hull Resistances of a Mono-Hull and A SWATH Craft // International Journal of Engineering, Science and Innovative Technology. 2 (2013), 4; 155-162. – Blagojević B, Žiha K. Robust structural design based on event-oriented system analysis // Advanced Shipping and Ocean Engineering International Journal of Shipbuilding Engineering Research. 1 (2012), 1; 1-7.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	– Blagojević B, Ban D, Ljubenkov B, Jadrešić K. Integrated Active Learning in Naval Architecture Studies // Proceedings of 21st Symposium on Theory and Practice of Shipbuilding / Rijeka, 2014. 565-573. – Blagojević B, Kuttenkeuler J. On project based learning in traditional engineering studies // Proceedings of XIX Symposium on theory and practice in shipbuilding Sorta 2010. / Split, 2010. 497-509. – Guedes Soares, C, Parunov J, Blagojević B, Grubišić R, Zamarin A, Žiha K, Ehlers S, Klanac A, Tokić G. Experience and Sustainability of International Curriculum Development in Naval Architecture, Zagreb, Fakultet strojarstva i brodogradnje, 2010. (ISBN: 978-953-7738-00-6).
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	– Autonomous modular surface vehicele: SWATH-hydrofoil. 2016. - – Autonomous adaptive control of underwater unmanned marine vehicles. 2013. – 2016. – The Design Process of high-speed craft. 2010. – 2013. Funded by: Swedish Defense Matériel Administration. – High speed craft in waves. 2008. – 2011. Funded by: Swedish Defense Matériel Administration. – Explicit FE modelling of fluid-structure interaction. 2008. – 2011. Funded by: Swedish Defence Matériel Administration. – Determination of safety factors for ships and off-shore structures. 2006 – 2012. Funded by: Croatian Ministry of Science – Advanced Ship Design for Pollution Prevention. 2006 – 2010. Funded by EU Tempus programme.
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-	– 'Training for teachers and administration staff'. EU project ME4CataLogue, 2014. – Seminar/workshop 'Application of the CDIO (Conceive Design Implement Operate) method in engineering studies'. 2012.

didactic-pedagogical group of competences?	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	Branko Klarin, professor
The course he/she teaches in the proposed study programme	Computational Fluid Dynamics
GENERAL INFORMATION ON COURSE TEACHER	
Address	A. Hebranga 7, 23000 Zadar
Telephone number	091-6305950
E-mail address	Branko.Klarin@fesb.hr
Personal web page	www.fesb.hr/~bklarin
Year of birth	27.09.1962.
Scientist ID	185972
Research or art rank, and date of last rank appointment	Scientific Advisor, 11.05.2011.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Professor, 2016.
Area and field of election into research or art rank	Technical sciences, mechanical engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of electrical and mechanical engineering and naval architecture
Date of employment	1991.
Name of position (professor, researcher, associate teacher, etc.)	professor
Field of research	teaching
Function	professor
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	Faculty of electrical and mechanical engineering and naval architecture
Place	Split
Date	2004.
INFORMATION ON ADDITIONAL TRAINING	
Year	
Place	
Institution	
Field of training	
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English 5 German 2
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	– Fluid mechanics, naval architecture study, B.Sc. level – Aeromechanics and wind turbines, mech.eng. study, mag.ing. level – Innovation in technics, mech.eng. study, mag.ing. level – Hybrid energy systems, mech.eng. study, mag.ing. level
Authorship of university/faculty textbooks in the field of the course	– Fluid mechanics, on-line course – Aeromechanics and wind turbines, on-line course

	– Innovation in technics, on-line course – Hybrid energy systems, on-line course
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	– Klarin B, Nižetić S, Roje J. Basic solar chimney flow improvements. // Strojarstvo. 51 (2009), 5; 465-472. – Ninić N, Klarin B, Tolj I. Hybrid wind-power-distillation plant. // Thermal Science. 16 (2012) , 1; 249-259 – Klarin B, Milić Kralj D. Wing sails for hybrid propulsion of the ships // International Congress Energy and the Environment Opatija 2014, Rijeka, 2014. 339-350 – Klarin B, Milić Kralj D. Rigid wing sails for hybrid propulsion of the ship // 8-th Conference on sustainable development of energy, water and environment system. Zagreb, 2013. 0423-1-0423-11 – Klarin B, Dumančić J, Vukman A. Possibilities of use a hybrid wind-solar power source (rigid wing and photovoltaics) for additional ship propulsion. 3rd Conference on marine technology - in memoriam of the academician Zlatko Winkler, Rijeka, 2009.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	– ME4CataLOgue – Croatian Catalogue of knowledge, skills and competences for mechanical engineering studies based on learning outcome. – Teacher and administration personnel training course.
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	Dean's praise for the 10% best rated teachers at Faculty ESB
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	University Quality Control Commission, avg. 4.8, all courses grades above Faculty ESB average grade.

