FACULTY OF MARITIME STUDIES
UNIVERSITY OF SPLIT

DETAILED PROPOSAL OF THE STUDY PROGRAMME

POSTGRADUATE UNIVERSITY STUDY TECHOLOGIES IN MARITIME AFFAIRS

SPLIT, 2020

GENERAL INFORMATION OF HIGHER EDUCATION INSTITUTION

Name of higher education institution	University of Split Faculty of Maritime Studies
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GENERAL INFORMATION OF THE STUDY PROGRAMME

Name of the study programme	Postgraduate University Study Technologies in Maritime Affairs		
Provider of the study programme	University of Split		
Coproviders of the study programme	Faculty of Maritime Studies		
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	Doctor of Science in the Field of Technical Sciences		

1. INTRODUCTION

1.1. Reasons for starting the doctoral study programme

Postgraduate education is of great importance for the development of Croatia, especially the Dalmatian region. Technical knowledge in maritime affairs is applied in various economic sectors, including maritime transport, shipbuilding, engineering, fisheries, logistics, and freight forwarding. The European Commission, together with the industry, is actively engaged in promoting the development of new educational programmes in this field as a prerequisite for societal progress. The need to increase the number of educated professionals and researchers in the technical field of maritime transport has been emphasized in the Development Strategy of the Republic of Croatia for the 21st century.[1]

The relatively rapid development of technology, driven by new knowledge and achievements, requires an appropriate level of education. A prerequisite for societal development is investment in education and science, as well as the promotion of new and innovative solutions that form the foundation for industrial growth.[2] Knowledge related to maritime transport is continuously evolving with technological advancements.

Croatia has approximately 27,000 seafarers (BIMCO, Report 2015).[3] So far, around 7,800 students have graduated from the Faculty of Maritime Studies in Split. Some students who wished to continue their education in the field of technical sciences, specifically in the area of transport and traffic technology, pursued further studies at related faculties (the Faculty of Maritime Studies in Rijeka and the Faculty of Transport and Traffic Sciences in Zagreb). Others continued their education in electrical engineering, electronics, mechanical engineering, or marine engineering at institutions such as the Faculty of Electrical Engineering, Mechanical Engineering, and Naval Architecture in Split, the Faculty of Mechanical Engineering and Naval Architecture in Zagreb, and the Faculty of Engineering in Rijeka, among others.

The Faculty of Maritime Studies in Split has had limited involvement in the education of its doctoral students, which is considered one of its major shortcomings.

A fundamental aspect of the faculty's role is the active participation of its scientists in the development of scientific and professional fields through direct involvement in and leadership of research projects. Scientific collaboration with renowned international research institutions is one of the faculty's core commitments.

[1] http://www.mvep.hr/files/file/publikacije/NPPEU_2004_1.pdf
[2] Cyranoski D, Gilbert N, Ledford H, Nayar A, Yahia M. The PhD Factory. Nature. 2011; 472:276-279.
[3] https://www.bimco.org/products/publications/other-manuals/manpower-report-2015

Since its establishment, the faculty has maintained strong cooperation with economic entities directly interested in transferring practical experience into teaching, updating the curriculum, and fostering collaboration through numerous projects and scientific research.

- With companies: Brodosplit, Brodotrogir, Croatian Register of Shipping, TLM, Adriawinch, Končar EU, Plovput, Globtik, Pasat, Jadroplov, and others.
- With institutes: Croatian Hydrographic Institute, Institute of Oceanography.
- With local government: Port authorities, the City of Split, and the County.
- Institutes: Croatian Hydrographic Institute, Oceanological Institute.
- With local government: Port authorities, the City of Split, and the County.

This collaboration is particularly evident through teaching bases, student internships, the development of studies and reports, and cooperation in international scientific conferences.

The Faculty organises the International Maritime Science Conference (IMSC) and publishes the journal *Transactions on Maritime Science* (ToMS)[4], which is indexed in databases such as Web of Science (ESCI) and Scopus.

The Faculty of Maritime Studies in Split has approximately 1,600 students, primarily from the Split-Dalmatia, Dubrovnik-Neretva, Šibenik-Knin, and Zadar counties.

The Faculty has launched several independent scientific projects funded by VIF resources and participates in the Functional Integration of Three Faculties project (infrastructure funds), aimed at enhancing scientific excellence, along with numerous other projects financed from various sources.

1.2. Compatibility with requirements of professional organizations

The study programme of the Postgraduate University Study Technologies in Maritime Affairs is aligned with the recommendations of *the European Society for Engineering Education* (ESEE).[5] The fundamental recommendations from SEFI, with which this study programme complies, are as follows:

- A doctorate must be the result of individual research work.
- A doctorate is the third level of qualifications within the Bologna Process.
- Flexibility in doctoral education.
- Improved quality of mentorship.
- Admission to the programme must be clear and transparent.
- The study programme should not take the form of a formal curriculum.

1.3. Partners outside the higher education system

Many faculty members have established scientific collaborations with universities and institutes worldwide. Especially important is the cooperation with leading international and domestic companies through projects and scientific research in which doctoral candidates are involved. There are several agreements between the faculty and organizations promoting scientific and educational activities, including:

- Economic and public sector entities, such as: Split-Dalmatia County, Croatian Academic and Research Network - CARNet, Croatian Register of Shipping, Brodosplit, Siemens
- Companies involved in crew recruitment in Croatia, such as Pasat, Gollar Shipping

- Companies engaged in maritime transport, such as Jadroplov, NYK, Brodospas, Dorian, Tankerska plovidba, Plovput d.o.o.
- Local governments and others.

Possible partners outside the higher education system who have shown interest and established cooperation during the preparation of postgraduate study programmes (some of them are ready to act as teaching bases and provide assistance with available equipment) and who plan to enhance the skills of young people include:

- Croatian Register of Shipping,
- Croatian Hydrographic Institute,
- Plovput d.o.o.,
- Pasat d.o.o.,
- IVA d.o.o.,
- Jadrolinija d.o.o.,
- Jadroplov d.d.

1.4. Financing

The Postgraduate University Study Technologies in Maritime Affairs will be funded through the tuition fees of doctoral candidates. The funds from the tuition fees will be used for educational purposes and scientific research, including covering the costs of external collaboration (with other universities in Croatia and abroad) and mentoring work. External collaboration will also be financed from CEEPUS funds, Erasmus Plus, tuition fees from participants, and other sources. For doctoral candidates employed as teaching assistants, the faculty and the university will cover the costs of their studies.

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

The Faculty actively monitors the development of higher education worldwide, particularly in Europe. In the process of creating the Postgraduate University Study Technologies in Maritime Affairs, similar European programmes and programmes from outside the European continent were taken into consideration. The system of education for scientists and experts in this field is highly diverse and interdisciplinary globally and in Europe, and no two countries have an identical educational system.

The programme covers a broad range of technical sciences focused on maritime technologies. It is important to emphasize that the choice of Subjects is entirely flexible in agreement with the mentor, allowing students to direct their research towards interdisciplinary studies in various scientific fields. The University Postgraduate Study Programme in Maritime Technologies can be compared with several other similar domestic and European postgraduate programmes. The structure of the proposed study programme is comparable to the programmes of related (scientific field and area) higher education institutions in Croatia:

- the doctoral study programme "Maritime Affairs" at the Faculty of Maritime Studies, University of Rijeka
- the doctoral study programme "Technological Systems in Transport" at the Faculty of Transport and Traffic Sciences, University of Zagreb.

It is also comparable to similar study programmes at renowned European universities.

Notable examples include:

- École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland (PhD

Programme),
- Faculty of Mechanical Engineering, University of Maribor, Maribor, Slovenia (PhD Programme),
- University of Lisbon, Lisbon, Portugal (PhD Programme).

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

The Postgraduate University Study Technologies in Maritime Affairs supports the mobility of students and professors both from Croatia and abroad, including institutions such as the Faculty of Mechanical Engineering and Naval Architecture at the University of Zagreb, the Faculty of Engineering at the University of Rijeka, the Faculty of Mechanical Engineering in Slavonski Brod at the University of Osijek, the Faculty of Maritime Studies in Rijeka, the Maritime Departments at the Universities of Zadar and Dubrovnik, the Faculty of Transport and Traffic Sciences in Zagreb, and the Faculty of Electrical Engineering, Mechanical Engineering, and Naval Architecture, among others.

Students are given the opportunity to complete part of their study programme at similar institutions in Croatia or abroad. In terms of international collaboration, student and staff exchanges are possible through the Erasmus Plus programme. The University Postgraduate Study in Maritime Technology will rely on internationalization, especially in delivering Subjects in English, facilitating staff exchanges, welcoming international students, and more.

1.7. 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

In 2015, the National Council for the Development of Human Resources issued a recommendation for STEM (Science, Technology, Engineering, and Mathematics) fields: "Considering the tasks defined in Article 10 of the Croatian Qualifications Framework Act (Official Gazette, No. 22/13), under which the National Council for the Development of Human Resources provides recommendations regarding the planning and development process of human resources in accordance with the development strategy of the Republic of Croatia, and provides opinions on the recommendations of sectoral councils concerning enrolment policies, enrolment quotas, and financing of qualifications from public sources, according to qualifications and counties, in the absence of sectoral council recommendations, and in line with its vision and mission, the National Council for the Development of Human Resources has decided to issue recommendations for a sectorally focused approach in defining enrolment quotas for secondary and higher education." [6]
Point 2 recommends maintaining the total enrolment quota for students in study programmes in the Republic of Croatia with redistribution in accordance with the recommendations of the Croatian Employment Service regarding educational enrolment policies and scholarship policies. It is necessary to increase enrolment quotas in the fields of natural sciences, technology, engineering, and mathematics (the so-called STEM fields), while reducing enrolment quotas in social sciences, with the exception of certain qualifications in the social and humanities areas classified as deficit professions. This recommendation suggests implementing measures such as defining the number of full subsidies for the participation costs of regular students, and through programme agreements between higher education institutions and the Ministry of Science, Education, and Sports.
The Senate of the University of Split adopted the 2015-2020 Strategy in October 2015.

This strategy defines the mission of the university through the enhancement of research and innovation, as well as collaboration with the local community, particularly in the economy, by transferring knowledge and technology.[7]

The first point of the Strategy: "Science, Research, Art, and Creativity" defines five strategic goals:

STRATEGIC GOAL 1: The University of Split is a research university recognized in the European Research Area.

STRATEGIC GOAL 2: The scientific and research activities of the University of Split contribute to the development of the region, the Republic of Croatia, and the European Union.

STRATEGIC GOAL 3: Interdisciplinary cooperation among scientists is encouraged through the functional integration of scientific and research activities at the University, as well as through collaboration with other domestic and international scientific research institutions and the economy.

STRATEGIC GOAL 4: Artistic creativity is encouraged, with an emphasis on the interdisciplinary interaction between cultural heritage and contemporary creative industries.[8]

In addition to the mission and vision of the University of Split, the following strategic documents were used as guidelines for setting strategic goals:

- European Strategy for Smart, Sustainable, and Inclusive Growth (EUROPA 2020)
- Strategic Documents of the European Research Area (ERA)
- Strategic Documents of the European Higher Education Area (EHEA)
- Strategy for Education, Science, and Technology of the Republic of Croatia.[9]

The Postgraduate University Study Technologies in Maritime Affairs is aligned with the mission, vision, and strategic goals adopted in the Development Strategy of the University and the Maritime Faculty of Split for the period 2012–2016, as well as with the Science Development Strategy of the Maritime Faculty of Split 2017–2022. This programme can be compared to similar doctoral studies conducted at the Faculty of Transport and Traffic Sciences and the Maritime Faculty of the University of Rijeka. These postgraduate studies train professionals who hold similar academic titles. However, the doctoral study concept at the Maritime Faculty of the University of Split differs from the mentioned programmes in the following aspects:

- Sustainability of the study programme
- Study concept
- Internationalization
- Enrolment of potential students
- Choice of thesis topic and mentor
- Funding for research activities
- Ratio of teaching and research work

[7] www.kvalifikacije.hr/fgs.axd?id=1061

[8] www.unist.hr/Portals/0/docs/.../UNIST_STRATEGIJA_2015_2020_.pdf

[9] ibidem

The Postgraduate University Study Technologies in Maritime Affairs will not be financed by the University or the Maritime Faculty. The enrolment fee will be sufficient for student education and the operation of the programme.

Students will have classes from two mandatory and three elective subjects. The tuition fee will cover the research work and study costs. The amount of tuition and projects the students would be involved in should be enough to support the scientific research process leading up to the creation of a doctoral dissertation. The teaching load for faculty members will be accounted for in their teaching workload, while mentoring will count toward their research workload. Guest lecturers may be compensated.

Professors involved in the doctoral study programme will be from both Croatia and abroad. The doctoral dissertation will be written in English, and teaching will be conducted in both Croatian and English.

Students who enrol based on an invitation must select a mentor and the area in which they wish to conduct research before enrolment. The mentor must be competent and assess the student's potential. The mentor will work with the student to create a research plan. Research funds will come from the tuition fees and other funds. Research work is the foundation of the programme.

The proposed study programme aligns with the strategic document **Network of Higher Education Institutions and Study Programmes in the Republic of Croatia**, which encourages the opening of study programmes in the STEM field, including the proposed programme.

The structure of the Postgraduate University Study Technologies in Maritime Affairs is based on the following foundational documents:

1. "Conclusions and Recommendations", Bologna Seminar on "Doctoral Programmes for the European Knowledge Society," Salzburg, 2005.
2. "Final Conclusions", Bologna Seminar on "Matching Ambition with Responsibilities and Resources," Nice, 2006.
3. "Doctoral studies in Europe: excellence in researcher training", LERU – League of European Research Universities, 2007.
4. Europe’s Universities beyond 2010: Diversity with a common purpose, Lisbon Declaration, 2007.
5. Europe’s Universities – Looking Forward with Confidence, Prague Declaration, 2009.
6. Doctoral Studies, Croatian Science Foundation, 2006.

The Postgraduate University Study Technologies in Maritime Affairs is structured in such a way that it can easily be integrated into the Doctoral School of the University of Split in the near future. This is due to the programme's orientation towards the technical field, particularly transportation technology, which is only offered at the Faculty of Maritime Studies.

In the **Strategy for Education, Science, and Technology**, adopted by the Croatian Parliament on **October 17, 2014**, in the section on **Doctoral Schools and Postdoctoral Training**, it is emphasized that:

"The importance of doctoral education and doctoral schools is of constant interest to the EU in all member states, including Croatia and its neighbouring countries. The goals set for doctoral schools are research excellence, the possibility of interdisciplinary research, an attractive institutional environment, openness towards the economy and other sectors, international networking, the internationalization of doctoral studies, including doctoral

candidates and mentors from abroad, acquisition of transversal skills, professional development of researchers, and ensuring quality."[10]

This statement highlights the alignment of the University Postgraduate Study in Maritime Technology with national and EU goals for doctoral education, emphasizing its interdisciplinary nature, internationalization, and research-driven approach.

A selection process will be implemented during the admission to the doctoral programme. Doctoral research will be linked to research projects and the best research groups, and doctoral training will be established. Collaboration will be achieved, utilizing the research and mentoring potential of scientific institutes, as well as the research resources from the business sector and societal activities. Artistic doctoral studies will be developed based on the same principles. “

1.8. Current experiences in equivalent or similar study programmes

Of the total number of students enrolled in existing doctoral programmes from 1999 to 2011, only 11% have completed them.[11] This disappointing success rate is the result of:

- unclear study rules,
- insufficiently good curricula,
- lack of motivation during the studies, and
- insufficient focus on industry and business-related subjects.

The pass rate decreases further if the doctoral student is from the industrial sector and studies half-time. The low success rate of students from the industrial sector is due to extended study periods, as well as modern trends in career changes driven by promotion, higher pay, etc. Doctoral candidates from the industrial sector are also insufficiently motivated to study because their personal earnings and career advancement are often not dependent on their degree.

Doctoral candidates in the current system coming from scientific institutes and research institutions see mandatory subjects, which are not aligned with their research direction, as a reason for their failure. Moreover, the small number of quality mentors, who are often occupied with other scientific research projects, further contributes to this issue.

In addition, the current conditions for enrolling in postgraduate studies can be considered insufficient, and the quality of newly enrolled doctoral students is questionable. The enrolment conditions include:

- A minimum GPA of 3.5 during undergraduate and graduate studies
- A GPA below 3.5, but with recommendations from three professors in scientific teaching positions from the graduate programme
- Previous scientific work.

[10] https://narodne-novine.nn.hr/clanci/sluzbeni/2014_10_124_2364.html

[11] Viđak M., Tokalić R., Marušić M., Puljak L., Sapunar D. Improving completion rates of students in biomedical PhD programmes: an interventional study. 2016, submitted

These enrolment criteria do not guarantee success in studies. Students typically choose their dissertation topic at the end of the subject cycle, and the mentor is chosen just before the defence of the topic. The selection of the mentor is confirmed by the Faculty Council based on the proposal of the Postgraduate Study Committee, ensuring alignment between the topic and the mentor's scientific work. This indicates that the mentor and the doctoral student begin working together only halfway through the postgraduate study, which does not contribute to the success of the scientific research work. Furthermore, neither of them has had previous points of contact in research prior to this, which results in the loss of valuable time in getting acquainted with each other's research methods and habits.

"The research work of the participants, aside from tuition fees, will be funded from project funds, which, with technical support from the Faculty's Science, Projects, and Cooperation Office, the participants will apply for and implement. In this way, participants will gain transversal skills in attracting external funding for research projects, essential for utilizing funding opportunities from ESI funds and European programmes."

Most of the University of Split's constituent units have not kept statistics on the success rate and duration of studies. For example, in doctoral studies in medicine in Croatia from 1998 to 2006, the average duration of doctoral studies was over 7 years[12]. It is estimated that an analysis of success rates for other units at the University would yield similar results.

According to the recommendations of the Association of Higher Maritime Institutions, the emphasis is placed on mentoring research work. Innovation in writing dissertations with clear scientific contributions and applications within Croatia is encouraged. The low pass rate in the postgraduate Maritime Studies programme (7%) at the University of Rijeka is an issue that should be addressed by enhancing mentorship and improving the selection of students.

2 DESCRIPTION OF THE STUDY PROGRAMME

2.1. General information

[12]Viđak M, Tokalić R, Marušić M, Puljak L, Sapunar D. Improving completion rates of students in biomedical PhD programmes: an interventional study. 2016, submitted

Scientific/artistic area of the study programme	Technical sciences
Duration of the study programme	at least 3 years
The minimum number of ECTS Mandatory for completion of study	180
Admission Requirements and Selection Process	**Curriculum of the University Postgraduate Study Technologies in Maritime Affairs** enables scientific advancement for various categories of applicants: • Applicants with completed undergraduate and graduate studies in relevant scientific fields, and at least **300 ECTS credits** earned. • Applicants with a completed university undergraduate programme in relevant scientific fields, according to the Law on Higher Education Institutions (NN. No. 59 from July 17, 1996), or the laws on higher education that were in force at the time. • Applicants with a Master's degree in relevant scientific fields and branches. Applicants who have completed postgraduate scientific studies for the acquisition of a Master of Science degree in the relevant scientific fields and branches and passed all exams but have not defended their master's thesis. • applicants who have achieved scientific achievements that, in their significance, meet the conditions for election to scientific titles in the relevant scientific fields, and a doctorate in science can be acquired by enrolling in a postgraduate study for scientific improvement and writing a doctoral thesis without attending classes and taking exams, • applicants who have started studying at related postgraduate studies (ECTS recognition and differential exams are determined by the Postgraduate Study Committee), • an interview between the Committee and the doctoral candidate is a mandatory integral part of the enrolment procedure, where all necessary conditions for completing the study within the stipulated deadline are clearly defined, • a doctoral candidate who studies part-time must submit a statement upon enrolment that the available working hours enable him to fulfil his student obligations according to the study plan. The relevant scientific fields and branches are: 2.2 Shipbuilding, 2.5 Civil Engineering (Supporting Structures, Hydraulic Engineering), 2.8 Metallurgy, 2.9. Computer Science, 2.10. Mining, Petroleum and Geological Engineering, 2.11. Mechanical Engineering, 2.12. Traffic Technology and Transport (Road and Rail Transport, Maritime and River Transport), 2.14. Aviation, 2.15. Basic Technical Sciences.

Enrolment in postgraduate studies is carried out based on the Decision of the Faculty Council. The Faculty will publicly announce the call for applications with the requirements for enrolment in the press and on its website.

Admission requirements vary depending on the category of applicant.
Admission requirements for applicants with a completed graduate degree according to the Act on Scientific Activity and Higher Education

The University Postgraduate Study Technologies in Maritime Affairs can be enrolled by applicants who have completed a university graduate study in the relevant scientific fields and have achieved at least 300 ECTS credits, subject to the following conditions:
• They have a recommendation from a professor who is involved in the postgraduate study in the technical field, which also includes future mentoring
• They know one of the world's languages for using scientific and professional literature.
• The interview of the Committee with the doctoral candidate is a mandatory integral part of the enrolment procedure, during which all necessary conditions for completing the study within the stipulated deadline are clearly defined.
• A doctoral candidate who studies part-time must submit a statement upon enrolment that the available working hours enable him to fulfil his student obligations according to the study plan.
• Before enrolment, the applicant must, in agreement with the mentor.
− determine a preliminary topic for the doctoral thesis: a proposal for the title of the doctoral thesis in Croatian and English,
− explain the preliminary topic,
- create a basic goal and research plan,
- create a research methodology and schedule,
- determine the expected original scientific contribution of the doctoral thesis, the proposal of the language in which the thesis will be written and defended, if it is proposed to write and defend it in English.
• list of papers, copies of published papers and evidence (certificates) of other activities for which the applicant has received ECTS credits,
• make a financial research plan,
• a short CV of the applicant with a description of scientific and professional activities.
• Doctoral students who have started studying at other related postgraduate studies may apply for admission to the Study with the recognition of ECTS credits. The recognition of credits is carried out by the Postgraduate Study Committee.

Applicants who have completed a corresponding university graduate study at foreign universities, their suitability for

admission to the Postgraduate University Study Technologies in Maritime Affairs is determined by the selected mentor and the Postgraduate Study Committee.
Enrolment may also be approved for applicants who have completed a graduate study in related scientific fields and branches at one of the technical faculties, with the passing of differential exams due to programme differences. The content of the differential exams is determined by the Postgraduate Study Committee:

Enrolment requirements for applicants with completed undergraduate studies according to the Higher Education Act

The postgraduate study in maritime technology can be enrolled by applicants who have completed a university graduate study in the relevant scientific fields and have achieved at least 300 ECTS credits, subject to the following conditions:
•They have a recommendation from a professor involved in the postgraduate study, which also includes future mentoring
• The Committee's interview with the doctoral candidate is a mandatory integral part of the enrolment process, clearly defining all the necessary conditions for completing the study within the stipulated deadline:
• A doctoral candidate who studies part-time must submit a statement upon enrolment that his/her available working hours allow him/her to fulfil his/her student obligations according to the study plan.
• Before enrolling, the candidate must, in agreement with the mentor:
− determine the preliminary topic of the doctoral thesis: a proposal for the title of the doctoral thesis in Croatian and English,
− explain the preliminary topic,
− create the basic goal and research plan,
− create a methodology and research flow chart,
− determine the expected original scientific contribution of the doctoral thesis, a proposal for the language in which the thesis will be written and defended, if writing and defending in English is proposed,
• a list of papers, copies of published papers and evidence (certificates) of other activities for which the candidate has received ECTS credits,
• create a financial research plan,
• a short CV of the candidate with a description of scientific and professional activities.

Doctoral students who have started studying at other related postgraduate studies may apply for enrolment in the Study with the recognition of ECTS credits. The recognition of credits is carried out by the Postgraduate Study Committee.
Applicants who have completed a relevant university graduate study at foreign universities, their suitability for

admission to a postgraduate study in a technical field is determined by the Postgraduate Study Committee.

Enrolment may also be approved for applicants who have completed a graduate study in related scientific fields and branches at one of the technical faculties, with the requirement to take differential exams due to programme differences. The content of the differential exams is determined by the Postgraduate Study Committee.

Enrolment requirements for applicants with a Master of Science

The postgraduate study in Maritime Technology may be enrolled by applicants who have obtained a Master of Science in relevant scientific fields and branches in the Republic of Croatia or equivalent scientific fields from abroad.

Enrolment may also be approved for applicants who have obtained a Master of Science in other related fields and branches of technical sciences, with the requirement to take differential exams due to programme differences. The content of the differential exams is determined by the Postgraduate Study Committee.

Applicants with a Master of Science are enrolled in the IV semester of postgraduate study provided that:

• they have a recommendation from a professor who is involved in the postgraduate study, which also includes future mentoring,

• an interview between the Committee and the doctoral candidate is a mandatory component of the enrolment procedure, clearly defining all the necessary conditions for completing the study within the stipulated deadline,

• a doctoral candidate who studies part-time must submit a statement upon enrolment that the available working hours enable him/her to fulfil his/her student obligations according to the study plan,

• before enrolment, the applicant must, in agreement with the mentor:

− determine a preliminary topic for the doctoral thesis: a proposal for the title of the doctoral thesis in Croatian and English,

− explain the preliminary topic,

− create a basic goal and research plan,

− create a methodology and research flowchart,

− determine the expected original scientific contribution of the doctoral thesis, a proposal for the language in which the thesis will be written and defended, if writing and defending in English is proposed,

• a list of papers, copies of published papers and evidence (confirmations) of other activities for which the applicant has received ECTS credits,

• create a financial research plan,

• a short CV applicant with a description of scientific and professional activities.

Doctoral students who have started their studies at other related postgraduate studies may apply for admission to the Study with the recognition of ECTS credits. The recognition of credits is carried out by the Postgraduate Study Committee.

Number of applicants and admission procedure
The number of applicants who enrol in the Postgraduate University Study Technologies in Maritime Affairs is limited and is based on the Decision of the Faculty Council in accordance with the available capacity. The number of applicants who enrol in the study in the current academic year is limited.

The criteria for evaluating applicants include success in graduate or undergraduate studies, demonstrated interest in scientific research, published works, recommendations for postgraduate studies, selection of a potential mentor, proposal for a research topic, scientific research plan, and proposal for scientific research equipment to be used.
Applicants who have completed postgraduate scientific studies for the acquisition of a Master of Science degree and have not obtained a Master of Science degree, as well as applicants who have obtained a Master of Science degree, are enrolled in the University Postgraduate Study of Maritime Technologies without an entrance exam and outside of the enrolment quotas.

For persons who have achieved scientific achievements and can acquire a doctorate by enrolling in postgraduate studies for scientific advancement and writing a doctoral thesis without attending classes and taking exams, special enrolment conditions are prescribed in accordance with the Act on Scientific Activity and Higher Education.

2.2. Learning outcomes of the study programme

The doctoral student acquires the highest level of competences (8.2) according to the Croatian Qualifications Framework (CKO), which relate to the creation and evaluation of new facts in the field of scientific research, which leads to the advancement of the boundaries of knowledge. He also develops social skills, independence and responsibility in work. Specific learning outcomes at the level of the University Postgraduate Study of Maritime Technologies:

1. Apply advanced mathematical, physical and scientific principles in the research and development of new technologies, ideas or processes in technical sciences;
2. Create and evaluate new facts, procedures and theories that, based on research results, lead to the advancement of knowledge in the field of scientific research;
3. As an author or co-author, write and successfully publish a paper in an internationally peer-reviewed journal referenced in the SCI, CC or SCI-Expanded database;
4. Prepare and present a public statement on the results and scientific knowledge at an international scientific conference;
5. Argue your opinion and defend your position in a discussion with other scientists in the field of research;
6. As a collaborator or project leader, design scientific research in the field of technical sciences;
7. Critically assess published original scientific results of other authors in their field of research;
8. Analyse and evaluate new and specialized knowledge, methods, tools and instruments in the field of scientific research;
9. Apply methods for defining and protecting intellectual property;
10. Collect and analyse information (literature and database searches);
11. Present and explain the results of scientific research to other scientists and laypeople;
12. Take ethical and social responsibility for the success of research and the possible consequences of the impact on the wider community.
13. Plan and lead multidisciplinary and international scientific projects (drafting scientific research, organizing research, timely detection of potential problems, determining necessary resources, leading a research team);
14. Write and report (speaking and listening skills, ability to present data and research results);
15. Express personal, professional and ethical stance.
16. Face new challenges of society and economy and contribute to social and economic development by applying the results of scientific research;
17. Analyse and evaluate different sources of scientific data;
18. Write and present scientific work in a technical field using scientific methods;
19. Select appropriate scientific methods suitable for research in a technical field;
20. Plan and conduct research independently under the supervision of a mentor or as part of a team.

2.3. Employment opportunity

The most successful PhDs can be employed at the University, at the technical departments, at the institutes and in the industry of the Dalmatian region and the Republic of Croatia. Among the institutions, in addition to the University of Split, it is worth mentioning:

- Croatian Register of Shipping,
- Croatian Hydrographic Institute and
- Oceanographic Institute.

Since the postgraduate university study should have an industrial orientation and the possibility of implementing the European Industrial Doctorates (EID) programme and the Marie Sklodowska Curie funds, emphasis is also placed on industrial partners, especially:
The industrial sector can be divided into the following sectors:

- shipbuilding,
- mechanical engineering,
- electronics and energy, and
- maritime transport.

There are two shipyards operating in the County: Brodosplit and Brodotrogir, two repair shipyards: Brodoremont Trogir and Brodoremont Vranjic, and a large number of manufacturers who maintain a century-old tradition in the construction and repair of small vessels.
Our shipbuilding is individual, not serial. It is focused on more demanding, higher quality, more complex and more sophisticated projects in new construction. When designing each new ship, in addition to domestic knowledge, top world knowledge and achievements are used.

The strongest and highest quality mechanical engineering capacities are intended for shipbuilding and nautical programmes. The diesel engine factory d.o.o. Split produces two-stroke slow-speed and four-stroke medium-speed and high-speed diesel engines under license from M.A.N. B&W. Dalstroj d.d. Split, Adriawinch d.o.o. produces marine and nautical deck equipment.

The following companies are recognized in the design, construction, production, assembly and testing of electrical devices, electronic equipment, solar cells and solar devices:
Končar Električni uređaji d.d. Split, a company with many years of top references in the field of engineering, design, production, assembly, testing and commissioning of low and medium voltage electrical devices and equipment.
PCE – Maritime Electronics Centre d.o.o. Split is a project and development software and hardware centre for the most complex electronic devices.

Among the maritime transport companies, it is worth highlighting Plovput d.o.o, Jadroplov Split, Marin Consalt, Port of Split, maritime agencies for boarding seafarers Golar, IVA, Orient d.o.o. Pasat d.o.o. and others.

2.4. Possibility of continuing studies at a higher level

Upon completion of studies and obtaining the academic title of Doctor of Science, further education is possible in post-doctoral Subjects, studies and advanced training.

2.5. Study/s of the lower level of the proposer or other institutions in the Republic of Croatia from which it is possible to enrol in the proposed study

Graduate university studies from which it is possible to enrol in the University Postgraduate Study Technologies in Maritime Affairs:

- Graduate university study in Mechanical Engineering,
- Graduate university study in Industrial Engineering,
- Graduate university study in Maritime Nautical Studies,
- Graduate university study in Naval Engineering,
- Graduate university study in Marine Engineering,
- Graduate university study in Marine Electrical and Information Technologies,
- Graduate university study in Maritime Systems and Processes,
- Graduate university study in Maritime Technologies of Yachts and Marinas,
- Graduate university study in Nautical Studies and Maritime Transport Technology,
- Graduate university study in Naval Engineering and Maritime Transport Technology,
- Graduate university study in Transport Technology and Organization,
- Graduate university study in Logistics and Management in Maritime and Transport,
- Graduate university study in Maritime Management,
- Graduate university study in Road Transport,
- Graduate university study in Urban Transport,
- Graduate university study in Information and Communication transport,
- Graduate university study in Postal Transport,
- Graduate university study in Water Transport,
- Graduate university study in Air Transport,
- Graduate university study in Railway Transport,
- Graduate university study in Intelligent Transport Systems and Logistics,
- Graduate university study in Logistics,
- Graduate university study in Aeronautics,
- Integrated study in Military Maritime Studies (Military Nautical Studies and Military Naval Engineering),
- Graduate university study in Electrical Engineering,
- Graduate university study in Electronics,
- Graduate university study in Computer Science.

The University Postgraduate Study Technologies in Maritime Affairs may also be enrolled by applicants who have completed a graduate study at other faculties in the appropriate scientific field, in accordance with the defined enrolment conditions. Enrolment may also be granted to applicants who have completed a graduate study in related scientific fields and branches at one of the technical faculties. The content of differential exams is determined by the Postgraduate Study Committee. Students who have started studying at other postgraduate studies may enrol in the postgraduate study in Maritime Technology, following the same enrolment procedure, with the recognition of exams and scientific research papers or, if necessary, taking differential exams. The Postgraduate Study Committee decides on the method of enrolment by transfer. Students whose rights to study at other postgraduate studies have expired cannot request the recognition of exams and papers by the Committee.

2.5. Conditions and method of studying

Enrolments

More attention needs to be paid to the quality of the admission criteria. Therefore, the mentor will be selected before enrolling in the postgraduate study. The student can enrol only after the mentor accepts the doctoral student for future joint scientific research work during the study. The mentor would develop a preliminary scientific research plan and a proposal for the equipment on which the research would be conducted. This scientific

research plan, as well as the topic, is evaluated by the Postgraduate Study Committee.

Study time

The postgraduate study lasts a minimum of three (3) years, or six (6) semesters. It is designed as a full-time study with a full workload for doctoral students, but it can also be carried out as a part-time study.

The postgraduate study for doctoral students studying full-time lasts three (3) years, but in justified cases it can be extended up to five (5) years by decision of the Faculty Council. The part-time study lasts five (5) years, and for justified reasons, decided by the Faculty Council, it can be extended up to seven (7) years with justification. In particularly justified cases, the Faculty Council may allow an extension of the deadline for defending the doctoral thesis up to a maximum of eight (8) years from enrolment.

Student activities during the study include:

- taking exams in subjects prescribed by the study programme,
- participating in scientific research with the help and supervision of a mentor that results in the preparation and defence of a doctoral thesis,
- presenting the results of scientific research to colleagues and at domestic and international scientific conferences,
- publishing scientific papers,
- staying at other domestic and foreign universities or scientific institutions, etc.

In order to increase the number of students who will successfully complete their studies and become Doctor of Science, it can be proposed to reduce the teaching load while simultaneously increasing scientific research work.

Subjects

The possibility of choosing individual subjects allows doctoral students to complete and deepen their knowledge in accordance with their scientific interests. Subjects are taken and passed at the Faculty with the possibility of choosing subjects from other components. This increases the quality of teaching, the selection of the highest quality lecturers-professors from a particular field and significantly reduces the costs arising from the payment of lecturer fees.