First and last name and title of teacher	Željan Lozina, professor
The course he/she teaches in the proposed study programme	Finite element method, Vibrations and vibration control
GENERAL INFORMATION ON COURSE TEACHER	
Address	Rendićeva 18, Split
Telephone number	+38521-6305-968
E-mail address	zeljan.lozina@fesb.hr
Personal web page	http://marjan.fesb.hr/~lozina/
Year of birth	1956
Scientist ID	96925
Research or art rank, and date of last rank appointment	Professor (full), 09.03.2005
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Professor, 21.06.2000.
Area and field of election into research or art rank	Mechanics/vibration, Numerical methods ("Basic engineering science")
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	University of Split, FESB
Date of employment	22.10.1982.
Name of position (professor, researcher, associate teacher, etc.)	Professor
Field of research	Mechanics/vibration, Numerical methods
Function	Head of cathedra
INFORMATION ON EDUCATION – Highest degree earned	
Degree	Dr.sc.
Institution	University of Zagreb, FSB
Place	Zagreb
Date	05.04.1989.
INFORMATION ON ADDITIONAL TRAINING	
Year	
Place	Udine
Institution	Centre/School of mechanics, Udine
Field of training	Mechanics
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English – 4 Italian -3 French - 2
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	Graduate courses: Finite element methods (Engineering modelling) Undergraduate courses: Engineering mechanics: Kinematics, Dynamics, Theory of Mechanisms. Programming (in C).
Authorship of university/faculty textbooks in the field of the course	Finite element method, Dynamics, Kinematics,
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	– Sedlar, Damir; Lozina, Željan; Vučina, Damir: An implementation of structural change detection procedure based on experimental and numerical model correlation. // Journal of sound and vibration. 331 (2012) , 13; 3068-3082

	– Vučina, Damir; Lozina, Željan; Pehnec, Igor. Ad-Hoc Cluster and Workflow for Parallel Implementation of Initial-Stage Evolutionary Optimum Design. // Structural and multidisciplinary optimization. 45 (2012) , 2; 197-222 – Vučina, Damir; Lozina, Željan; Pehnec, Igor. Computational procedure for optimum shape design based on chained Bezier surfaces parameterization. // Engineering applications of artificial intelligence. 25 (2012) , 3; 648-667 – Vučina, Damir; Lozina, Željan; Vlak, Frane. NPV-based decision support in multi-objective design using evolutionary algorithms. // Engineering applications of artificial intelligence. 23 (2010) , 1; 48-60 – Lozina, Željan; Sedlar, Damir; Vučina, Damir. Model Update with Observer/Kalman Filter and Genetic Algorithm Approach. // Transactions of FAMENA. 36 (2012)
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	– Cvitanić, Vedrana; Duplančić, Igor; Lozina, Željan; Ivandić, Daniel. Earing predictions for Al2008-T4 sheet. // Aluminum and its alloys. 3 (2011) ; 73-77 – Sedlar, Damir; Lozina, Željan; Vučina, Damir. – Comparison of Genetic and Bees Algorithm in the Finite Element Model Update. // Transactions of FAMENA. 35 (2011) , 1; 1-12
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	– Inverzni postupci i napredni algoritmi u dinamici konstrukcija i strojeva, (023-0231744-1747), MZOŠ – Vibracije agregata A, Zakučac – Balansiranje rotora turbine, BANKO – Analiza naprezanja poklopca, Radež
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	– ME4 project – teachers' training.
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	Boris Ljubenkov, associate professor
The course he/she teaches in the proposed study programme	Special materials and shipbuilding technologies , Boat production, Shipyard design, Wooden ships
GENERAL INFORMATION ON COURSE TEACHER	
Address	Gundulićeva 38
Telephone number	091 430 5997, 098 1762 831
E-mail address	boris.ljubenkov@fesb.hr
Personal web page	
Year of birth	1972.
Scientist ID	215023
Research or art rank, and date of last rank appointment	Senior scientific associate, 15.04.2015.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Associate professor, 15.07.2015.
Area and field of election into research or art rank	Technical sciences, Naval Architecture.
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	FESB
Date of employment	2013.
Name of position (professor, researcher, associate teacher, etc.)	Associate professor
Field of research	Naval Architecture
Function	Vice dean for science and research
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	FSB
Place	Zagreb
Date	2006.
INFORMATION ON ADDITIONAL TRAINING	
Year	1998.
Place	Kraljevica
Institution	Borodgradilište Kraljevica
Field of training	Software package: TRIDENT – module CADDS
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English - 4
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	Graduate courses (FSB Zagreb): - Shipbuilding technology, - Methods and system in shipbuilding production process, Undergraduate courses (FESB Split): - Shipbuilding technology, - Ship equipment, - Shipyard design, - Advanced materials and technologies in shipbuilding, - Organization of ship production process

Authorship of university/faculty textbooks in the field of the course	– Ljubenkov B.: Shipbuilding technology – Lectures 2014., https://elearning.fesb.hr – Ljubenkov B.: Organization and management in shipyard – lecture, 2013. https://elearning.fesb.hr, – Ljubenkov B: Composite materials in shipbuilding, FESB, 2016.
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	– Juraga, I.; Stojanović, I.; Ljubenkov, B.: 'Experimental Research of the Duplex Stainless Steel Welds in Shipbuilding', Brodogradnja 65(2014)2, pp 74-85, Zagreb – B. Ljubenkov, K. Žiha: 'Conceptual design of shipyard for seagoing ships on the river Danube', Proceedings of the 15th Conference of the International Maritime Association of the Mediterranean, p 551-556, 13-17. October 2013, Corunna, Spain – S. Rudan, B. Ljubenkov, H. Senegović: 'Structural Analysis in Shipbuilding Production Process', Brodogradnja 63(2012)4, pp 336-341, Zagreb – K. Žiha, J. Kodvanj, B. Ljubenkov, A. Bakić, N. Dupor: 'Strength of ships 'as-built'; Proceedings of the 31th International Conference on Offshore Mechanics and Arctic Engineering OMAE2012, 10-15 June 2012., Rio de Janeiro, Brazil – Šestan A., Gomerčić M., Ljubenkov B., Vladimir N.: 'Measurement of Hull Deflections for Reliable Propulsion System Alignment Using Digital Photogrammetry', Proceedings of the International Conference on Innovative Technologies, p 80-83, 14-16.09.2010., Prague, Czech Republic
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	– Blagojević, Branko; Ban, Dario; Ljubenkov, Boris; Jadrešić, Klement. Integrated Active Learning in Naval Architecture Studies // Proceedings of 21st Symposium on Theory and Practice of Shipbuilding / Baška, otok Krk, 2014. 565-573.
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	– Safety factors of ships and offshore objects: leader Prof. Kalman Žiha – FSB Zagreb,
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	– 'Training za teachers and administration staff', project EU ME4CataLogue, FESB, 2014.
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	Zoran Milas, associate professor
The course he/she teaches in the proposed study programme	Fluid flow
GENERAL INFORMATION ON COURSE TEACHER	
Address	Mažuranićevo šet. ½, Split
Telephone number	021-305951
E-mail address	zmilas@fesb.hr
Personal web page	
Year of birth	21.10.1951
Scientist ID	80670
Research or art rank, and date of last rank appointment	Senior scientific associate, 2008.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Associate professor 2014
Area and field of election into research or art rank	Technical sciences, mechanical engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	FESB Split
Date of employment	1980
Name of position (professor, researcher, associate teacher, etc.)	Professor
Field of research	Fluid mechanics
Function	
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	FSB Zagreb
Place	Zagreb
Date	2001
INFORMATION ON ADDITIONAL TRAINING	
Year	1985
Place	Udine
Institution	CISM
Field of training	1985
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English - 5
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	– Fluid mechanics (undergraduate study): – Fluid flow (graduate study)
Authorship of university/faculty textbooks in the field of the course	Mehanika fluida, 2015, FESB, Split
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at	– Milas, Z.; Vučina, D.; Marinić-Kragić, I., Multi-regime Shape Optimization of Fan Vanes for Energy Conversion Efficiency Using CFD, 3D Optical Scanning and Parameterization, Journal

most)	of Engineering Applications of Computational Fluid Mechanics (1994-2060) 8 (2014), 3; 407-421 – Vučina, D.; Milas, Z.; Pehnec, I., Reverse Shape Synthesis of Hydro pump Volute Using Stereo-Photogrammetry, Parameterization and Geometric Modeling.// Journal of Computing in Engineering, ASME Trans.. 12 (2012), 2; 021001-1-021001-6 – Milas, Z.; Penga, Ž. AW 2500 Mud Mixer. 2014, Adriawinch, Split, p.40. – Marinić-Kragić, I; Vučina, D.; Milas, Z., 3D Shape Optimization of Fan Vanes for Multiple Operating Regimes Subject to Efficiency and Noise Related Excellence Criteria and Constraints, *Journal of Applied Soft Computing*, ASOC-D-14-01870, 2015.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	–
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	– Project HRZZ br. 6130 , Adaptivna parametrizacija promjenjivih 3D geometrija kod optimizacije oblika i bezmrežnog numeričkog modeliranja.
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	– IPA IV project ME4CataLOgue.
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	prof. emeritus Radoslav Pavazza
The course he/she teaches in the proposed study programme	Mechanics of ship structure Structural analysis of ship structure
GENERAL INFORMATION ON COURSE TEACHER	
Address	Ruđera Boškovića 32
Telephone number	021305972
E-mail address	Radoslav.Pavazza@fesb.hr
Personal web page	
Year of birth	1945.
Scientist ID	35240
Research or art rank, and date of last rank appointment	Scientific advisor, 20.06.2003.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Full professor 05.05.2008.
Area and field of election into research or art rank	Technical sciences, fundamental technical sciences.
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Retired
Date of employment	
Name of position (professor, researcher, associate teacher, etc.)	
Field of research	
Function	
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	FSB, Zagreb
Place	Zagreb
Date	07.10.1991.
INFORMATION ON ADDITIONAL TRAINING	
Year	
Place	
Institution	
Field of training	
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English: 4 French: 3 Italian: 2 Russian: 2
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	
Authorship of university/faculty textbooks in the field of the course	– Mehanika-Statika, Školska knjiga, Zagreb 2014 – Uvod u analizu tankostjenih štapova, Kigen, Zagreb 2007

Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	– Pavazza, R, Matoković, A., Bending of thin-walled beams of open section with influence shear-Part I: Theory (Article in press), Thin-Walled Structuers, In Press, Corrected Proof, Available online 6 October 2016; http://dx.doi.org/10.1016/j.tws.2016.08.027. – Pavazza, R, Matoković, A., Vukasović, M. Bending of thin-walled beams of open section with influence of shear-Part II: Application (Article in press), Thin-Walled Structures, In Press, Corrected Proof, Available online 7 November 2016; http://dx.doi.org/10.1016/j.tws.2016.08.026. – Pavazza, Radoslav, Plazibat, Bože. Distortion of thin-walled beams of open section assembled of three plates. Engineering structures. 57 (2013) ; 189-198 – Pavazza, Radoslav; Matoković, Ado; Plazibat, Bože. Torsion of thin-walled beams of symmetrical open cross-sections with influence of shear. // Transactions of FAMENA. Vol. 37 (2013) , 2; 1-14 – 2. Pavazza, Radoslav; Matoković, Ado; Plazibat, Bože. Bending of thin-walled beams of symmerical open cross-section with influence of shear. / Transaction of FAMENA. 37 (2013) , 3; 17-30 .
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	– Project MZOŠ 023-0231744-3010 „Warping and distortion of thin-walled beams”.
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	Plaketa za istaknuti doprinos razvoju Sveučilišta u Splitu, 2015. godine. Professor emeritus Sveučiliušta u Splitu, izabran 2016. godine
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	Gojmir Radica, professor
The course he/she teaches in the proposed study program	Marine engines
GENERAL INFORMATION ON COURSE TEACHER	
Address	Tolstojeva 43, 21000 Split
Telephone number	021 305955
E-mail address	gojmir.radica@fesb.hr
Personal web page	https://nastava.fesb.unist.hr/nastava/nastavnici/detalji/goradica
Year of birth	1962
Scientist ID	245370
Research or art rank, and date of last rank appointment	15.9.2010. scientific advisor
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	20.03.2013. Professor
Area and field of election into research or art rank	Technical science, mechanical engineering, marine engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of electrical engineering mechanical engineering and naval architecture
Date of employment	1.10.2011.
Name of position (professor, researcher, associate teacher, etc.)	Professor
Field of research	Thermodynamic machines, marine engineering
Function	Professor
INFORMATION ON EDUCATION – Highest degree earned	
Degree	Doctor of Science in Mechanical Engineering
Institution	Postgraduate Studies, Faculty of Mechanical Engineering and Naval Architecture - University of Zagreb
Place	Zagreb
Date	21.06.2004.
INFORMATION ON ADDITIONAL TRAINING	
Year	1992
Place	Split, Croatia
Institution	Maritime faculty University of Split, Croatia
Field of training	Marine engineer
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English – 5 Italian- 3 German- 3
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	Professional studies: Marine propulsion Undergraduate studies: Marine engineering, Marine machineries and devices, Propulsion systems of small ships Graduate studies: Ship propulsion systems.
Authorship of university/faculty textbooks in the field of the course	

Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	– Grljušić, Mirko; Medica, Vladimir; Radica, Gojmir. Calculation of Efficiencies of a Ship Power Plant Operating with Waste Heat Recovery through Combined Heat and Power Production. // Energies. 8 (2015) , 5; 4273-4299 (članak, znanstveni) – Jakovac, Marin; Vrsalović, Pol; Radica, Gojmir; Račić, Nikola. Dijagnostika kvarova rashladnog sustava brodskih motora. // Ukorak s vremenom : glasilo ... : časopis Udruge pomorskih strojara Split. 48 (2013) ; 42-50 (članak, stručni). – Vrsalović, Pol; Radica, Gojmir; Račić, Nikola. Dijagnostika kvarova sustava ulja brodskih motora. // Ukorak s vremenom, časopis Udruge pomorskih strojara Split. 46 (2012) ; 44-52. – Domić, Ivica; Radica, Gojmir; Jelić, Maro. DIJAGNOSTIKA KVAROVA SUSTAVA GORIVA U PORIVNIM BRODSKIM MOTORIMA. // Naše more : znanstveni časopis za more i pomorstvo. 58 (2011.) , 1-2; 22-30 (članak, stručni). – Račić, N; Radica G; Kasum J. Development of marine engines to fulfill IMO emission regulations for yachts. // WIT Transactions on Ecology and the Environment, 148 (2011) ; 611-621
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	– Barle, Jani; Franulović, Marina; Jurčević Lulić, Tanja; Kladarić, Ivica; Markučič, Damir; Radica, Gojmir. Izrada kataloga znanja, vještina i kompetencija za studije strojarstva u Republici Hrvatskoj // Zbornik radova međunarodne stručne konferencije ME4CataLOgue / Kozak, D., Barle, J., Markučič, D., Pavletić, D., Matičević, G, Vranešević M. N., Rosandić, Ž, Damjanović D. (ur.). Slavonski Brod : Strojarski fakultet u Slavonskom Brodu, 2014. 21-30.
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	– Repowering motor boat 2012-13
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	– Implementation of learning outcomes in development of graduate studies of mechanical engineering, IPA IV project: "ME4CataLOgue – Croatian catalogue of knowledge, skills and competences for ME studies, 2013-2.2015.
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	Gold medal for patent on 8th Innovation fair INVENTUM 2014.
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	4,8