Subjects are taught through lectures or seminars. In the event that fewer than five (5) students choose a subject, or if it is a part-time study, classes are taught through consultations.

Subjects taught through lectures have 30 hours of direct teaching. Teaching in seminar subjects is conducted in the form of consultations, and they are also enrolled with a fund of 30 hours of teaching. The introductory part of the teaching of at least 3 hours is held in the form of lectures.

Subjects serve to profile knowledge for a narrower area of research. They belong to the narrower area of the doctoral student's scientific research. Within the offered subjects, the doctoral student chooses a total of five (5) subjects in I. and II. semester, of which two (2) are mandatory and three (3) are elective. Elective subjects are subjects chosen with the consent of the mentor in the direction of the doctoral candidate's scientific profiling. With the consent of the mentor and the Postgraduate Study Committee, the doctoral candidate may enrol in one (1) subject from another postgraduate study programme at faculties of other universities. In the case of cooperation between the University and other

universities, with the consent of the Postgraduate Study Committee, the stated condition may be changed.

The doctoral candidate is mandatory to pass both mandatory subjects, and from the elective subjects, choose the mentor's subject and two other subjects in accordance with his/her scientific profiling. All subjects are aligned with the trends in the development of science and changes in scientific and research projects, with the approval of the Faculty Council. The selection of subjects is carried out by mentors and is fully adapted to each doctoral student, with the proviso that for some subjects there are certain prerequisites, which are presented in the tables for each individual subject.
The postgraduate studies are taught by teachers with scientific teaching titles in the technical field.

Scientific research work

During their postgraduate studies, a doctoral candidate is obliged to actively conduct scientific research and publish scientific papers in the field of the doctoral thesis. A doctoral candidate is obliged to present and publish at least one scientific paper in the proceedings of a scientific conference in the field of the doctoral thesis with international peer review and to publish at least one paper in an internationally peer-reviewed journal indexed in CC, SCI or SCI-Expanded, thematically related to the doctoral research, in which they are the main author.

A doctoral candidate may publish scientific papers in scientific journals that are categorized differently with respect to the scientific basis and publish papers at international scientific conferences with a mandatory certificate of participation and presentation. Published articles should be based on research work in the direction of the doctoral dissertation.

The doctoral candidate's mentor writes a report on the doctoral candidate after two years of joint work. Such a report should be accepted by the Postgraduate Study Committee.

Public discussion

Public discussion implies prior application of the doctoral thesis topic. The procedure for applying for a doctoral thesis topic is initiated by submitting a completed Doctoral Thesis Topic Application Form. The condition for applying for a doctoral thesis topic is passing exams in all enrolled subjects, and the doctoral candidate must have published at least one scientific paper in the proceedings of a scientific conference with international peer review in the field of the doctoral thesis topic.
In the process of accepting the doctoral thesis topic, a public discussion is held on the expected original scientific contribution of the dissertation, which assesses the expected scientific contribution and its feasibility.

Writing a doctoral thesis

The procedure for preparing and defending a doctoral thesis includes submitting the text of the doctoral thesis, evaluating the thesis and defending it in accordance with the Regulations on Postgraduate Studies.
Before submitting the doctoral thesis for evaluation, the doctoral candidate is Mandatory to have published at least one internationally peer-reviewed paper in a journal indexed in CC, SCI or SCI-E, thematically related to the doctoral research, in which he is the main author. The paper should be published in a journal referred to the scientific field of the doctoral research.
The framework content and layout of the doctoral thesis are prescribed by special

Instructions on the Content and Layout of the Doctoral Thesis. The doctoral thesis can be prepared in the form:

i) scientific monographs or
ii) in the form of a set of published scientific papers with an overview chapter.

The doctoral thesis is written in English. The thesis defence is in English before an international committee.

Points system

The teaching and scientific-research workload of the study is expressed in ECTS credits, with each subject or activity being assigned a certain number of credits, which is proportional to the workload of the doctoral student. The basic principle of the ECTS system is that the minimum sum of credits for one academic year is 60, or a total of 180 ECTS credits for postgraduate studies (Table 2).

The distribution of credits related to individual activities of the doctoral student is as follows:

- taking subjects prescribed by the study programme at least 25 ECTS,
- publishing scientific papers in proceedings and journals and conducting scientific research resulting in the preparation and defence of a doctoral thesis 95 ECTS,
- public discussion 20 ECTS,
- defence of a doctoral thesis 40 ECTS.

The structure of the postgraduate study with the minimum number of subjects and the corresponding ECTS credits is shown in the table. A doctoral student can enrol in a larger number of subjects.

Table 2. Content of the Postgraduate University Study Technologies in Maritime Affairs and distribution of ECTS credits

Semester	**I**	**II**	**III**	**IV**	**V**	**VI**		**ECTS points**
Study subjects	2 Mand.	3 Elect.	-	-	-	-	-	**25**
Public discussion	-	-	-	1	-	-	-	**20**
Scientific research and doctoral thesis	+	+	+	+	+	+	-	**95**
Doctoral thesis defence	-	-	-	-	-	-	1	**40**
Total points after defending the doctoral thesis								**180**

The evaluation of published scientific papers is carried out according to the following criteria:

- Scientific paper in an international scientific journal from scientific databases: CC, SCI, 25 ECTS,
- Scientific paper in an international scientific journal from scientific databases SCI-E, 20 ECTS,
- Scientific paper in an international scientific journal from scientific database SCOPUS, 8 ECTS,
- International conference (with certificate of participation and presentation) 7 ECTS,
- Research work on a scientific project 15 ECTS,
- Research work on projects (developmental, innovative, etc.) by the EU 10 ECTS (decided by the Postgraduate Study Committee),
- Research on a professional paper 4 ECTS.

Recognition of doctorates - Scandinavian model

A scientific work based on consolidated scientific papers in the form of a set of published scientific papers in the Web of Science database, which were published after enrolment in the doctoral study. A set of published scientific papers consists of 3-5 papers, of which the applicant must be the first author in 3 papers. The total IF (Impact Factor) of the published papers must not be less than 4. The scientific papers that are proposed as a doctoral thesis together must form a complete whole in the field covered by the accepted topic of the doctoral thesis. Each paper, unless specifically explained, can qualify only one doctoral candidate. The mandatory accompanying part of such a form of doctoral thesis is a chapter written in Croatian, consisting of an introduction with clearly elaborated hypotheses, research methods, discussion and conclusions. A doctoral thesis submitted in this way through consolidated published papers undergoes the same evaluation and defence procedure as a monograph.

2.7. System of counselling and guidance throughout the study

Study conditions

The doctoral student chooses a mentor before enrolling in the postgraduate study. The mentor accepts or rejects the mentorship based on the interview of the doctoral student-future student. After each academic year, the mentor submits a report on the doctoral students work to the Postgraduate Study Committee. The doctoral student is obliged to regularly report to the mentor on the results achieved during the activities foreseen in the study programme. The doctoral student is obliged to submit a report on his/her work to the mentor once a year. The doctoral student can enrol in the next academic year only after he/she has fulfilled all obligations from the previous academic years. Each exam can be taken four times. If the doctoral student fails to pass the exam after the 4th attempt, he/she is enrolled for the entire academic year. Each academic year can be repeated. If the doctoral student fails the exam after the eighth attempt, the doctoral student will be dismissed (Table 3.)

The postgraduate study aims to educate scientists for innovation and finding new technical and technological solutions in industry, especially maritime. In addition, the goal is to retain the highest quality staff at higher education institutions and institutes in Croatia.

The postgraduate study should tend to better connect the industrial and educational sectors, not only in terms of joint projects but also in terms of training quality personnel who would enable innovation and increase production. On the other hand, the industry would provide the doctoral study with feedback on the necessary inputs for the purpose of higher quality education.

The postgraduate study is based on mentoring work with doctoral students. It will be based on the Faculty's existing scientific and research projects, which will ensure high quality teaching by competent teachers and enable the active role of students through direct involvement in various scientific topics. The postgraduate study will enable doctoral students to use the Faculty's resources such as scientific and teaching equipment, library funds, laboratories, simulators, etc. It will enable significant financial savings in the organization of teaching and scientific research work. It will simplify management and improve coordination between components in relation to the postgraduate study, supervision of doctoral students' topics and their scientific contribution.

Table 3. Actions and conditions aimed at reducing study time and increasing student success

Intervention	Measures	Description of the intervention	Expected outcome
Enrolment strategy	Selection criteria	The main criteria for admission are a tentative research plan that includes a realistic contribution, a description of the available equipment on which the research would be conducted, and the choice of a mentor. Doctoral students have a defined research topic and mentor.	Doctoral students must define a research topic, plan, and mentor.
	Interdisciplinary approach to doctoral enrolment	Admission of students who are scientifically and research oriented	Building interdisciplinary research groups that work together
Programme regulation	Doctoral Student Progress Report Strict rules for enrolment in the next academic year	Mandatory biennial report as the main indicator of student progress A doctoral student can take each exam (including the bimonthly report) 4 times during the year. After that, he/she must repeat the academic year. Each year can only be repeated once. If they fail eight times during the two years of study, doctoral students are dismissed	Insight into PhD student progress PhD students study regularly.
Curriculum	Formal education and skills	Introduction to the study: Research skills, methodology, technology transfer, ethics in research, presentation of scientific research work. Acquiring the necessary skills for a successful research career	Acquiring the necessary skills for a successful research career
	Emphasis on research	Mandatory completion of a detailed research plan by the end of the first year of study	Research plan completed by the end of the first year of study.

2.8. List of subjects that doctoral students can enrol in from other studies

Doctoral students can choose elective subjects from other doctoral studies and doctoral schools in the Republic of Croatia and abroad in accordance with the rules of the Bologna Process. The Postgraduate Study Committee and the ECTS coordinator assess the value of ECTS Subjects. A maximum of one subject can be chosen. The chosen subjects must be in

the direction of the doctoral student's scientific specialization. Permission to enrol in subjects from other studies is granted by the Postgraduate Study Committee with the written consent of the mentor.

2.9. List of subjects that can be taught in a foreign language

Any subject can be taught in English. The doctoral dissertation is written and defended in English.

2.10. Criteria and conditions for transferring ECTS credits

The ECTS credit value of subjects that doctoral students can choose from other studies at the University or at other universities is recognized and fully transferred if it is related to the number of hours of student workload in that subject. Every 30 hours of student workload carries 1 ECTS credit.

2.11. Completion of studies

The postgraduate university study programme in maritime technology is completed by passing exams in all enrolled subjects, publishing prescribed scientific papers, and writing and publicly defending a doctoral thesis. The requirements for submitting a doctoral thesis topic and submitting a doctoral thesis for assessment, as well as the procedures for assessing a doctoral thesis topic, assessing and defending a doctoral thesis are presented in the following table.

Submitting a doctoral thesis topic	The requirements for submitting a doctoral thesis topic are: • passed exams in all enrolled subjects; • achieved 45 ECTS from scientific research work (journals and conferences). The Faculty Council appoints the Committee for the Evaluation of the Doctoral Thesis Topic. • The Committee consists of three or five members whose scientific activity is in the field of the doctoral thesis of the doctoral candidate. • At least one member must not be an employee of a constituent of the University of Split, at least one member must not be an employee of the Faculty of Maritime Studies in Split or a postgraduate teacher. • The President of the Committee must be a postgraduate teacher elected to the title of at least associate professor in the field of the doctoral thesis. The work of the Committee is coordinated by the President of the Committee. • The mentor of the doctoral candidate may be a member of the Committee but may not be the President of the Committee. The public discussion on the expected scientific contribution of the doctoral thesis is conducted by the Committee for Accepting the Topic of the Doctoral Thesis. The Committee for Accepting the Topic of the Doctoral Thesis submits to the Postgraduate Study Committee an assessment of the doctoral thesis topic with a proposal for accepting or rejecting the topic of the thesis. The final decision on accepting or rejecting the doctoral thesis topic is made by the Faculty Council upon the proposal of the Postgraduate Study Committee.
Doctoral thesis evaluation	The requirements for submitting a doctoral thesis are: • the doctoral candidate must have published at least one internationally peer-reviewed paper in a journal indexed in CC, SCI or SCI-E, thematically related to the doctoral research, in which he/she is the main author, the paper must be published in a journal referred to the scientific field of the doctoral research. • the doctoral candidate is obliged to present and publish at least one paper in the proceedings of an international scientific conference, thematically related to the doctoral research. The Faculty Council appoints the Doctoral Thesis Evaluation Committee and the Doctoral Thesis Defence Committee. • The Committee consists of five members whose scientific activity is in the field of the candidate's doctoral thesis. • At least one member must not be an employee of the University of Split, at least one member must not be an employee of the Faculty of Maritime Studies in Split or a teacher of the University postgraduate study in maritime technology. • At least one member must be from an EU country in the field of the doctoral thesis topic. • The President of the Committee must be a lecturer of the Faculty's postgraduate study elected to the rank of at least associate professor in the field of the doctoral thesis topic. The work of the Committee is coordinated by the President of the Committee. • The doctoral candidate's mentor cannot be a member of the Committee.

	• The Committee for the Defence of the Doctoral Thesis may have the same composition as the Committee for the Evaluation of the Thesis. The text of the doctoral thesis is published on the Faculty's website. The Doctoral Thesis Evaluation Committee submits the doctoral thesis evaluation to the Postgraduate Study Committee. The final decision on the doctoral thesis evaluation is made by the Faculty Council upon the proposal of the Postgraduate Study Committee.
Doctoral thesis defence	• The doctoral thesis is defended before the Doctoral Thesis Defence Committee. • The members of the defence committee may be the same as those of the Doctoral Thesis Evaluation Committee. • If a defence committee is elected, it is elected in the same manner and under the same conditions as the doctoral thesis evaluation committee. • The doctoral candidate may defend the doctoral thesis no later than two months after the Faculty Council accepts the positive evaluation of the doctoral thesis. • The defence of the doctoral thesis is public. The Doctoral Thesis Defence Committee issues an evaluation after the defence. • The defence evaluation is entered in the minutes, which are signed by all members of the Committee. • The doctoral thesis is defended only once.

2.12. List of mandatory subjects

LIST OF SUBJECTS							
Year: 1							
Semester: 1							
STATUS	CODE	SUBJECT	HOURS PER SEMESTER				ECTS
			L	S	E	F	
Mandatory	DS01	Scientific research methodology	20	10			5
	DS02	Organization of scientific projects and bibliometrics	18	2	10		5
	Total required		40	20			10

2.13. Description of mandatory subjects

SUBJECT NAME	Scientific research methodology					
Code	DS01	Year of study	1			
Subject holder/s	Full Prof. Zlatan Kulenović Asst. Prof. Hrvoje Dodig	Point value (ECTS)	5			
Collaborators		Teaching method (hours per semester)	P	S	V	T
			20	10	0	0
Subject status	Mandatory	Percentage of e-learning				
SUBJECT DESCRIPTION						
Subject objectives	Doctoral students will learn about various scientific methods. They will be able to choose a suitable scientific method for researching a particular problem. Familiarization with the method of reviewing scientific articles. Analysing ethics in writing scientific articles. Getting to know different ways of citing. Analysis of plagiarism detection software.					
Subject enrolment requirements and entry competencies	Completed graduate university studies.					
Expected learning outcomes at the subject level (4-10 learning outcomes)	After successfully completing the subject, doctoral students will be able to: 1. Independently use citations and references correctly 2. Critically analyse methods of plagiarism 3. Independently assess the quality of a scientific article 4. Independently conduct a review 5. Combine plagiarism detection programmes					
	Lectures 1. Research methods (2 hours) 2. Citation and referencing methods (1 hour) 3. Writing styles (1 hour)					

<table>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="6">4. Ethics in writing. (1 hour)
5. The concept of plagiarism and computer programmes for detecting plagiarism. (2 hours)
6. Writing a scientific article: selection of literature, content of a scientific article (1 hour)
7. Selecting a journal to search for an article. (1 hour)
8. Preparing the article according to the instructions for authors. (1 hour)
9. Assessing the value of a scientific article. (1 hour)
10. Review. (1 hour)
11. Working in electronic journal systems for sending articles. (2 hours)
12. Communication with the journal editorial board. (2 hours)
13. Procedure after acceptance of the article. (1 hour)
14. Computer programme End Note for managing references. (1 hour)
15. Evaluation of the article (original scientific, review, preliminary announcement, professional paper). (1 hour)
16. Using a plagiarism detection programme (1 hour)

Seminars
1. Examples of plagiarism (databases, methods of detection, types). (2 hours)
2. Critical attitude towards a scientific article. (2 hours)
3. Searching bibliographic data (2 hours)
4. Creating a poster (2 hours)
5. Creating a presentation (2 hours)</td></tr>
<tr><td>Types of teaching</td><td colspan="3">☒ lectures
☒seminars and workshops
□ exercises
□ complete online
□ mixed e-learning
□ fieldwork</td><td colspan="3">□ independent tasks
□ multimedia
□ laboratory
□ mentoring work
□ (other, write in)</td></tr>
<tr><td>Student obligations</td><td colspan="6"></td></tr>
<tr><td rowspan="5">Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)</td><td>Attending classes</td><td>1</td><td>Research</td><td>1</td><td>Practical work</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Essays</td><td>1</td><td>Seminar paper</td><td>1</td><td>(other, write in)</td><td></td></tr>
<tr><td>Colloquia</td><td></td><td>Oral exam</td><td>1</td><td>(other, write in)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Grading and evaluating student work during classes and at the final</td><td colspan="6">The doctoral candidate is Mandatory to attend lectures, seminars and exercises, and to participate independently and defend the seminar paper. The doctoral candidate is assessed orally.</td></tr>
<tr><td rowspan="2">Mandatory literature (available in the library and through other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability through other media</td></tr>
<tr><td colspan="3">Zelenika, R. Metodologija i tehnologija izrade znanstvenog i stručnog djela, Ekonomski fakultet Sveučilišta u Rijeci, 1999.</td><td></td><td></td></tr>
</table>