First and last name and title of teacher	Ivica Veža, professor
The course he/she teaches in the proposed study programme	Project management
GENERAL INFORMATION ON COURSE TEACHER	
Address	Odeska 13, 21000 Split
Telephone number	091 5151884
E-mail address	iveza@fesb.hr
Personal web page	https://www.fesb.hr/~iveza
Year of birth	1951.
Scientist ID	95643
Research or art rank, and date of last rank appointment	Scientific adviser, 05.07.2006.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Full professor, 06.06.2002.
Area and field of election into research or art rank	Engineering, Mechanical Engineering, Production Engineering Social sciences, fundamental technical science, organization of work and production
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture
Date of employment	01.01. 1981.
Name of position (professor, researcher, associate teacher, etc.)	Professor
Field of research	Organization of work and production
Function	Head of the Chair of Industrial Engineering
INFORMATION ON EDUCATION – Highest degree earned	
Degree	Professor
Institution	Faculty of Mechanical Engineering and naval Architecture
Place	Zagreb
Date	26.11.1985.
INFORMATION ON ADDITIONAL TRAINING	
Year	1983/84, 1991.
Place	Stuttgart, Berlin
Institution	Fraunhofer-IPA, Fraunhofer-IPK
Field of training	Plant layout, Simulation, Assembly
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	German, 4 English, 4
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	Undergraduate study course at FESB: Organization Graduate study courses at FESB: Project management Nagoya University, course on graduate study on Faculty of Economics: Technology management
Authorship of university/faculty textbooks in the field of the course	– Veža, I., Gjeldum, N.; Mladineo, M.: Project management. Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, Split 2013.
Professional, scholarly and artistic	– Veža, I.; Mladineo, M.; Gjeldum, N. Managing Innovative

articles published in the last five years in the field of the course (5 works at most)	Production Network of Smart Factories, 15th IFAC Symposium on Information Control Problems in Manufacturing, 2015. 589-594 – Mladineo, M. Veža, I.; Gjeldum, N. Multi-criteria decision-making in virtual enterprise formation process, CIM 2013: Computer Integrated Manufacturing and High Speed Machining, Zagreb: Croatian Association of Production Engineering, 2013. 175-178 – Veža, I.; Mladineo, M.; Gjeldum, N. Lean Learning Factory, the Learning Factory - An Annual Edition from the Network of Innovative Learning Factories, Frankfurt am Main: Next Level Interactive UG, 2015. 74-78. – Mladineo, M.; Veža, I.; Gjeldum N. Single-Objective and Multi-Objective Optimization using the HUMANT algorithm. // Croatian Operational Research Review (CRORR). 6 (2015) ; 459-473 – Veža, I.; Mladineo, M.; Peko, I. Analysis of the current state of Croatian manufacturing industry with regard to Industry 4.0, Proceedings of the 15th International Scientific Conference on Production Engineering - CIM'2015: Computer Integrated Manufacturing and High Speed Machining, Zagreb : Croatian Association of Production Engineering, 2015. 249-254
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	– Takakuwa, S.; Veža, I.: Technology Transfer and World Competitiveness, Annals of DAAAM for 2013. & Proceedings of the 24th International DAAAM Symposium, Zadar, 2013. 1-7 – Veža, I.; Gjeldum, N.; Mladineo, M.: Logistics Personal Excellence by Continuous Self-Assessment (LOPEC): Pilot Implementation - Case Studies. Conference Proceedings - MTSM 2014, Split, 2014. 39-46
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	– Veža, I.; Štefanić, N.: Introduction of Lean Management to company Končar-Transfomatori, Zagreb, 2011. – Veža, I.; Štefanić, N.: Uvođenje Lean Management u tvornicu FEAL, Split, 2014. – LEONARDO DA VINCI Project "LOPEC - Logistics personnel excellence by continuous self-assessment", FESB Split, University of Reutlingen – Network of Innovative Learning Factories NIL, "System - Learning Factory", FESB, Split, University of Reutlingen – Project TEMPUS-2008-IT-JPCR 144 959, Master Study Program in Product Lifecycle Management with Sustainable Production
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	– As a part of DIATUS 1990, he was given award for best innovation at the University of Split for work "Reducing production costs and delivery time by integrating sales and production" as a member of the team of the Laboratory of production systems FESB. – He was a project manager for the Ministry of Science and Technology together with the team of the Laboratory of production systems FESB and won a gold medal and a plaque

	for innovation "Planning and optimization of the production system using the simulation" at the Spring Exhibition of Inventions INOVA'95 in Zagreb. – For scientific contributions to the work of the association Danube Adria Association for Automation and Manufacturing DAAAM as a member of the International Committee of the Croatian, he won the award in Vienna in October 1996, and for ten years of activity in the same association in 1999. – For special contribution to the work of the Croatian Association of Production Engineering, for the benefit of scientific and economic development of the Republic of Croatian, he received a Jubilee medal and medal of the Croatian Association of Production Engineering, Zagreb, 1999. – Life Achievement Award of the Croatian Association of Production Engineering, Zagreb, 2005
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	4,8

First and last name and title of teacher	Frane Vlak, Associate professor
The course he/she teaches in the proposed study programme	Mechanics of ship structure, Mechanics of composite materials, Ship structural analysis
GENERAL INFORMATION ON COURSE TEACHER	
Address	Ruđera Boškovića 32
Telephone number	021305971
E-mail address	fvlak@fesb.hr
Personal web page	
Year of birth	1968.
Scientist ID	233385
Research or art rank, and date of last rank appointment	Scientific adviser, 11.11.2015.
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Associate professor, 29.09.2011.
Area and field of election into research or art rank	Technical sciences, field Fundamental technical sciences
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	University of Split, FESB
Date of employment	06.06.1995.
Name of position (professor, researcher, associate teacher, etc.)	Associate professor
Field of research	Mechanics of solid bodies
Function	Head of the Chair for mechanics
INFORMATION ON EDUCATION – Highest degree earned	
Degree	PhD
Institution	University of Split, FESB
Place	Split
Date	13.01.2006.
INFORMATION ON ADDITIONAL TRAINING	
Year	
Place	
Institution	
Field of training	
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English, 4 Italian, 2
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	Technical mechanics 1, Professional study of Mechanical engineering and Naval architecture Mechanics of materials 1, Undergraduate study of Mechanical engineering and Naval architecture
Authorship of university/faculty textbooks in the field of the course	
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at	– Barle, Jani; Grubišić, Vatroslav; Vlak, Frane. Failure analysis of the highway sign structure and the design improvement. // Engineering failure analysis. 18 (2011) , 3; 1076-1084 (članak,

most)	znanstveni). – Vlak, Frane; Cvitanić, Vedrana; Vučina, Damir. An approach for reduction of the volume loss in the rigid-plastic FEM using two-step updating procedure. // International journal of mechanical sciences. 53 (2011) , 10; 839-845 (članak, znanstveni). – Pavazza, Radoslav; Vlak, Frane; Vukasović, Marko. Bending and torsion of stiffeners with L sections under the plate normal pressure // Advanced Ship Design for Pollution Prevention / Soares, Guedes C. ; Parunov, Joško (ur.). London : CRC Press/Balkema, Taylor & Francis Group, 2010. Str. 121-127. – Vlak, Frane; Pavazza, Radoslav; Vukasović, Marko. An approximate analytic solution for the stresses and displacements of thin-walled orthotropic beams subjected to bending // 16th European Conference on Composite Materials ECCM16-Conference Proceedings-Seville, Spain: University of Seville, Spain, 2014. / Paris, Federico (ur.). Seville : University of Seville, 2014. 1-8 (predavanje,međunarodna recenzija,objavljeni rad,znanstveni). – Pavazza, Radoslav; Matoković, Ado; Vlak, Frane. An analytical solution for displacements and stresses for mono symmetrical stiffend plate structures under transverse loads // Knjiga sažetaka XX. simpozija Teorija i praksa brodogradnje in memoriam prof. Leopolod Sorta / Žiha, Kalman (ur.). Zagreb : Fakultet strojarstva i brodogradnje, Brodarski institut d.o.o., 2012. 76-76 (predavanje,međunarodna recenzija,objavljeni rad,znanstveni).
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	Scientific project of the Croatian Ministry of Science, Education and Sports no. 023-0231744-3010 " Warping and distortion of thin-walled sections", 2006.-2014.
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences?-pedagoške kompetencije?	ME4CataLOgoue (Mechanical Engineering for Catalogue)
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	Damir Vučina, professor
The course he/she teaches in the proposed study programme	Optimization methods
GENERAL INFORMATION ON COURSE TEACHER	
Address	FESB, R. Boškovića 32, 21000 Split
Telephone number	021 305 969
E-mail address	vucina@fesb.hr
Personal web page	
Year of birth	1962.
Scientist ID	129716
Research or art rank, and date of last rank appointment	Scientific adviser
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Full professor 2005
Area and field of election into research or art rank	Fundamental technical sciences
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	University of Split, FESB
Date of employment	1985
Name of position (professor, researcher, associate teacher, etc.)	Senior Full Professor
Field of research	Optimization methods
Function	Chair of modelling and computer application
INFORMATION ON EDUCATION – Highest degree earned	
Degree	Ph.D.
Institution	University of Zagreb
Place	Zagreb
Date	1993
INFORMATION ON ADDITIONAL TRAINING	
Year	
Place	
Institution	
Field of training	
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English, 5 German, 5
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	Undergraduate course: - Computer assisted analysis - Programming Graduate course: - Optimization methods
Authorship of university/faculty textbooks in the field of the course	Damir Vučina, 'Primjena računala u inženjerskoj analizi', FESB, 2007
Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at	– p1. Ćurković, M.; Vučina, D. 3D Shape acquisition and integral compact representation using optical scanning and enhanced shape parameterization. Advanced engineering informatics. 28