	Žugaj, M. Metodologija znanstveno-istraživačkog rada, FOI, Varaždin, 1997		
	Databases of scientific and professional papers available on the Internet		
Supplemental literature	1. Markel, Mike: „Writing in the Technical Fields“, IEEE Press, 1994. 2. Thorsten, Ewald: Writing in the Technical Fields: A Practical Guide, Oxford University Press, 2014		
Quality assurance methods that ensure the acquisition of established			
Other (according to the proposer's			

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Organization of scientific projects and bibliometrics</td></tr>
<tr><td>Code</td><td>DS02</td><td>Year of study</td><td colspan="3">1</td></tr>
<tr><td>Subject holder/s</td><td>Full Prof. Nenad Vulić,
Asst. Prof. Joško Šoda</td><td>Point value
(ECTS)</td><td colspan="3">5</td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td rowspan="2">Teaching method
(hours per semester)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>18</td><td>2</td><td>10</td><td>0</td></tr>
<tr><td>Subject status</td><td>Mandatory</td><td>Percentage of
e-learning</td><td colspan="3"></td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">Doctoral students will be able to independently design a project, from the basic idea to writing an application. They will be introduced to the design of quality hypotheses and the methods of possible proofs. They will be introduced to the methods of database searches and bibliometrics of journals and the methods of searching and comparing journal features. Doctoral students will learn the functioning of the editorial board of scientific journals and conferences.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies mandatory for the subject</td><td colspan="5">Completed graduate university studies.</td></tr>
<tr><td>Expected learning outcomes at the subject level (4-10 learning outcomes)</td><td colspan="5">After successfully completing the subject, doctoral students will be able to:
1. Independently design a project from idea to application
2. Critically judge and formulate a hypothesis
3. Independently search scientific databases
4. Independently search and evaluate journal metrics
5. Analyse the work of journals and conferences</td></tr>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="5">Lectures
1. Writing successful projects in the technical field (presentation of the meaning and importance of the project, explanation of general principles of proposal writing, organization of time and resources, division of tasks, problems, obstacles) (4 hours)
2. From idea to title and summary (1 hour)
3. Elaboration of the mortgage and assumptions (1 hour)
4. Procedures, protocols, plans (1 hour)
5. Goals and expected results (1 hour)
6. Basic features of the database (1 hour)
7. Types of database and their overview (1 hour)
8. Bibliometrics (term of base, term of citation, IF) (1 hour)
9. Boolean operators (1 hour)
10. Web of Science (1 hour)
11. Scopus (1 hour)
12. Organization of the magazine (1 hour)
13. Organization of conferences (1 hour)

Seminar
1. Project preparation</td></tr>
</table>

<table>
<tr><td>Types of teaching</td><td colspan="3">☒ lectures
☒seminars and workshops
☐ exercises
☐ on line in full
☐ mixed e-learning
☐ fieldwork</td><td colspan="3">☐ independent tasks
☐ multimedia
☐ laboratory
☐ mentoring work
☐ (other, write in)</td></tr>
<tr><td>Student obligations</td><td colspan="6"></td></tr>
<tr><td rowspan="5">Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)</td><td>Attending classes</td><td>1</td><td>Research</td><td>1</td><td>Practical work</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Essays</td><td>1</td><td>Seminar paper</td><td>1</td><td>(other, write in)</td><td></td></tr>
<tr><td>Colloquia</td><td></td><td>Oral exam</td><td>1</td><td>(other, write in)</td><td></td></tr>
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<tr><td>Grading and evaluating student work during classes and at the final</td><td colspan="6">The doctoral candidate is Mandatory to attend lectures, seminars and exercises, and to participate independently and defend the seminar paper. The doctoral candidate is assessed orally.</td></tr>
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<tr><td colspan="3">2. Databases of scientific and professional papers available on the Internet</td><td></td><td></td></tr>
<tr><td>Supplemental literature</td><td colspan="6">1. Markel, Mike: „Writing in the Technical Fields “, IEEE Press, 1994.
2. Thorsten, Ewald: Writing in the Technical Fields: A Practical Guide, Oxford University Press, 2014</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of established learning outcomes</td><td colspan="6"></td></tr>
<tr><td>Other (according to the proposer's opinion)</td><td colspan="6"></td></tr>
</table>

2.14. List of elective subjects

LIST OF SUBJECTS							
Year: 1							
Semester: 1 and 2							
STATUS	CODE	SUBJECT	HRS. PER SEMESTER				ECTS
			L	S	E	F	
Elective	DS03	Maritime expert systems	20	10	0	0	5
	DS04	Intelligent transportation systems in maritime studies	15	15	0	0	5
	DS05	Strength and vibration of marine propulsion systems	20	10	0	0	5
	DS06	Modelling and simulation of marine propulsion systems	20	0	0	0	5
	DS07	Energy efficiency of ship systems	20	10	0	0	5
	DS08	Technical supervision of maritime vessels	20	0	0	0	5
	DS09	Mathematical methods in maritime studies	12	10	8	0	5
	DS10	Modelling and optimization of maritime transport systems	25	0	5	0	5
	DS11	Energy efficiency in maritime traffic	20	5	5	0	5
	DS12	Advanced algorithms in traffic control systems	20	10	0	0	5
	DS13	Sustainable maritime transport system from the aspect of ecology and environmental protection	20	10	0	0	5
	DS14	Forensic hydrography, modelling and simulation	20	10	0	0	5
	DS15	Synthesis of control systems in high-risk sea areas	25	0	5	0	5
	DS16	Methodology of maritime operations design	20	0	0	0	5
	DS17	Maritime route planning	15	15	0	0	5
	DS18	Sustainable transport and logistics	30	30	0	0	5

2.15. Description of elective subjects

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Maritime expert systems</td></tr>
<tr><td>Code</td><td>DS03</td><td>Year of study</td><td colspan="3">1</td></tr>
<tr><td>Subject holder/s</td><td>Asst. Prof. Hrvoje Dodig</td><td>Point value (ECTS)</td><td colspan="3">5</td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td rowspan="2">Teaching method (hours per semester)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>20</td><td>10</td><td>0</td><td>0</td></tr>
<tr><td>Subject status</td><td>Elective</td><td>Percentage of e-learning</td><td colspan="3"></td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">Getting to know expert systems in maritime and acquiring knowledge for the application and creation of expert systems in maritime. Design of expert systems for navigation with the help of fuzzy logic. Fuzzy logic in autopilot and collision avoidance at sea. Fuzzy logic when positioning the ship. DSS (Decision Support System) and CBR (Case Based Reasoning) expert systems and application for marine autopilot. Neural networks and application in ship expert systems: steering control, ship motion modelling, automatic ship mooring systems. Belief networks and Dempster-Shafter theory.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies mandatory for the</td><td colspan="5">Completed graduate university studies.</td></tr>
<tr><td>Expected learning outcomes at the subject level (4-10 learning outcomes)</td><td colspan="5">1. Present the architecture of an expert system and its components: knowledge bases, reasoning, inference
2. Interpret the operation of a DSS and CBR expert system and design and simulate a marine CBR autopilot system.
3. Design and simulate a marine expert system based on fuzzy logic.
4. Simulate and design a marine collision avoidance system based on fuzzy logic.
5. Design and simulate a marine expert system based on neural networks.
6. Combine different inference methods and apply the most appropriate method to a maritime problem.</td></tr>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="5">Lectures
1. Introduction: Artificial Intelligence and Expert Systems (2 hours)
2. Expert System Architecture (1 hour)
3. Knowledge Bases and Knowledge Representation (1 hour)
4. Reasoning and Inference (1 hour)
5. DSS and CBR - Expert Decision Support Systems (1 hour)
6. Application of CBR Expert System in Ship Autopilot (1 hour)
7. Fuzzy Logic (1 hour)
8. Fuzzy Logic in Expert Systems (2 hours)
9. Application of Fuzzy Logic Systems in Expert Systems on Ships
10. Analysis of a Collision Avoidance System at Sea Based on Fuzzy Logic (2 hours)
11. Neural Networks (2 hours)
12. Neural Networks as a Part of Expert Systems (1 hour)</td></tr>
</table>

	13. Application of Neural Networks in Automatic Ship Mooring Systems (2 hours) 14. Belief Networks and Dempster-Shafter Theory (1 hour) 15. Other Expert Systems in Traffic and Transport (1 hour) **Seminars** 1. DSS and CBR expert systems (2 hours) 2. Fuzzy logic and application in maritime (2 hours) 3. Neural networks and application in maritime transport (2 hours) 4. Application of the Dempster-Shafter theory (2 hours) 5. Neural networks in transport (2 hours)

Types of teaching	☒ lectures ☒seminars and workshops ☐ exercises ☐ on line in full ☐ mixed e-learning ☐ fieldwork	☐ independent tasks ☐ multimedia ☐ laboratory ☐ mentoring work ☐ (other, write in)

Student obligations						
Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)	Attending classes	1	Research	1	Practical work	
	Experimental work		Report		(other, write in)	
	Essays	1.75	Seminar paper	0.25	(other, write in)	
	Colloquia		Oral exam	1	(other, write in)	
	Written exam		Project		(other, write in)	

Grading and evaluating student work during classes and at the final exam	The doctoral candidate is Mandatory to attend lectures, seminars and exercises, participate independently and defend the seminar paper. The doctoral candidate is assessed daily by oral exam.

Mandatory literature (available in the library and through other media)	**Title**	**Number of copies in the library**	**Availability through other media**
	Giarratano and J. Riley, „Expert Systems: Principles and Programming “, PWS Publishing Company, Boston, 1994		
	P. Jackson, „Introduction to Expert Systems“, Addisson-Wesley Publications, New York, 1999		
	Dr. K. Uma Rao, „Artificial Intelligence and Neural Networks“, Pearson, 2011		
	T.J. Ross, "Fuzzy Logic with Engineering Applications", 3rd ed, Wiley,		
Supplemental literature	G. Shafer, "Mathematical Theory of Evidence", Princeton University Press, 1976		

Quality assurance methods that ensure the acquisition of established learning outcomes	University survey, self-evaluation, student record list, analysis of passing rates at the end of the academic year
Other (according to the proposer's opinion)	

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Intelligent transport systems in maritime studies</td></tr>
<tr><td>Code</td><td>DS04</td><td>Year of study</td><td colspan="3">1</td></tr>
<tr><td>Subject holder/s</td><td>Full Prof. Pero Vidan</td><td>Point value (ECTS)</td><td colspan="3">5</td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td rowspan="2">Teaching method
(hours per semester)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>15</td><td>15</td><td>0</td><td>0</td></tr>
<tr><td>Subject status</td><td>Elective</td><td>Percentage of e-learning</td><td colspan="3"></td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">Analysing ship management systems from the perspective of intelligent technologies. Critical thinking towards new advanced management systems. Comparative analysis of possible IT systems. Directing thinking towards innovations of new technologies for the purpose of obtaining reliable autonomous ships.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies</td><td colspan="5">Completed graduate university studies in a technical field.</td></tr>
<tr><td>Expected learning outcomes at the subject level (4-10 learning outcomes)</td><td colspan="5">After successfully completing the subject, doctoral students will be able to:
1. Independently search and analyse scientific literature in the field of intelligent technologies.
2. Write and present a review paper on modern technological solutions in the field of design and analysis of intelligent systems in the maritime sector.
3. Critically assess the features of new methods of design and analysis of intelligent transport systems.
4. Propose optimal solutions in the design and engineering of intelligent systems.</td></tr>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="5">Lectures
1. The concept of intelligence in traffic (3 hours)
2. Analysis of electronic navigation devices SOLAS (2 hours)
3. Comparative analysis of elements of an integrated navigation system (3 hours)
4. Integrated ship system - analysis, legal regulations (2 hours)
5. Automation of the bridge and engine room (SOLAS) (1 hour)
6. Analysis of the reporting system (2 hours)
7. E-navigation, concept, legal regulations (2 hours)

Seminars
1. Ship management models (2 hours)
2. E-navigation systems in the world (2 hours)
3. Meteorological data processing (2 hours)
4. ITS simulation on board (1 hour)
5. Human error in ITS (1 hour)
6. Advanced systems in e-navigation (2 hours)
7. Unmanned ship (1 hour)
8. Telemetry in maritime transport (2 hours)
9. Ergonomics and design (2 hours)</td></tr>
<tr><td>Types of teaching</td><td colspan="3">☒ lectures
☒seminars and workshops
☐ exercises
☐ on line in full
☐ mixed e-learning
☐ fieldwork</td><td colspan="2">☐ independent tasks
☐ multimedia
☐ laboratory
☐ mentoring work
☐ (other, write in)</td></tr>
</table>

Student obligations						
Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)	Attending classes	1	Research	1	Practical work	
	Experimental work		Report		(other, write in)	
	Essays	1	Seminar paper	1	(other, write in)	
	Colloquia		Oral exam	1	(other, write in)	
	Written exam		Project		(other, write in)	
Grading and evaluating student work during classes and at the final exam	The doctoral candidate is Mandatory to attend lectures, seminars and exercises, participate independently and defend the seminar paper. The doctoral candidate is assessed by oral exam.					

	Title	Number of copies in the library	Availability through other media
Mandatory literature (available in the library and through other media)	www.imo.org		x
	www.unmanned-ship.org/munin/about/the-autonomus-ship/		x
Supplemental literature			
Quality assurance methods that ensure the acquisition of established learning outcomes			
Other (according to the proposer's opinion)			

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Strength and vibrations of marine propulsion systems</td></tr>
<tr><td>Code</td><td>DS05</td><td>Year of study</td><td colspan="3">1</td></tr>
<tr><td>Subject holder/s</td><td>Full Prof. Nenad Vulić</td><td>Point value (ECTS)</td><td colspan="3">5</td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td rowspan="2">Teaching method
(hours per semester)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>20</td><td>10</td><td>0</td><td>0</td></tr>
<tr><td>Subject status</td><td>Elective</td><td>Percentage of e-learning</td><td colspan="3"></td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">Master the advanced techniques of calculating and verifying the strength and vibrations of the ship's propulsion system as a mechanical assembly, which include the structural form, dimensions, choice of materials, determination of the driving load, as well as the calculation of displacements, speeds, accelerations, critical frequencies, internal forces, deformations, stresses, permissible stresses and safety factors in the time and frequency domain.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies mandatory for the subject</td><td colspan="5">Completed undergraduate studies in the scientific field of technical sciences, which includes subjects in mechanics of deformable solids (strength).</td></tr>
<tr><td>Expected learning outcomes at the subject level (4-10 learning outcomes)</td><td colspan="5">After successfully completing the subject, doctoral students will be able to:
1. Independently search and analyse scientific literature in the field of mechanical behaviour of ship propulsion systems.
2. Write and present a review paper on the centration (alignment) of the propeller shaft, and/or on its torsion, longitudinal, bending or precession vibrations.
3. Critically assess the characteristics of new methods of design and analysis of the mechanical characteristics of ship propeller shafts.
4. Propose rational solutions in the design and engineering of ship propulsion systems, using modern simulation programmes.</td></tr>
<tr><td>Sadržaj predmeta detaljno razrađen prema satnici nastave</td><td colspan="5">Lectures
1. Selection of the concept of the ship's propulsion system and the structural shape of its elements
2. Selection of the material of the ship's propulsion system elements
3. Dimensioning from the point of view of the nominal torque
4. Dimensioning from the point of view of the vibration moment
5. Loading of the ship's propulsion system elements at rest
6. Propulsion load
7. Calculation, documentation and technology of the propeller shaft centring
8. Verification of the criteria for calculating the propeller shaft centring
9. Validation of the centre calculation by measuring on board
10. Simulation of torsion vibrations of the propeller shaft using the SimulationX and/or ShaftDesigner programmes
11. Calculation of longitudinal vibrations of the propeller shaft
12. Calculation of flexural and precession vibrations of the propeller shaft

Seminar
A seminar paper that a doctoral student prepares independently under the supervision of the study director on a chosen topic.</td></tr>
</table>

<table>
<tr><td>Types of teaching</td><td colspan="3">☒ lectures
☒ seminars and workshops
☐ exercises
☐ on line in full
☐ mixed e-learning
☒ fieldwork</td><td colspan="3">☐ independent tasks
☐ multimedia
☐ laboratory
☒ mentoring work
☐ (other, write in)</td></tr>
<tr><td>Student obligations</td><td colspan="6"></td></tr>
<tr><td rowspan="5">Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit</td><td>Attending classes</td><td>1</td><td>Research</td><td>1</td><td>Practical work</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Essays</td><td>1</td><td>Seminar paper</td><td>1</td><td>(other, write in)</td><td></td></tr>
<tr><td>Colloquia</td><td></td><td>Oral exam</td><td>1</td><td>(other, write in)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Grading and evaluating student work during classes and at the final exam</td><td colspan="6">The doctoral student is Mandatory to attend lectures, participate independently, and defend a seminar paper. The doctoral student is assessed orally.</td></tr>
<tr><td rowspan="7">Mandatory literature (available in the library and through other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability through other media</td></tr>
<tr><td colspan="3">…, Guide for Enhanced Shaft Alignment, American Bureau of Shipping, Houston, 2016.</td><td></td><td>web</td></tr>
<tr><td colspan="3">…, Guidance Notes on Propulsion Shafting Alignment, American Bureau of Shipping, Houston, 2014.</td><td></td><td>web</td></tr>
<tr><td colspan="3">…, Calculation of shafts in marine applications, Edition 2015-12, DNV GL class guidelines (CG), Høvik, 2015.</td><td></td><td>web</td></tr>
<tr><td colspan="3">…, Guidelines on Shafting Alignment, Nippon Kaiji Kyokai, Tokyo , 2006.</td><td></td><td>web</td></tr>
<tr><td colspan="3">BS ISO 20283-4:2012 +A1:2014, Mechanical vibration - Measurement of vibration on ships - Part 4: Measurement and evaluation of vibration of the ship propulsion machinery, British Standards Institution, London, 2014.</td><td></td><td></td></tr>
<tr><td colspan="3">VDI 2039:2016-06 / Corr. 2016-08, Torsional vibration of drivelines - Calculation, measurement, reduction, Verein Deutscher Ingenieure e.V., Düsseldorf, 2016.</td><td></td><td></td></tr>
<tr><td>Supplemental literature</td><td colspan="6">…, FKM Guideline: Analytical Strength Assessment of Components, Made of Steel, Cast Iron and Aluminum Materials in Mechanical Engineering (6th Edition), VDMA Verband Deutscher Maschinen- und Anlagenbau, Berlin, 2012.</td></tr>
</table>

Quality assurance methods that ensure the acquisition of established learning outcomes	1. Evaluation of results in accordance with the specified learning outcomes 2. Student feedback via survey 3. Teacher self-evaluation 4. Institutional and extra-institutional checks
Other (according to the proposer's opinion)	-

SUBJECT NAME	Modelling and simulation of marine propulsion systems						
Code	DS06	Year of study	1				
Subject holder/s	Full Prof. Nikola Račić	Point value (ECTS)	5				
Collaborators		Teaching method (hours per semester)	L	S	AV	LV	KV
			20	0	0	0	0
Subject status	Elective	Percentage of e-learning					

SUBJECT DESCRIPTION

Subject objectives	• deepening knowledge of modelling using examples of mathematical and simulation models of ship propulsion systems • creating simulation models of ship propulsion system elements • preparing for research, development and optimization of ship propulsion
Subject enrolment requirements and entry competencies mandatory for the subject	Completed graduate university studies in Mechanical Engineering, Naval Architecture, Naval Engineering
Expected learning outcomes at the subject level (4-10 learning outcomes)	After successfully completing the subject, doctoral students will be able to: 1. independently search and analyse scientific literature in the field of modelling and simulation of ship propulsion system elements, 2. apply appropriate mathematical, physical and scientific principles in the research and development of new ideas in the research area, 3. write and present a review paper on technological solutions researched on the developed model. 4. critically assess the characteristics of new technologies for collecting relevant parameters of technical systems for optimizing operation, 5. propose a solution for optimal system operation, 6. evaluate new methods, tools and instruments in the field of modelling and simulation of ship propulsion systems.
The subject content is elaborated in detail according to the class schedule	• Goals and tasks of mathematical modelling and simulation of processes in ship propulsion systems • Mathematical models of thermodynamic processes in ship propulsion engines (slow-speed DM, medium-speed DM, Gas turbine, Steam turbine; • Modelling of diesel electric propulsion plant; • Propulsor modelling; • Shaft line modelling; • Jet propulsion system modelling; • Modelling (coding) of models in the Matlab - SIMULINK programming language; • Model validation testing; • Application of simulation models for analysis of operating parameters under various external influences, and research into improving the control system; • Analysis of waste heat in different operating modes, and research into the possibilities of cogeneration;

Types of teaching		
	☒ lectures	☒ independent tasks
	☒ seminars and workshops	☐ multimedia
	☒ exercises	☒ laboratory
	☐ on line in full	☒ mentoring work
	☐ mixed e-learning	☐ (other, write in)
	☐ fieldwork	

<table>
<tr><td>Student obligations</td><td colspan="6">Active participation in all forms of teaching: lectures, consultations, literature searches, independent work on modelling the assigned problem.</td></tr>
<tr><td rowspan="6">Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value):</td><td>Attending classes</td><td>1,5</td><td>Research</td><td>1,5</td><td>Practical work</td><td>1,5</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Essays</td><td></td><td>Seminar paper</td><td>1,5</td><td>(other, write in)</td><td></td></tr>
<tr><td>Colloquia</td><td></td><td>Oral exam</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td></td><td colspan="5"></td></tr>
<tr><td>Grading and evaluating student work during classes and at the final</td><td colspan="6">The grade is determined as the mean value:
• evaluation of the quality of the written review paper
• evaluation of its oral presentation and
• evaluation of the results of the simulation of the given problem.</td></tr>
<tr><td rowspan="6">Mandatory literature (available in the library and through other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td colspan="2">Availability through other media</td></tr>
<tr><td colspan="3">[1] Martelli M.: Marine Propulsion Simulation, De Gruyter, Warsaw, 2014.</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="3">[2] Heywood John B.: Internal Combustion Engine Fundamentals, McGraw-Hill, Singapore, 2002.</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="3">[3] Weber J.: Optimization Methods for the Mixture Formation and Combustion process in Diesel Engines, CUVILLIER VERLAG, Gottingen, 2008.</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="3">[4] Xiros N.: Robust Control of Diesel Ship Propulsion, Springer-Verlag London Limited, 2002.</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="3"></td><td></td><td colspan="2"></td></tr>
<tr><td>Supplemental literature</td><td colspan="6">[1] Račić, N.: Simulacija rada brodskog propulzijskog sustava sa sporohodnim dizelskim motorom u otežanim uvjetima, PhD Thesis (in Croatian), University of Rijeka 2008.
[2] Radica, G., Antonić, R., Račić, N.: Engine Working Cycle Analysis for Diagnostic and Optimisation Purposes, Brodogradnja, Zagreb, 4 (2009), 378-387.
[3] Medica, V., Račić, N., Radica, G.: Performance Simulation of Marine Slow-Speed Diesel Propulsion Engine With Turbocharger Under Aggravated Conditions, Strojarstvo, Zagreb, 51 (2009), 199-212.
[4] Abusoglu, A., Kanoglu, M.: First and second law analysis of diesel engine powered cogeneration systems, Energy Conversion and Management 49 (2008) p. 2026-2031.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of established learning outcomes</td><td colspan="6">• Evaluation of results in accordance with the specified learning outcomes
• Feedback from students through a survey
• Teacher self-evaluation
• Institutional and extra-institutional checks</td></tr>
<tr><td>Other (according to the proposer's opinion)</td><td colspan="6"></td></tr>
</table>

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Energy efficiency of marine systems</td></tr>
<tr><td>Code</td><td>DS07</td><td>Year of study</td><td colspan="3">1</td></tr>
<tr><td>Subject holder/s</td><td>Asst. Prof. Zdeslav Jurić</td><td>Point value (ECTS)</td><td colspan="3">5</td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td rowspan="2">Teaching method (hours per semester)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>20</td><td>10</td><td>0</td><td>0</td></tr>
<tr><td>Subject status</td><td>Elective</td><td>Percentage of e-learning</td><td colspan="3"></td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">Analysing ship systems and devices from the aspect of increasing their exergy efficiency. Directing thinking towards the use of renewable energy sources and the use and design of systems (with a higher overall efficiency) in order to reduce the use of fossil fuels and environmental pollution caused by their use. Responsible use of energy in everyday life.
Selecting relevant parameters when assessing system efficiency with respect to the Second Law of Thermodynamics (exergy/entropy analysis). Determining the interaction of individual systems and devices and assessing and proposing measures to increase the energy efficiency of the ship's energy system.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies mandatory for the</td><td colspan="5">Completed graduate university studies in a technical field, mechanical engineering, naval engineering, naval architecture or related studies.</td></tr>
<tr><td>Expected learning outcomes at the subject level (4-10 learning outcomes)</td><td colspan="5">After successfully completing the subject, doctoral students will be able to:
1. Independently search and analyse scientific literature in the field of energy aspects of a ship or vessel.
2. Select relevant parameters for assessing energy efficiency.
3. Assess energy efficiency.
4. Confirm or reject and rank measures to increase energy efficiency.
5. Recommend measures to increase the energy efficiency of ship energy devices and systems.</td></tr>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="5">Lectures
1. Energy efficiency of the system with respect to the First and Second Laws of Thermodynamics: advantages, disadvantages and differences. Irreversibility and losses.
2. Specific features of ship energy systems with respect to stationary energy systems. Use of fossil and renewable energy sources.
3. Renewable energy sources, use and possibilities of their use on vessels.
4. Working power and losses. Selection of the system boundary. Thermal validity.
5. Energy sources and consumers on vessels: exergy analysis of a selected ship device.
6. Energy sources and consumers on vessels: exergy analysis of a selected ship system.
7. Example: calculation of the thermal validity of a process.
8. Operating modes of ship energy devices and systems (underway, at berth and at anchor).
9. Measures to increase the exergy efficiency of ship systems.
10. Impact of energy efficiency measures on navigation safety.

Seminars
1. Energy efficiency analysis of selected marine machinery
2. Energy efficiency analysis of selected marine machinery system</td></tr>
</table>

<table>
<tr><td>Types of teaching</td><td colspan="6">☒ lectures
☒seminars and workshops
☐ exercises
☐ on line in full
☐ mixed e-learning
☐ fieldwork</td><td colspan="2">☐ independent tasks
☐ multimedia
☐ laboratory
☐ mentoring work
☐ (other, write in)</td></tr>
<tr><td>Student obligations</td><td colspan="8"></td></tr>
<tr><td rowspan="5">Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)</td><td>Attending classes</td><td>1</td><td>Research</td><td>1</td><td>Practical work</td><td></td><td></td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(other, write in)</td><td></td><td></td><td></td></tr>
<tr><td>Essays</td><td>1</td><td>Seminar paper</td><td>1</td><td>(other, write in)</td><td></td><td></td><td></td></tr>
<tr><td>Colloquia</td><td></td><td>Oral exam</td><td>1</td><td>(other, write in)</td><td></td><td></td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(other, write in)</td><td></td><td></td><td></td></tr>
<tr><td>Grading and evaluating student work during classes and at the final exam</td><td colspan="8">The doctoral candidate is Mandatory to attend lectures, seminars and exercises, participate independently and defend the seminar paper.
The doctoral candidate is assessed orally.</td></tr>
<tr><td rowspan="4">Mandatory literature (available in the library and through other media)</td><td colspan="5">Title</td><td>Number of copies in the library</td><td>Availability through other media</td></tr>
<tr><td colspan="5">Bošnjaković F., Nauka o toplini I, Tehnička knjiga, Zagreb</td><td></td><td></td></tr>
<tr><td colspan="5">Bošnjaković F., Nauka o toplini II, Tehnička knjiga, Zagreb</td><td></td><td></td></tr>
<tr><td colspan="5">Bošnjaković F., Nauka o toplini III, Tehnička knjiga, Zagreb</td><td></td><td></td></tr>
<tr><td>Supplemental literature</td><td colspan="8">Bejan A., Advanced Engineering Thermodynamics, 3rd edition, John Wiley & Sons, Inc., 2006</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of established learning outcomes</td><td colspan="8">Record of class participation, written and oral exams, and a survey organized by the University of Split (evaluating teachers, classes, and subjects).</td></tr>
<tr><td>Other (according to the proposer's opinion)opinio</td><td colspan="8"></td></tr>
</table>

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Technical supervision of sea-going vessels</td></tr>
<tr><td>Code</td><td>DS08</td><td>Year of study</td><td colspan="3">1</td></tr>
<tr><td>Subject holder/s</td><td>Assoc. Prof. Ivan Komar</td><td>Point value (ECTS)</td><td colspan="3">5</td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td rowspan="2">Teaching method
(hours per semester)</td><td>P</td><td>S</td><td>V</td><td>T</td></tr>
<tr><td>20</td><td>10</td><td>0</td><td>0</td></tr>
<tr><td>Subject status</td><td>Elective</td><td>Percentage of e-learning</td><td colspan="3"></td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">This chapter aims to acquire knowledge important for scientific and professional development and to familiarize doctoral students with the basics of classification and statutory supervision, as a basis for developing the necessary specific knowledge for successful preparation for everyday cooperation and interaction with experts from various inspection bodies that carry out supervision of ships and other maritime facilities. By mastering the curriculum, participants will learn what the starting points are for the observations they receive on a maritime facility, what they must accept, what they may discuss, and within which requirements the observations must/may be removed. The aim is also to present a system for implementing an analysis of maritime facility management from the aspect of applying international standards for classification and statutory certification, starting from the technological and safety parameters of the current or anticipated future state of shipping, and in this way to maintain full potential, operational efficiency and safety of life, property and the environment at sea.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies mandatory for the</td><td colspan="5">Completed graduate university studies in a technical field.</td></tr>
<tr><td>Expected learning outcomes at the subject level (4-10 learning outcomes)</td><td colspan="5">After successfully completing the subject, doctoral students will be able to:
1. Explain and correctly interpret the Rules of the IACS member classification societies for the classification and statutory certification of maritime vessels.
2. Independently search and analyse scientific literature in the field of class maintenance and statutory certification of maritime vessels.
3. Analyse the management system of maritime facilities from the aspect of the application of international standards for classification and statutory certification.
4. Plan and prepare the ship for inspection by the classification society and statutory institutions.
5. Analyse and critically assess specific cases of failures in ship equipment.</td></tr>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="5">Introduction and basic concepts, Historical development, Basic division of maritime objects, International starting points for the classification of maritime objects, International starting points for the statutory certification of maritime objects, Basic processes in the system of technical supervision of maritime objects, Supervision by the Croatian Register of Shipping, Technical rules of classification societies and recognized organizations, Approval of technical documentation, Supervision of the construction of maritime objects, Supervision of the modification of maritime objects, Basic inspection of newly acquired maritime objects, Type approval of machinery, devices and marine equipment, Approval of manufacturers, testing institutions and service companies, Supervision by other inspection bodies, The role of quality management in technical supervision, Concluding remarks</td></tr>
</table>

<table>
<tr><td>Types of teaching</td><td colspan="3">☒ lectures
☒seminars and workshops
☐ exercises
☐ on line in full
☐ mixed e-learning
☐ fieldwork</td><td colspan="3">☐ independent tasks
☐ multimedia
☐ laboratory
☐ mentoring work
☐ (other, write in)</td></tr>
<tr><td>Student obligations</td><td colspan="6"></td></tr>
<tr><td rowspan="5">Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)</td><td>Attending classes</td><td>0,75</td><td>Research</td><td></td><td>Practical work</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar paper</td><td>1,25</td><td>(other, write in)</td><td></td></tr>
<tr><td>Colloquia</td><td></td><td>Oral exam</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td>1</td><td>(other, write in)</td><td></td></tr>
<tr><td>Grading and evaluating student work during classes and at the final exam</td><td colspan="6">The doctoral student is Mandatory to attend lectures, seminars and exercises, participate independently and defend the seminar paper. The doctoral student is assessed orally.</td></tr>
<tr><td rowspan="4">Mandatory literature (available in the library and through other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability through other media</td></tr>
<tr><td colspan="3">Pravila za statutarnu certifikaciju pomorskih brodova, Dio 1.-Opći propisi, Hrvatski registar brodova, Split, 2013.</td><td></td><td></td></tr>
<tr><td colspan="3">Rules for the Classification of Sea-Going Ships, Part 1.-General Requirements, Hrvatski registar brodova, Split, 2013.</td><td></td><td></td></tr>
<tr><td colspan="3"></td><td></td><td></td></tr>
<tr><td>Supplemental literature</td><td colspan="6">1. IMO Res. 739(18) – Guidelines for thr authorization of orgsnization on behalf of the Administration
2. IMO Res. 789(19)- Specification on the survey and certification functions of RO acting on behalf of the Administration
3. IACS Unified Requirements, www.iacs.org.uk
4. IMO publications SOLAS i MARPOL
5. The shipmaster’s business companion, The Nautical Institute Fourth edition, London 2004, www.nautinst.org
6. Vaughan,B.: The Liability of Classification Societies, University of Cape Town, 2006</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of established learning outcomes</td><td colspan="6"></td></tr>
<tr><td>Other (according to the proposer's opinion)</td><td colspan="6"></td></tr>
</table>

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Mathematical methods in maritime studies</td></tr>
<tr><td>Code</td><td>DS09</td><td>Year of study</td><td colspan="3">1</td></tr>
<tr><td>Subject holder/s</td><td>Assoc. Prof.Tatjana Stanivuk</td><td>Point value (ECTS)</td><td colspan="3">5</td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td rowspan="2">Teaching method (hours per semester)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>12</td><td>10</td><td>8</td><td>0</td></tr>
<tr><td>Subject status</td><td>Elective</td><td>Percentage of e-learning</td><td colspan="3"></td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">To introduce doctoral students to the most important mathematical methods applicable in maritime affairs and provide them with the basic knowledge so that they can independently apply them in the research part of their doctoral dissertation.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies mandatory for the subject</td><td colspan="5">Completed graduate university studies.</td></tr>
<tr><td>Expected learning outcomes at the subject level (4-10 learning outcomes)</td><td colspan="5">After successfully completing the subject, doctoral students will be able to:
1. Respond to the research problem set, i.e. design your own research.
2. Independently select, use and apply a specific mathematical method in the research part of the paper.
3. Synthesize the mastered mathematical methods applicable in the field of maritime affairs.
4. Determine the appropriate mathematical method and report on your research in the form of a scientific paper.
5. Publish the results of the research.
6. Implement mathematical knowledge and mathematical methods in maritime transport in a way that opens the way to some new knowledge and techniques.
7. Critically consider the possibility of using a new mathematical method and its applicability in maritime affairs.</td></tr>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="5">Lectures
1. Graph theory and applications in maritime (2 hours)
2. Theory of linear programming (2 hours)
3. Transport and distribution problems (2 hours)
4. Different modifications of the transport problem (2 hours)
5. Transport network (2 hours)
6. Theory of strategic games (2 hours)