most)	(2014), 2; 111-126, IF 2.086. – p2. Vučina, D.; Ćurković, M.; Novković, T. Classification of 3d shape deviation using feature recognition operating on parameterization control points. // Computers in industry. 65 (2014), 6; 1018-1031. IF 1.457. – p3. Milas, Zoran; Vučina, Damir; Marinić-Kragić, Ivo. Multi-regime shape optimization of fan vanes for energy conversion efficiency using cfd, 3d optical scanning and parameterization. // Engineering Applications of Computational Fluid Mechanics. 8 (2014), 3; 407-421. IF 0.921. – p6. Vučina, D.; Lozina, Ž. Pehnec, I. Ad-Hoc Cluster and Workflow for Parallel Implementation of Initial-Stage Evolutionary Optimum Design. Structural and multidisciplinary optimization. 45 (2012), 2; 197-222. IF 1.488. p5. Vučina, D.; Lozina, Ž. Pehnec, I. Computational procedure for optimum shape design based on chained Bezier surfaces parameterization. Engineering applications of artificial intelligence. 25 (2012), 3; 648-667. IF 1.665.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	A number of various projects for industry.
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	Continuous, lectures, conferences.
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	– Columbia University, New York, USA, 1986- 1987, US Fulbright scholarship – Sveučilište u Splitu, 'Nagrada Nikola Tesla' za tehničke znanosti, 2014.
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

First and last name and title of teacher	Slavko Vujević, professor
The course he/she teaches in the proposed study programme	Marine Electrical Engineering
GENERAL INFORMATION ON COURSE TEACHER	
Address	Vijugasta 18, Split
Telephone number	021 / 395-552
E-mail address	vujevic@fesb.hr
Personal web page	
Year of birth	1958
Scientist ID	122731
Research or art rank, and date of last rank appointment	Scientific Adviser, January 20, 2005
Research-and-teaching, art-and-teaching or teaching rank, and date of last rank appointment	Senior Full Professor, September 24, 2009
Area and field of election into research or art rank	Area of engineering, field of electrical engineering
INFORMATION ON CURRENT EMPLOYMENT	
Institution where employed	University of Split, FESB
Date of employment	February 26, 1982
Name of position (professor, researcher, associate teacher, etc.)	Senior Full Professor
Field of research	Electric Power Engineering
Function	Head of the Sub department of electromagnetics and engineering modeling
INFORMATION ON EDUCATION – Highest degree earned	
Degree	Ph.D.
Institution	University of Split, FESB
Place	Split
Date	July 14, 1994
INFORMATION ON ADDITIONAL TRAINING	
Year	2003
Place	Neumarkt, Germany
Institution	DEHN + Söhne
Field of training	Certificate in Red/Line-Seminar and Yellow/Line-Seminar on "Lightning and Surge Protection in Power Networks"
MOTHER TONGUE AND FOREIGN LANGUAGES	
Mother tongue	Croatian
Foreign language and command of foreign language on a scale from 2 (sufficient) to 5 (excellent)	English, 4 German, 2
COMPETENCES FOR THE COURSE	
Earlier experience as course teacher of similar courses (name title of course, study programme where it is/was offered, and level of study programme)	- Marine Electrical Engineering, university undergraduate study program of Naval Architecture, University of Split, FESB - Marine Electrical Engineering, bachelor study program of Naval Architecture, University of Split, FESB - Marine Electrical Engineering, bachelor study program of Electrical Engineering and Information Technology, course of Electrical Engineering, University of Split, FESB
Authorship of university/faculty textbooks in the field of the course	

Professional, scholarly and artistic articles published in the last five years in the field of the course (5 works at most)	– Vujević, Slavko; Lovrić, Dino, On Continuous Numerical Fourier Transform for Transient Analysis of Lightning Current Related Phenomena, Electric Power Systems Research, Vol. 119, pp. 364-369, 2015. – Vujević, Slavko; Lovrić, Dino; Balaž, Zdenko, Self and Mutual Ground Impedances of Cylindrical Metal Plates Buried In Homogeneous Earth, International Journal of Numerical Modelling - Electronic Networks Devices and Fields; Vol. 28. No. 1, pp. 33-49, 2015. – Vujević, Slavko; Lovrić, Dino; Boras, Vedran, High-Accurate Numerical Computation of Internal Impedance of Cylindrical Conductors for Complex Arguments of Arbitrary Magnitude, IEEE Transactions on Electromagnetic Compatibility, Vol. 56, No. 6, pp. 1431-1438, 2014. – Lovrić, Dino; Vujević, Slavko; Modrić, Tonći, On the Estimation of Heidler Function Parameters for Reproduction of Various Standardized and Recorded Lightning Current Waveshapes, International Transactions on Electrical Energy Systems; Vol. 23, No. 2, pp. 290-300, 2013. – Vujević, Slavko; Sarajčev, Petar; Lovrić, Dino, Time-Harmonic Analysis of Grounding System in Horizontally Stratified Multilayer Medium, Electric Power Systems Research, Vol. 83, No. 1, pp. 28-34, 2012.
Professional and scholarly articles published in the last five years in subjects of teaching methodology and teaching quality (5 works at most)	
Professional, science and artistic projects in the field of the course carried out in the last five years (5 at most)	Scientific project of MZOS of Republic of Croatia No. 023-0000000-3271 - Development of advanced algorithms for modelling electromagnetic phenomena, 2008. - 2013. (Senior researcher Professor Slavko Vujević)
The name of the programme and the volume in which the main teacher passed exams in/acquired the methodological-psychological-didactic-pedagogical group of competences	
PRIZES AND AWARDS, STUDENT EVALUATION	
Prizes and awards for teaching and scholarly/artistic work	
Results of student evaluation taken in the last five years for the course that is comparable to the course described in the form (evaluation organizer, average grade, note on grading scale and course evaluated)	

3.4. Optimal number of students

The optimal number for the first study year is 15 students.