Exercises
1. Geometric solving of linear programming problems (2 hours)
2. Numerical solution of a linear problem (2 hours)
3. Linear transport models (2 hours)
4. Fractured linear programming (2 hours)

Seminars
1. Elements of input-output analysis on maritime models (2 hours)
2. Optimal production programme in maritime (2 hours)
3. Linear transport models (2 hours)
4. Fractional linear programming on maritime cases (2 hours)
5. Game model on maritime cases (2 hours)</td></tr>
</table>

<table>
<tr><td>Types of teaching</td><td colspan="3">☒ lectures
☒seminars and workshops
☒exercises
☐ on line in full
☐ mixed e-learning
☐ fieldwork</td><td colspan="3">☒ independent tasks
☒ multimedia laboratory
☒ mentoring work
☒ (other, write in)</td></tr>
<tr><td>Student obligations</td><td colspan="6">Attendance at classes, regular consultations, preparation of a seminar paper based on recent literature in the field of doctoral work with special emphasis on the mathematical methods used.</td></tr>
<tr><td rowspan="5">Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)</td><td>Attending classes</td><td>0,875</td><td>Research</td><td>1</td><td>Practical work</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar paper</td><td>2</td><td>(other, write in)</td><td></td></tr>
<tr><td>Colloquia</td><td></td><td>Oral exam</td><td>0,125</td><td>(other, write in)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td>1</td><td>(other, write in)</td><td></td></tr>
<tr><td>Grading and evaluating student work during classes and at the final</td><td colspan="6">The assessment of doctoral candidates is oral. The doctoral candidate's work during classes, seminar paper, and the quality and originality of the independent research draft are evaluated.</td></tr>
<tr><td rowspan="7">Mandatory literature (available in the library and through other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability through other media</td></tr>
<tr><td colspan="3">Berge, C., Ghouilla-Houri, A.: Games and transportation networks. London, 1965.</td><td></td><td></td></tr>
<tr><td colspan="3">Hillier, F. S., Lieberman, G. J.: Introduction to Operations Research. San Francisco, 1969.</td><td></td><td></td></tr>
<tr><td colspan="3">Martić, Lj.: Primjena matematičkih metoda u ekonomskoj analizi. Informator - Zagreb, 1971.</td><td></td><td></td></tr>
<tr><td colspan="3">Pašagić H.: Matematičke metode u prometu. FPZ, Zagreb, 2003.</td><td></td><td></td></tr>
<tr><td colspan="3">Robinson, J.: An Iterative Method of Solving a Game. Annals of Mathematics, 1951.</td><td></td><td></td></tr>
<tr><td colspan="3">Vajda, S.: An introduction to Liear Programming and the Theory of Games. London, 1960.</td><td></td><td></td></tr>
<tr><td>Supplemental literature</td><td colspan="6">1. Bazar, M., Jarvis, J., Sherali, H.: Liner programming and network. New York, 1990.
2. Gordon, G., Pressman, I.: Quantitative decision making for business. London, 1983.
3. Meško, I.: Graf i mreže. Maribor, 1975.
4. Pašagić, H.: Matematičko modeliranje i teorije grafova. Fakultet prometnih znanosti, Zagreb, 1998.
5. Vujošević, M., Stanojević, M., Mladenović, N.: Metode optimizacije – mrežni, lokacijski i višekriterijalni modeli. DOPIS, Beograd, 1996.
6. Vukadinović, S., Cvejić, S.: Matematičko programiranje. Priština, 1996.</td></tr>
</table>

Quality assurance methods that ensure the acquisition of established	Standard quality assurance procedures developed and managed by the Quality Committee of the Faculty of Maritime Studies, University of Split (evaluation of work after completion of classes).
Other (according to the proposer's	

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Modelling and optimization of maritime transport systems</td></tr>
<tr><td>Code</td><td>DS10</td><td>Year of study</td><td colspan="3">1</td></tr>
<tr><td>Subject holder/s</td><td>Full Prof. Danko Kezić,
Assoc. Prof. Anita Gudelj</td><td>Point value (ECTS)</td><td colspan="3">5</td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td rowspan="2">Teaching method
(hours per semester)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>25</td><td>0</td><td>5</td><td>0</td></tr>
<tr><td>Subject status</td><td>Elective</td><td>Percentage of
e-learning</td><td colspan="3"></td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">The subject provides adequate basic knowledge in the field of modelling and optimization of maritime systems. PhD students will be trained to analyse, model, and optimize maritime transport systems and develop control algorithms that increase the utilization and efficiency of system resources, using the theory of discrete event systems and genetic algorithms.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies mandatory for the subject</td><td colspan="5">Completed graduate university studies in the field of technical sciences.</td></tr>
<tr><td>Expected learning outcomes at the subject level (4-10 learning outcomes)</td><td colspan="5">After successfully completing the subject, doctoral students will be able to:
1. Present the type of discrete systems used for modelling maritime traffic.
2. Sketch a model of a maritime traffic system using finite automata and Petri nets.
3. Apply an algorithm for examining conflict and deadlock states in the resulting model.
4. Synthesize a traffic system control model without deadlock states.
5. Critically evaluate published original scientific results of other authors in the field of Petri net integration and genetic algorithms.
6. Mathematically model the problem of job scheduling optimization in a relevant maritime system and argue for it.
7. Develop a software solution for integrating Petri nets and genetic algorithms for job scheduling optimization and critically evaluate it.
8. As an author or co-author, write and publish an original scientific paper in an internationally peer-reviewed journal.</td></tr>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="5">Lectures
1. System division (3 hours)
2. Discrete event traffic systems, examples in maritime (3 hours)
3. Automaton theory, Petri nets (3 hours)
4. Conflict, deadlock and infinite waiting prevention (3 hours)
5. Stability analysis of traffic systems in terms of resource constraints (3 hours)
6. Optimization of maritime system job scheduling (3 hours)
7. Genetic algorithm method (2 hours)
8. Implementation of genetic algorithm for job scheduling (2 hours)
9. Petri net and genetic algorithm integration model for job scheduling (4 hours)
10. Application of the model to maritime systems (4 hours)

Exercises
1. Model the maritime system (2 hours)
2. Analyse the state of conflicts and congestion (1 hour)
3. Develop an algorithm for optimal traffic management (2 hours)

Seminar
1. Modelling and Optimization of a Maritime Transport System – Case Study</td></tr>
</table>

<table>
<tr><td>Types of teaching</td><td colspan="3">☒ lectures
☒seminars and workshops
☒ exercises
☐ on line in full
☐ mixed e-learning
☐ fieldwork</td><td colspan="3">☐ independent tasks
☐ multimedia
☐ laboratory
☐ mentoring work
☐ (other, write in)</td></tr>
<tr><td>Student obligations</td><td colspan="6"></td></tr>
<tr><td rowspan="5">Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)</td><td>Attending classes</td><td>0,875</td><td>Research</td><td></td><td>Practical work</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar paper</td><td>3</td><td>(other, write in)</td><td></td></tr>
<tr><td>Colloquia</td><td></td><td>Oral exam</td><td>1,125</td><td>(other, write in)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Grading and evaluating student work during classes and at the final exam</td><td colspan="6">The doctoral student is Mandatory to attend lectures, seminars and exercises, participate independently and defend the seminar paper. The doctoral student is assessed orally.</td></tr>
<tr><td rowspan="6">Mandatory literature (available in the library and through other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability through other media</td></tr>
<tr><td colspan="3">Reisig, W.: Understanding Petri Nets: Modeling Techniques, Analysis Methods, Case Studies Springer, 2013.</td><td>1</td><td></td></tr>
<tr><td colspan="3">Golub, M. "Genetski algoritmi", Fakultet elektrotehnike i računarstva, Zavod za elektroniku, mikroelektroniku, računalne i inteligentne sustave, 2002.</td><td></td><td>http://www.zemris.fer.hr/~golub/ga/ga.html</td></tr>
<tr><td colspan="3">Kezić, D.: Sprječavanje potpunog zastoja u sustavima s diskretnim događajima primjenom Petrijevih mreža, Doktorska disertacija, Sveučilište u Zagrebu, Fakultet elektrotehnike i računarstva, Zagreb, 2004.</td><td>1</td><td></td></tr>
<tr><td colspan="3">Gudelj A: Optimalizacija sustava s diskretnim događajima primjenom Petrijevih mreža i genetskih algoritama, Doktorska disertacija, Sveučilište u Zagrebu, Fakultet organizacije i informatike, Varaždin, 2010.</td><td>1</td><td></td></tr>
<tr><td colspan="3">David, R., Alla H., Discrete, Continuous, and Hybrid Petri Nets, Springer, Berlin Heidelberg New York, 2010.</td><td>1</td><td></td></tr>
</table>

Supplemental literature	
Quality assurance methods that ensure the acquisition of established learning outcomes	
Other (according to the proposer's opinion)	

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Energy efficiency in maritime traffic</td></tr>
<tr><td>Code</td><td>DS11</td><td>Year of study</td><td colspan="3">1</td></tr>
<tr><td>Subject holder/s</td><td>Assoc. Prof. Maja Krčum</td><td>Point value (ECTS)</td><td colspan="3">5</td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td>Teaching method</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>(hours per semester)</td><td>20</td><td>5</td><td>5</td><td>0</td></tr>
<tr><td>Subject status</td><td>Elective</td><td>Percentage of e-learning</td><td colspan="3">20%</td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">The adoption of resolution MEPC.203 (62) and the amendment of Annex VI to MARPOL improve the energy efficiency of ships by using design and operational measures that result in the reduction of emissions of particulate matter resulting from the combustion of fossil fuels, including greenhouse gas emissions. The aim of this subject is to highlight energy efficiency measures in the maritime transport sector, in order to reduce energy consumption. The emphasis is placed on renewable energy sources and their application in the maritime sector, while at the same time raising the awareness of stakeholders to take measures that contribute to a “clean” energy infrastructure for ships in ports, harbours and at sea.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies mandatory for the</td><td colspan="5">Completed graduate university studies in a technical field.</td></tr>
<tr><td>Expected learning outcomes at the subject level

(4-10 learning outcomes)</td><td colspan="5">1. To create and interpret new knowledge in the field of application of renewable sources as well as technologies that contribute to energy efficiency, especially in the field of marine technology.
2. Publish the research results.
3. Apply knowledge and research to create a concept and implement a project that generates new knowledge and technologies in the field of energy efficiency in maritime transport.
4. Create a judgment based on critical analysis, evaluation and synthesize new and complex ideas in the field of energy efficiency, thereby contributing to the strengthening of social, scientific and ethical responsibility.
5. Contribute to the development of quality and generic skills that are necessary for employment/self-employment.
6. In academic and professional contexts, promote technological progress in the field of new technologies that contribute to energy efficiency in maritime transport.</td></tr>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="5">Lectures
1. Application of the Energy Efficiency Design Index (EEDI) and the Ship Energy Efficiency Management Plan (SEEMP) (2 hours)
Measures and environmental standards that determine the energy efficiency index for ships (higher quality materials, nanotechnology improvements to materials, application of complex sensors and control systems in all engine operation segments, optimization of thermal combustion, more efficient navigation system control, optimization of cargo distribution, reduction of harmful gas emissions) (8 hours)
3. Towards a hybrid approach to the use of additional renewable energy sources (2 hours)
4. Impact of development policy, regulations and the effect of incentives aimed at encouraging energy efficiency in shipping, ports and terminals (4 hours)
5. Use of renewable energy sources in ports and terminals and comparison with the use of renewable sources on land (2 hours)</td></tr>
</table>

	6. Corporate responsibility towards the environment, especially in ports and with an emphasis on energy efficiency (shore connection, high-voltage connections, etc.) (4 hours) 7. Use of wind energy at sea (2 hours) 8. Energy management in shipping, ports and terminals (2 hours) 9. Creating a simulation model - optimizing energy sources on board (solar panels, wind, turbine) (2 hours) 10. Creating a simulation model - optimizing energy sources on land (terminal, port) (2 hours) **Seminars** 1. Creation of a simulation model - optimization of energy sources on board (solar panels, wind, turbine) (4 hours) 2. Creation of a simulation model - optimization of energy sources on land (terminal, port) (4 hours) **Exercises** 1. Creation of a simulation model - optimization of energy sources on board (solar panels, wind, turbine) (4 hours) 2. Creation of a simulation model - optimization of energy sources on land (terminal, port) (3 hours)

Types of teaching	☒ lectures ☒seminars and workshops ☒exercises ☐ on line in full ☐ mixed e-learning ☐ fieldwork	☐ independent tasks ☐ multimedia ☐ laboratory ☐ mentoring work ☐ (other, write in)

Student obligations						
Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)	Attending classes	1	Research	1	Practical work	
	Experimental work		Report		(other, write in)	
	Essay	1	Seminar paper	1	(other, write in)	
	Colloquia		Oral exam	1	(other, write in)	
	Written exam		Project		(other, write in)	
Grading and evaluating student work during classes and at the final exam	The doctoral candidate is Mandatory to attend lectures, seminars and exercises and to participate independently, defend a seminar paper, and independently write and present a scientific research paper. The doctoral candidate is assessed orally.					

	Title	Number of copies in the	Availability through other media
Mandatory literature (available in the library and through other media)	Krčum, M.; Gudelj, A.; Krčum, P.: *The Renewable Energy on Ship: Simulation and Optimization*, International Conference on Traffic and Transport Engineering - Belgrade, November 29-30, 2012.p.p.11-20/ Ph. D Olja Čokorilo, editor (lecture international, peer-review, published,		
	Florentinus A., Hamelinck C., Van den Bos A., Winkel R., & Cuijpers M. (2011). *Potential of biofuels for shipping.* Ecofys 2011 by order of: European Maritime Safety Agency (EMSA)		
	Marine Environment Protection Committee (MEPC), 56th session: 9-13 July 2007. 6. International Bunkering Industry Association		
	P.E. Hřjlund Nielsen. (2011). *OBATE: An upgraded alcohol fuel for efficient & clean Diesel engine application*. Marine Days. Goteborg, Sweden		
Supplemental literature	1.Odense Steel Shipyard Ltd Ørndrup Nielsen B., (2009). Green Ship of the Future Concept study 2.Nielsen C.K., & Schack C. (2012) Vessel emission study: Comparison of various abatement technologies to meet emission levels for ECA's. 9th annual Green Ship Technology 3.www.cepal.org/transporte		
Quality assurance methods that ensure the acquisition of established learning outcomes			
Other (according to the proposer's opinion)			

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Advanced algorithms in traffic monitoring systems</td></tr>
<tr><td>Code</td><td>DS12</td><td>Year of study</td><td colspan="3">1</td></tr>
<tr><td>Subject holder/s</td><td>Assoc Prof. Igor Vujović,
Asst. Prof. Petar Matić</td><td>Point value (ECTS)</td><td colspan="3">5</td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td rowspan="2">Teaching method
(hours per semester)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>20</td><td>10</td><td>0</td><td>0</td></tr>
<tr><td>Subject status</td><td>Elective</td><td>Percentage of e-learning</td><td colspan="3">10</td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">The Subject aims to create and evaluate theoretical knowledge in advanced algorithms that are needed at different levels of thinking, implementation, design and development of surveillance systems used in traffic technology. The Subject enables the doctoral student to take on ethical and social responsibility related to surveillance systems and offers tools for research and development of applications or parts of applications that surveillance systems consist of. The Subject covers wavelet and multiresolution signal processing and analysis techniques, statistical quality measures, application of algorithms in software tools for image processing and analysis, image processing and analysis systems in the visible and infrared regions, algorithms for low, medium and high-level image analysis. Also investigated are differences in traffic control depending on the type (land, rail, maritime, river, air) and the impact of different weather conditions on the performance of computer vision algorithms, image fusion, etc.
Applications in the prevention and control of environmental incidents, prevention of criminal and terrorist activities, improvement of work methods and organization, control of goods movement, intelligent alarm systems. Control of drones for search and rescue. Clustering and identification of vessels from surveillance sensors in the water sea.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies</td><td colspan="5">Completed graduate study at PEIT, FESB or a related study programme.</td></tr>
<tr><td>Expected learning outcomes at the subject level (4-10 learning outcomes)</td><td colspan="5">1. Create, research and evaluate signal processing and analysis algorithms for traffic surveillance applications.
2. Critically evaluate quality measures and the selection of measures for assessing the performance of algorithms and modules for signal processing and analysis within surveillance applications.
3. Analyse and critically assess statistical criteria for assessing the safety and control of the movement of people and goods in traffic systems, ports, warehouses and on roads (land, air and water).
4. Predict, using mathematical tools, a time-frequency analysis algorithm for use in surveillance applications.</td></tr>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="5">Lectures
1. Overview of traffic control systems and their components. (1 hour)
2. Overview of satellite and remote sensors in traffic. Locally placed sensors. Applications in coastal surveillance and sea rescue. (1 hour)
3. Signal processing as a basic algorithm for analysing surveillance systems. Modern algorithms in signal processing and analysis. (1 hour)
4. Time-frequency signal analysis. Algorithms in wavelet transformation: continuous, discrete and complex. Definitions of quality measures for evaluating the effectiveness of algorithms. (2 hours)
5. Wavelet transformation at the so-called low level of processing and the so-called high level of processing. Algorithm with an adapted wavelet and its application. (4 hours)</td></tr>
</table>

	6. Algorithms in signal processing and analysis in 2D and 3D space. (1 hour) 7. Integral transformations derived from wavelets: EMD, curvelets, contourlets, edgelets, ridgelets, bendlets, shapelets and the application of the forementioned advanced algorithms in the so-called low level of processing. (2 hours) 8. Stochastic signals and the impact of interference and various types of noise on traffic surveillance systems through standard defined quality measures. Compensation of the above impacts. Impact of weather conditions on sensors in surveillance applications. (2 hours) 9. The role of automated scouts in surveillance and search and rescue in the water area (vessels, aircraft). (2 hours) 10. Clustering and identification of vessels from surveillance sensors in the water area. (1 hour) 11. Identification and counting of vessels outside the AIS system. (1 hour) 12. Connection of VTS technology and sensor fusion with maritime traffic surveillance tasks. (2 hours) **Seminar:** Research and development of algorithms for traffic control systems.
Types of teaching	☒ lectures ☒seminars and workshops □ exercises □ on line in full □ mixed e-learning □ fieldwork ☒independent tasks □ multimedia □ laboratory ☒mentoring work □ (other, write in)

Student obligations						
Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)	Attending classes	1	Research	2	Practical work	
	Experimental work		Report		(other, write in)	
	Essay		Seminar paper	1	(other, write in)	
	Colloquia		Oral exam	1	(other, write in)	
	Written exam		Project		(other, write in)	

Grading and evaluating student work during classes and at the final exam	The doctoral student works independently, with the guidance of the teacher, on research in the field of the subject. He/she must publish a scientific paper in a relevant scientific journal. At the end, he/she takes an oral exam. The grade is determined as the mean value: • evaluation of the quality of the written review paper • evaluation of its oral presentation and • evaluation of the results of the simulation of the given problem.

Mandatory literature (available in the library and through other media)	**Title**	**Number of copies in the library**	**Availability through other media**

Supplemental literature	Articles in relevant scientific databases 1. Vidakovic, Brani: „Statistical Modeling by Wavelets“, John Wiley & Sons, inc., 1999. 2. Donoho, David L., Johnstone, Iain M.: „Adapting to Uknown Smoothness via Wavelet Shrinkage“, Department of Statistics, Stanford University, 1994. 3. Strang, G.; Nquyen, T.: Wavelets and Filter Banks, Wellesley – Cambridge Press, MA (USA), 1997. 4. Mallat, S.: A Wavelet Tour of Signal Processing, 3rd Edition, ACADEMIC PRESS, 2008.

Quality assurance methods that ensure the acquisition of established learning outcomes	• Evaluation of results in accordance with the specified learning outcomes • Feedback from students through a student survey • Teacher self-evaluation • Institutional and extra-institutional checks
Other (according to the proposer's opinion)	

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Sustainable maritime transport system from the aspect of ecology and environmental protection</td></tr>
<tr><td>Code</td><td>DS13</td><td>Year of study</td><td colspan="3">1</td></tr>
<tr><td>Subject holder/s</td><td>Full Prof. Gorana Jelić Mrčelić,
Full Prof. Merica Slišković,
Asst. Prof Tina Perić</td><td>Point value (ECTS)</td><td colspan="3">5</td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td rowspan="2">Teaching method
(hours per semester)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>20</td><td>10</td><td>0</td><td>0</td></tr>
<tr><td>Subject status</td><td>Elective</td><td>Percentage of e-learning</td><td colspan="3"></td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">After successfully completing the subject, doctoral students will be able to:
1. Independently search and analyse scientific literature in the field of maritime transport sustainability.
2. Critically assess the sustainability features of the maritime transport system – ecological principles.
3. Propose optimal solutions that meet sustainability.
4. Write and present a review paper in the specified field.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies mandatory for the subject</td><td colspan="5">Completed graduate university studies.</td></tr>
<tr><td>Expected learning outcomes at the subject level (4-10 learning outcomes)</td><td colspan="5">1. Analyse and compare the concepts of ecology, environmental protection and sustainability.
2. Scientifically analyse marine systems (structure of the marine ecosystem, their function...).
3. Connect key elements of the marine ecosystem into a functional whole.
4. Analyse key threats to the sustainability of the marine environment from maritime transport.
5. Critically assess the impact of maritime transport on the marine environment.
6. Analyse the criteria for selecting policies aimed at protecting the marine environment and compare and synthesize current practices.
7. Analyse and synthesize EU policies - legal bases, strategies, policies.</td></tr>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="5">Lectures
1. Structure and function of the marine ecosystem (2 hours)
2. Stability of the marine ecosystem (1 hour)
3. Marine ecosystem as a functional unit (1 hour)
4. Ship as a source of pollution of the marine environment (3 hours)
5. Changes in the marine ecosystem caused by maritime traffic (3 hours)
6. Sustainable development and integrated coastal zone management – basic concepts (1 hour)
7. Legal framework for the protection of the (marine) environment (2 hours)
8. Strategies and policies for environmental protection and (maritime) transport, environmental impact assessment and strategic environmental impact assessment (2 hours)
9. Examples of practice/case studies (5 hours)
Seminar
Sustainable maritime transport system from the perspective of ecology and environmental protection (10 hours)</td></tr>
</table>

<table>
<tr><td>Types of teaching</td><td colspan="3">☒ lectures
☒seminars and workshops
☐ exercises
☐ on line in full
☐ mixed e-learning
☐ fieldwork</td><td colspan="3">☐ independent tasks
☐ multimedia
☐ laboratory
☐ mentoring work
☐ (other, write in)</td></tr>
<tr><td>Student obligations</td><td colspan="6"></td></tr>
<tr><td rowspan="5">Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)</td><td>Attending classes</td><td>1</td><td>Research</td><td>1</td><td>Practical work</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Essay</td><td>1</td><td>Seminar paper</td><td>1</td><td>(other, write in)</td><td></td></tr>
<tr><td>Colloquia</td><td></td><td>Oral exam</td><td>1</td><td>(other, write in)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Grading and evaluating student work during classes and at the final exam</td><td colspan="6">The doctoral candidate is Mandatory to attend lectures, seminars and exercises, participate independently and defend the seminar paper. The doctoral candidate is assessed orally.</td></tr>
<tr><td rowspan="4">Mandatory literature (available in the library and through other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability through other media</td></tr>
<tr><td colspan="3">1. Field JG, Hempel G, Summerhayes (2002): Oceans 2020, Island Press, London</td><td></td><td>Yes (e-book)</td></tr>
<tr><td colspan="3">2. EASAC (2016): Marine sustainability in an age of changing oceans and seas</td><td></td><td>Yes (e-book)</td></tr>
<tr><td colspan="3">3. IMO (2016): A concept of a sustainable maritime transportation system</td><td></td><td>Yes (e-book)</td></tr>
<tr><td>Supplemental literature</td><td colspan="6">Nanda VP, Pring G (2013): International Environmental Law and Policy for the 21st Century, Martinus Nijhof Publishers</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of established learning outcomes</td><td colspan="6"></td></tr>
<tr><td>Other (according to the proposer's opinion)</td><td colspan="6"></td></tr>
</table>

SUBJECT NAME	Forensic hydrography, modelling and simulation							
Code	DS 14		Year of study	1.				
Subject holder/s	Full Prof. Josip Kasum		Point value (ECTS)					
Collaborators			Teaching method (hours per semester)	L	S	E	F	
				20	0	10	0	
Subject status	Elective		Percentage of e-learning					
SUBJECT DESCRIPTION								
Subject objectives	• deepening knowledge of modelling using examples of forensic hydrography models • creation of new models in forensic hydrography • preparation for research and development in forensic hydrography and maritime applications							
Subject enrolment requirements and entry competencies mandatory for the	Completed graduate university studies.							
Expected learning outcomes at the subject level (4-10 learning outcomes)	After successfully completing the subject, doctoral students will be able to: 1. Independently search and analyse scientific literature in the field of hydrography. 2. Apply mathematical, physical and scientific principles in research and development of new knowledge in forensic hydrography. 3. Write and present a review paper on technological solutions investigated on the developed model. 4. Critically assess the features of new technologies for collecting relevant system parameters used in hydrographic activities. 5. Propose new solutions. 6. Evaluate new methods, tools and instruments in the field of modelling and simulation in forensic hydrography with application in maritime.							
The subject content is elaborated in detail according to the class schedule	• Goals and tasks of process modelling in forensic hydrography • Goals and tasks of process simulation in forensic hydrography • Forensic hydrography models • Hydrography system modelling • User system modelling • Prevention system modelling • Analysis system modelling in forensic hydrography • Synthesis system modelling in forensic hydrography • Validation testing of developed models • Application of simulation models in forensic hydrography and maritime							
Types of teaching	☒ lectures ☒ seminars and workshops ☒ exercises □ on line in full □ mixed e-learning □ fieldwork		☒ independent tasks □ multimedia ☒ laboratory ☒ mentoring work □ (other, write in)					
Student obligations	Active participation in all forms of teaching; lectures, consultations, literature searches, independent work on modelling the assigned problem.							
Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)	Attending classes	1,5	Research	1,5	Practical work	1,5		
	Experimental work		Report		(other, write in)			
	Essay		Seminar paper	1,5	(other, write in)			
	Colloquia		Oral exam		(other, write in)			
	Written exam		Project		(other, write in)			

Grading and evaluating student work during classes and at the final exam	The grade is determined as the mean value: • evaluation of the quality of the written review paper • evaluation of its oral presentation and • evaluation of the results of the simulation of the given problem.		
Mandatory literature (available in the library and through other media)	**Title**	**Number of copies in the library**	**Availability through other media**
	1. Manual on hydrography, IHO, Monaco, 2011		
	2. Pavić, I., Kasum, J., Perkušić, M., Organizational and Legal Aspects of International Hydrographic Activity, NAŠE MORE, 61 (5-6), 117-123, 2014		
	3. Kasum, J., Cvjetković, S., J., Stanivuk, T., Dynamic Model for Calculating the VHF Radio Horizon at Sea, BRODOGRADNJA: Teorija i praksa brodogradnje i pomorske tehnike 64 (4), 482-4873, 2013		
	4. Kasum, J., Pavić, I., Mišković, J., Increase of Combat Effectiveness of Warships with the Introduction into Operation of WECDIS, Naše More, 60 (3-4), 55-60, 2013		
	5. Russo, A., Urlić, J., Kasum, J., Human resources and their possible forensic meanings. Psychiatry Danubina 27 (1), 123-129, 2015		
Supplemental literature	1. Jeličić, T., Modrić, D., Kasum, J., Standardization of colours on charts, Međunarodni znanstveni skup Tiskarstvo & dizajn, 2017 2. Jeličić, T., Gržetić, Z., Kasum, J., Development of publishing activities of hydrographic organizations, 17. međunarodna konferencija tiskarstva, dizajna i grafičkih komunikacija, 2013 3. Jeličić, T., Kasum, J., Pogancic, M., Development of graphic technology and advancement of publishing-and-printing activities of hydrographic organizations, 16. Medjunarodna konferencija tiskarstva, dizajna i grafičkih komunikacija, 2012 4. Jeličić, T., Gržetić, Z., Kasum, J., Contribution of graphic technology in the production of nautical charts and publications, Space, Heritage & Future-GIS Odyssey 2010		
Quality assurance methods that ensure the acquisition of established learning outcomes	• Evaluation of results in accordance with the specified learning outcomes • Feedback from students through a student survey • Teacher self-evaluation • Institutional and extra-institutional checks		
Other (according to the proposer's opinion)			

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Synthesis of control systems in high-risk sea areas</td></tr>
<tr><td>Code</td><td>DS15</td><td>Year of study</td><td colspan="3"></td></tr>
<tr><td>Subject holder/s</td><td>Asst. Prof. Rino Bošnjak,
Full Prof. Danko Kezić</td><td>Point value (ECTS)</td><td colspan="3">5</td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td rowspan="2">Teaching method
(hours per semester)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>25</td><td>0</td><td>5</td><td>0</td></tr>
<tr><td>Subject status</td><td>Elective</td><td>Percentage of e-learning</td><td colspan="3"></td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">The subject provides adequate basic knowledge in the field of innovative technologies in maritime affairs. Modern technologies in maritime areas with increased collision risk are considered. PhD students will be trained to analyse, model and simulate maritime traffic systems where the risk of collision is increased, using nautical simulators in combination with the theory of discrete event systems.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies mandatory for the</td><td colspan="5">Completed graduate university studies in the field of technical sciences.</td></tr>
<tr><td>Expected learning outcomes at the subject level (4-10 learning outcomes)</td><td colspan="5">1. Present the applications of new technologies in maritime transport.
2. Apply and demonstrate a formal method within a surveillance system.
3. Define types of crossing models according to priorities (P) and ship importance (W).
4. Define terms and types of networks used to synthesize a surveillance system in areas of increased collision risk.
5. Present the functioning of a crossing supervisor.
6. Develop an algorithm for a sector supervisor in an area of increased collision risk.
7. Develop an appropriate type of Petri net based on a case study.
8. Write and publish an original scientific paper in an internationally peer-reviewed journal as an author or co-author.</td></tr>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="5">Lectures
1. Application of new technologies in maritime (3 hours)
2. Discrete event traffic systems - examples in maritime (3 hours)
3. Theory of supervisory control in maritime (ports and canals) (3 hours)
4. Development of a formal method with application in supervisory systems (3 hours)
5. Application of mathematical methods in specific sea passages with the aim of preventing collisions and collision situations (3 hours)
6. Crossing models and synthesis of the supervisory system (2 hours)
7. Basic concepts and types of Petri nets used for the synthesis of the supervisory system (2 hours)
8. Synthesis of crossing supervisors in maritime traffic (2 hours)
9. Synthesis of Petri nets on a case study in maritime traffic (2 hours)
10. Types of networks used in crossing supervisors in specific sea passages and approaches to ports (2 hours)
Exercises
1. Visual object net, Matlab ver. 2016. (2 hours)
2. NTPRO 5000 Transas simulator (2 hours)
3. Collision simulation on the example of the Dover Strait (1 hour)
Seminar
Modelling a maritime transport system with increased collision risk – a case study</td></tr>
<tr><td>Types of teaching</td><td colspan="3">☒ lectures
☒seminars and workshops
☒exercises
☐ on line in full
☐ mixed e-learning
☐ fieldwork</td><td colspan="2">☐ independent tasks
☐ multimedia
☐ laboratory
☐ mentoring work
☐ (other, write in)</td></tr>
</table>

Student obligations						
Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)	Attending classes	0,875	Research		Practical work	
	Experimental work		Report		(other, write in)	
	Essay		Seminar paper	3	(other, write in)	
	Colloquia		Oral exam	1,125	(other, write in)	
	Written exam		Project		(other, write in)	
Grading and evaluating student work during classes and at the final	The doctoral student is Mandatory to attend lectures, seminars and exercises and independently participate in defending the seminar paper. The doctoral student is assessed orally.					

	Title	Number of copies in the library	Availability through other media
Mandatory literature (available in the library and through other media)	Bošnjak, R.: Sinteza sustava upravljanja plovidbom u e – Navigaciji, Doctoral dissertation, University of Zagreb, Faculty of Transport and Traffic Sciences,	1	
	Kezić, D.: Sprječavanje potpunog zastoja u sustavima s diskretnim događajima primjenom Petrijevih mreža, octoral dissertation, University of Zagreb, Faculty of Electrical Engineering and Computing, Zagreb, 2004.	1	
	Vidan, P.: Model povećanja sigurnosti plovidbe na unutarnjim plovnim putovima, Doctoral dissertation, University of Zagreb, Faculty of Transport and Traffic Sciences, Zagreb 2010.	1	
	Gudelj A: Optimalizacija sustava s diskretnim događajima primjenom Petrijevih mreža i genetskih algoritama, Doctoral dissertation, University of Zagreb, Faculty of Organization and Informatics, Varaždin, 2010.	1	
	David, R., Alla H., *Discrete, Continuous, and Hybrid Petri Nets,* Springer, Berlin Heidelberg New York, 2010.	1	
	Weintrit, A. (2011). "Navigational Systems and Simulator", Gdynia Maritime University, Gdynia, Poland, p. 55-63.		
Supplemental literature	Porathe, T.; Lützhöft, M.; Praetorius, G. (In press). Communicating intended routes in ECDIS, Evaluating technological change, Journal of Accident Analysis and Prevention, Elseviers (available online from January 2013). Lützhöft, M., Porathe, T., Jenvald, J. & Dahman, J. (2010). *System Simulations for Safety*. In O. Turans, J. Bos, J. Stark & J. L. Colwell (Eds.) *Proceedings of the International Conference on Human Performance at Sea*, p. 3. Glasgow: University of Strathclyde.		