3.5. Estimate of costs per student

The annual cost per student amounts to 25,000 kn.

3.6. Plan of procedures of study programme quality assurance

<table>
<tr><td colspan="2">In keeping with the European standards and guidelines for internal quality assurance in higher education institutions (according to “Standards and Guidelines of Quality Assurance in the European Higher Education Area”) on the basis of which the University of Zagreb defines procedures for quality assurance, the proposer of the study programme is obliged to draw up a plan of procedures of study programme quality assurance.</td></tr>
<tr><td colspan="2">Documentation on which the quality assurance system of the constituent part of the University is based:</td></tr>
<tr><td colspan="2">• Regulations on the system for improving quality of FESB.</td></tr>
<tr><td colspan="2">• Handbook on the quality assurance system of the constituent part</td></tr>
<tr><td colspan="2">Description of procedures for evaluation of the quality of study programme implementation:
• For each procedure the method needs to be described (most often questionnaires for students or teachers, and self-evaluation questionnaire), name the body conducting evaluation (constituent part, university office), method of processing results and making information available, and timeframe for carrying out evaluation
• If procedure is described in an attached document, name the document and the article.</td></tr>
<tr><td>Evaluation of the work of teachers and part-time teachers</td><td>• Student evaluation of teaching quality and teaching through surveys (leaves).
• The poll organized by the Centre for Quality Improvement, University of Split, and conducted by the Committee for improving the quality of faculty (the Committee).
• Processing of the results of the survey conducted at the University computer.
• The survey is conducted every semester.
• The overall results of the survey presented to the Committee at the meetings of the Faculty Council. This report is published on the website of the Faculty.
All procedures are carried out according to the Regulations on the structure and role of the quality management system of the University of Split, according to the Regulations on the Procedure of evaluation of the quality of teachers and by the students of the University of Split and the Regulations on the system for improving the quality of FESB.</td></tr>
<tr><td>Monitoring of grading and harmonization of grading with anticipated learning outcomes</td><td>Committee for study programs Mechanical Engineering, Naval Architecture and Industrial Engineering monitors compliance with the assessment of learning outcomes. All procedures are</td></tr>
</table>

	performed according to the Rules of Procedure of the Faculty Council and the Council of the Institute, as the Committees for the study programs of the Faculty Council bodies and report.
Evaluation of availability of resources (spatial, human, IT) in the process of learning and instruction	• Student evaluation of the work of administrative and professional services and infrastructure for learning and student life through electronic surveys • Evaluation is conducted via an online questionnaire which students filled in all the years of study, except for the final • The poll organized by the Centre for Quality Improvement, University of Split, and conducted by the Committee for improving the quality of faculty (the Committee) • Processing of the results of the survey conducted at the University Computer • The survey is conducted every year • The survey results presented at meetings of the Faculty Council and published ma website of the Faculty.
Availability and evaluation of student support (mentorship, tutorship, advising)	• Students have access to administrative and professional support services in their work • Mentors are assigned to students for making the final and dissertations
Monitoring of student pass/fail rate by course and study programme as a whole	• Analysis of the student pass rate on cases and studies carried out once a year • analyzes of the studies carried out by the University in collaboration with the Board • Analysis by subjects and studies carried out by the Faculty of Management • The results of both analyzes are presented in the sessions of the Faculty Council and published on the website of the Faculty.
Student satisfaction with the programme as a whole	• Student evaluation of the work of administrative and professional services and infrastructure for learning and student life through electronic surveys • Evaluation is conducted via an online questionnaire which students complete after graduation • The poll organized by the Centre for Quality Improvement, University of Split, and conducted by the Committee for improving the quality of faculty (the Committee) • Processing of the results of the survey conducted at the University Computer • The survey results presented at meetings of the Faculty Council and published on the website of the faculty.
Procedures for obtaining feedback from external parties (alums, employers, labor market and other relevant organizations)	• Once a month, the Faculty of Management meets with the Presidency alumni • Once a year, the Days of the Faculty, organized round tables and workshops with employers and other stakeholders
Evaluation of student practical education (where this applies)	Student practice is not a mandatory part of the program. Some of the students' optional job placement abroad.

Other evaluation procedures carried out by the proposer	• Once a year, carried out the Internal periodic assessment of the quality system • Every 5 years in the Self-Evaluation All procedures are performed according to the Manual on Quality Assurance FESB.
Description of procedures for informing external parties on the study programme (students, employers, alums)	• All the information is available on the website of the Faculty: https: //www/fesb.hr • For high school students from Split and the surrounding region are organized visits to the Faculty • Participation at the festival University • Media representation