Quality assurance methods that ensure the acquisition of established learning outcomes	
Other (according to the proposer's opinion)	

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Methodology of maritime operations design</td></tr>
<tr><td>Code</td><td>DS16</td><td>Year of study</td><td colspan="3">1</td></tr>
<tr><td>Subject holder/s</td><td>Asst. Prof. Ivica Pavić</td><td>Point value (ECTS)</td><td colspan="3"></td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td rowspan="2">Teaching method
(hours per semester)</td><td>L</td><td>S</td><td>AV</td><td>LV</td><td>KV</td></tr>
<tr><td>20</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Subject status</td><td>Elective</td><td>Percentage of e-learning</td><td colspan="3"></td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">• Study of theoretical approaches to operational design
• Analysis of the practical application of operational design in naval operations
• Determination of complementarity and interdependence between operational design and operational planning and execution of campaigns and major operations
• Linking the doctrine and practice of operational art in the function of developing elements of operational design.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies mandatory for the subject</td><td colspan="5">Completed graduate university studies in Nautical or Naval Studies</td></tr>
<tr><td>Expected learning outcomes at the subject level (4-10 learning outcomes)</td><td colspan="5">After successfully completing the subject, doctoral students will be able to:
1. Independently search and analyse scientific literature in the field of operational design.
2. Apply appropriate doctrinal principles in the research, development and practical application of operational design in contemporary maritime operations.
3. Write and present a scientific paper in the interdisciplinary field of military-defence and security-intelligence sciences and arts.
4. Use and critically evaluate methods for determining elements of operational design and the impact and characteristics of new technologies on determining these elements.</td></tr>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="5">• Theoretical approaches to operational design
• Analysis of the classical approach to operational design
• Development of the operational idea through elements of the classical approach to operational design
• Analysis of the theoretical foundations of the effects-based operational design approach
• Identification of elements of operational planning, determination and action on hubs and links of the system, and development of main activities within the planning of operations based on effects
• Analysis of theoretical foundations of system operational design
• Determining relations and relations between entities and influencing relations and connections within complex adaptive systems with disSubjects of system operational design
• Examining and analysing the application of operational design in maritime operations and the impact on operational planning and implementation of operations</td></tr>
<tr><td></td><td colspan="3">☒ lectures
☐ seminars and workshops
☐ exercises
☐ on line in full
☐ mixed e-learning
☐ fieldwork</td><td colspan="2">☒ independent tasks
☐ multimedia
☐ laboratory
☒ mentoring work
☐ (other, write in)</td></tr>
<tr><td>Student obligations</td><td colspan="5">Active participation in all forms of teaching: lectures, consultations, literature searches, independent work on analysing the assigned problem.</td></tr>
</table>

<table>
<tr><td rowspan="5">Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)</td><td>Attending classes</td><td>1,5</td><td>Research</td><td>1,5</td><td>Practical work</td><td>1,5</td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar paper</td><td>1,5</td><td>(other, write in)</td><td></td></tr>
<tr><td>Colloquia</td><td></td><td>Oral exam</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(other, write in)</td><td></td></tr>
<tr><td>Grading and evaluating student work during classes and at the final exam</td><td colspan="6">The grade is determined as the mean value:
• evaluation of the quality of the written scientific paper and
• evaluation of the presentation of the scientific paper.</td></tr>
<tr><td rowspan="6">Mandatory literature (available in the library and through other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td colspan="2">Availability through other media</td></tr>
<tr><td colspan="3">[1] Planner's Handbook for Operational Design, Joint Chiefs of Staff, Joint Staff, J-7, Joint and Coalition Warfighting, Suffolk, Virginia, 2011.</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="3">[2] Naveh, Shimon: In Pursuit of Military Excellence: The Evolution of Operational Theory, London, Frank Cass, 1997.</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="3">[3] Sorrells, William T., et. al.: Systemic Operational Design: An introduction, School of Advanced Military Studies United States Army Command and General Staff College Fort Leavenworth, Kansas, 2005.</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="3">[4] Vego, Milan: Joint Operational Warfare – Theory and Practice, Naval War College, Newport, Rhode Island, 2007.</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="3">[5] Warden, John A. III: The Air Campaign: Planning for Combat, Washington, DC: National Defense University Press, 1988.</td><td></td><td colspan="2"></td></tr>
<tr><td>Supplemental literature</td><td colspan="6">[1] Banach, S. J., Ryan, A.: The Art of Design, A Design Methodology, Military Review, 2009US Army Combined Arms Center, Fort Leavenworth, Kansas, 2009.
[2] Dalton, L. C.: Systemic Operational Design: Epistemiological Bumpf or the Way Ahead for Operational Design,?, A monograph, School of Advanced Military Studies, US Army Command and General Staff College, Fort Leavenworth, Kansas, 2006.
[3] Kober, A.: The Israeli Defense Forces in the Second Lebanon War: Why the Poor Performance?, The Journal of Strategic Strudies, Vol. 31. No. 1, London, New York, 2008.
[4] McGlade, P. E.: Effect-Based Approach to Operations Versus Systemic Operational Design: Is there a Difference?, Graduate Research Project, Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio, 2006.
[5] Pavić, I.: Izraelski pristup operativnom dizajnu u kampanji protiv Hezbollaha 2006., Diplomski rad, Zapovjedno-stožerna škola "Blago Zadro", Hrvatsko vojno učilište, Zagreb, 2010.
[6] Pavić, I., Mišković, J., Pomorska blokada tijekom Izraelsko-Libanonskog sukoba 2006., Izvorni znanstveni članak, Adrias, Zbornik zavoda za znanstveni i umjetnički rad Hrvatske akademije znanosti i umjetnosti, Vol. 17, 2010, Zagreb – Split, 2010.</td></tr>
</table>

	[7] Vego, M.: *A Case against Systemic Operational Design*, Joint Forces Quarterly, Issue 53, National Defense University Press, Washington DC, 2009. [8] Vego, M.: *Systems versus Classical Approach to Warfare*, Joint Forces Quarterly, Issue 52, National Defense University Press, Washington DC, 2009. [9] Vego, M.: *Effect-Based Operations: A Critique*, Joint Forces Quarterly, Issue 41, National Defense University Press, Washington DC, 2006.
Quality assurance methods that ensure the acquisition of established learning outcomes	• Evaluation of results in accordance with the specified learning outcomes • Feedback from students through a student survey • Teacher self-evaluation • Institutional and extra-institutional checks
Other (according to the proposer's opinion)	

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Maritime route planning</td></tr>
<tr><td>Code</td><td>DS17</td><td>Year of study</td><td colspan="3">1</td></tr>
<tr><td>Subject holder/s</td><td>Assoc. Prof. Zvonimir Lušić</td><td>Point value (ECTS)</td><td colspan="3">7</td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td rowspan="2">Teaching method (hours per semester)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>15</td><td>15</td><td>0</td><td>0</td></tr>
<tr><td>Subject status</td><td>Mandatory</td><td>Percentage of e-learning</td><td colspan="3"></td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">Apply scientific methods in solving complex problems of organization and supervision of maritime navigation and improvement of safety measures at sea.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies mandatory for the</td><td colspan="5">Completed graduate studies in Maritime Studies or another major that includes at least the contents of STCW II/2.</td></tr>
<tr><td>Expected learning outcomes at the subject level (4-10 learning outcomes)</td><td colspan="5">1. Application of quantitative and qualitative methods in ship collision and grounding assessments.
2. Independently analyse ship navigation flows, determine movement distributions and ship traffic structure, and present research results.
3. Critically assess elements of maritime international and national legal regulations, especially in the area of regulation of maritime navigation, protection of human life at sea, protection of property and prevention of pollution of the marine environment.
4. Analyse the usability of complex navigation and communication systems and devices in maritime navigation monitoring systems, and the possibilities of improving them.
5. Develop models for optimizing maritime travel and navigation, and systems for improving maritime safety in general.</td></tr>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="5">1. Spatial movement of ships and characteristics of the navigation flow (direction, speed, traffic volume, density, traffic structure, distribution).
2. Statistical processing of data on ship movement (AIS, radar, optical systems).
3. Models for assessing ship collisions
4. Models for assessing ship grounding
5. Principles governing navigation - international and national regulations
6. VTS systems; establishment, organization, examples, contribution to safety
7. Technical support for ships in navigation
8. Ship detection systems, communication and remote-control capabilities
9. Traffic management in ports and on approach routes
10. Maritime characteristics of ships
11. Principles of ship voyage planning and its optimization, models for optimizing maritime voyage
12. Time-based ship guidance
13. Navigation management in special circumstances; war zones, areas of pirate attacks, interruption of communication and navigation systems; navigation management of special ships and objects at sea.
14. Management of autonomous vessels.</td></tr>
<tr><td>Types of teaching</td><td colspan="3">☒ lectures
☒seminars and workshops
☐ exercises
☐ on line in full
☐ mixed e-learning
☐ fieldwork</td><td colspan="2">☒independent tasks
☐ multimedia
☐ laboratory
☒mentoring work
☐ (other, write in)</td></tr>
</table>

Student obligations	Attending classes, researching, writing a seminar paper					
Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value	Attending classes	0,375	Research	5	Practical work	
	Experimental work		Report		(other, write in)	
	Essay		Seminar paper	0,375	(other, write in)	
	Colloquia		Oral exam	1,25	(other, write in)	
	Written exam		Project		(other, write in)	
Grading and evaluating student work during classes and at the final exam	The student is Mandatory to attend lectures, complete independent assignments/research, and prepare, present, and defend a seminar paper.					

	Title	Number of copies in the library	Availability through other media
Mandatory literature (available in the library and through other media)	Kristiansen, S.: Maritime Transportation: Safety Management and Risk Analysis, Elsevier-Butterworth-Heinemann, 2005.	1	
	Kos, S.; Zorović, D.; Vranić, D.: Terestrička i elektronička navigacija, Pomorski fakultet u Rijeci, Rijeka, 2010.	1	
	Mazaheri, A.: Probabilistic modeling of ship grounding, Helsinki University of tehnology-Faculty of Engineering and Architecture, 2009.		YES
	Zec, D.: Planiranje pomorske plovidbe, Pomorski fakultet u Rijeci, Rijeka, 1997.	1	
	Hansen, P.F.: Basic Modelling Principles for prediction of collision and grounding frequencies-IWRAP MK II, Technical University of Denmark, 2008.		YES
	Guidance Note on the Preparation of Proposals on Ships Routeing Systems and Ship Reporting Systems, IMO (www.imo.org)		YES
	Ships Routing, IMO	1	
	IALA VTS manual, IMO, 2012		YES
	Andersson, A.: Multi-objective optimisation of ship routes-Master's thesis, Chalmers University of Technology, 2015.		YES
	E-navigation Strategy Implementation Plan (SIP); IALA Guideline on Shore-side portrayal ensuring harmonisation with e-Navigation related information		YES

Supplemental literature	Bowditch, N.: The American Practical Navigator, DMAHTC, Maryland, 2002. Benković, F.; Piškorec, M.; Lako, Lj..; Čepelak, K.; Stajić, D.: Terestrička i elektronska navigacija, Hidrografski Institut Ratne mornarice, Split, 1986. Zec, D.: Sigurnost na moru, Pomorski fakultet u Rijeci, Rijeka, 2001. Risk assesment applications for the marine and offshore oil and gas industries, ABS, 2000. Maber, M.H.: Risk and safety in Civil Engineering, Swiss Federal Institute of tehnology, Zurich. Kopacz, Z.; Morgas, W.; Urbanski, J.: The Maritime Safety System, its Main Components and Elements, The Journal of Navigation, Vol 54, No 2, The Royal Institute of Navigation, United Kingdom, 2001., str. 199-211. Ruihua LU; Turan, O.; Boulougouris, E.: Voyage optimisation: prediction of ship specific fuel consumption for energy efficient shipping, Low Carbon Shipping Conference, London 2013.
Quality assurance methods that ensure the acquisition of established learning outcomes	• Evaluation of results in accordance with the specified learning outcomes • Feedback from students through a student survey • Teacher self-evaluation • Institutional and extra-institutional checks
Other (according to the proposer's opinion)	

<table>
<tr><td>SUBJECT NAME</td><td colspan="5">Sustainable transport and logistics</td></tr>
<tr><td>Code</td><td>DS18</td><td>Year of study</td><td colspan="3">1</td></tr>
<tr><td>Subject holder/s</td><td>Asst. Prof. Luka Vukić</td><td>Point value (ECTS)</td><td colspan="3">5</td></tr>
<tr><td rowspan="2">Collaborators</td><td rowspan="2"></td><td>Teaching method</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>(hours per semester)</td><td>30</td><td>30</td><td>0</td><td>0</td></tr>
<tr><td>Subject status</td><td>Elective</td><td>Percentage of e-learning</td><td colspan="3">10%</td></tr>
<tr><td colspan="6">SUBJECT DESCRIPTION</td></tr>
<tr><td>Subject objectives</td><td colspan="5">The general objective of the subject is to point out the existing models (theoretical and practical) of sustainability of the transport system and to define the role and significance of logistics for the entire system, as well as its position and importance in the transport services market. At the same time, the objective is to point out the relationships and importance of determining the direction of development of each individual transport modality, which refers to investments in infrastructure and superstructure, but also the use of modern transport technologies necessary for further development, in accordance with real needs in the context of optimizing the logistics chain. Special attention will be paid to the analysis and determination of the balance between the economic, ecological and social elements of transport sustainability, with the aim of reducing the negative impact of transport on the environment and society while optimizing costs and maximizing the economic benefits of activities in various segments of the logistics chain.
Additionally, the advantages and disadvantages of integrating sustainability principles in the logistics chain will be considered, such as reducing congestion and emissions, reducing operating costs, improving safety, increasing the productivity of transport infrastructure, reducing consumption and introducing alternative energy sources, and acquiring knowledge about the functionality of sustainable transport development. The subject also aims to highlight the importance of the impact of technological measures and political initiatives in achieving a comprehensive and compatible sustainability initiative that is supported by transport and economic policy. In addition to the above thematic units, the role of logistics in the entire transport chain will be determined, as well as the use of qualitative and quantitative methods and models in determining optimal and sustainable transport services.</td></tr>
<tr><td>Subject enrolment requirements and entry competencies mandatory for the</td><td colspan="5"></td></tr>
<tr><td>Expected learning outcomes at the subject level (4-10 learning outcomes)</td><td colspan="5">1. Assess and validate, in theoretical and practical terms, the fundamental concepts of logistics and sustainable transport, with a focus on transport management and transport models, intermodal transport, tools for assessing sustainability impacts (e.g. external cost calculation or life cycle assessment), methods for evaluating and optimizing transport (e.g. multi-criteria analysis, social cost-benefit analysis) and other complementary areas
2. Critically assess proposed solutions and plans for sustainable transport, based on technological measures and political initiatives to reduce the negative impact of the transport sector on the environment and society.
3. Valorise and assess the competitiveness of transport routes (road, rail, maritime and other) as a segment of the logistics chain in transport, with the optimization of the examined parameters in the entire logistics and distribution chain.</td></tr>
</table>

<table>
<tr><td></td><td colspan="6">4. Systematize and argue general and specific factors of sustainability of various transport modalities in the logistics system, taking into account the planning of the phases of the transport process, determining specific conditions for cargo transport based on the specific nature of the cargo, the use of information technologies to reduce transport costs and increase process efficiency, and increase the safety of the subject of transport.
5. Present a systematic understanding, ability to design, implement and adapt the research process, thereby contributing to the dissemination of knowledge about logistics and sustainable transport, which the student confirms by publishing his results in recognized publications.</td></tr>
<tr><td>The subject content is elaborated in detail according to the class schedule</td><td colspan="6">• Basic laws and factors of transport sustainability in the logistics chain of service provision
• Indicators of sustainable development in transport, analysis of the ecological, social and economic characteristics of the structure of sustainable development, the tendency to reduce the negative impact of transport on the environment and society based on the implementation of technological measures and political initiatives in proportion to the optimization of costs and the increase of the efficiency of logistics operations (e.g. infrastructure requirements of different transport modalities, intermodal transport as an element of sustainability, internal and external costs of transport activity, etc.)
• Valorisation of segments (with regard to the subject of research) of the logistics-distribution chain with the aim of increasing competitiveness, considering the demands and needs of users in a dynamic and competitive environment of providing transport services
• Case study modelling using logistic and analytical optimization methods (e.g. multi-criteria method, DEA, AHP, LCA, etc.) in the context of valorising the logistics system in transport (on a specific example) and solving problems in transport and traffic.</td></tr>
<tr><td>Types of teaching</td><td colspan="3">☒ lectures
☒seminars and workshops
☐ exercises
☐ on line in full
☐ mixed e-learning
☐fieldwork</td><td colspan="3">☒ independent tasks
☐ multimedia
☐ laboratory
☐ mentoring work
☐ (other, write in)</td></tr>
<tr><td>Student obligations</td><td colspan="6">Attendance at classes (lectures or consultative classes), research and preparation of seminars related to the research conducted, presentation of research, oral exam</td></tr>
<tr><td rowspan="6">Monitoring student work (enter the share in ECTS points for each activity so that the total number of ECTS points corresponds to the subject credit value)</td><td>Attending classes</td><td>1,5</td><td>Research</td><td>1,125</td><td>Practical work</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Homework</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar paper</td><td>1,625</td><td>(other, write in)</td><td></td></tr>
<tr><td>Colloquia</td><td></td><td>Oral exam</td><td>0,75</td><td>(other, write in)</td><td></td></tr>
<tr><td>Written exam (if not meeting the planned activities) *</td><td></td><td>Project</td><td></td><td>(other, write in)</td><td></td></tr>
</table>

<table>
<tr><td>Grading and evaluating student work during classes and at the final exam</td><td colspan="3">The student is Mandatory to attend lectures, complete independent assignments/ research, and prepare, present, and defend a seminar paper.
In addition to attending classes, seminars, and workshops, students' obligations are based on independent tasks related to the application of acquired knowledge in the subject area within the scope of postgraduate interests, and writing, publishing, or presenting their research to the scientific and professional community.</td></tr>
<tr><td rowspan="6">Mandatory literature (available in the library and through other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability through other media</td></tr>
<tr><td>Cinar, D., Gakis, K., Pardalos, P.M. (2017). Sustainable Logistics and Transportation: Optimization Models and Algorithms, Springer.</td><td>1</td><td></td></tr>
<tr><td>McKinnon, A., Browne, M., Whiteing, A., Piecyk, M. (2015). Green Logistics: Improving the Environmental Sustainability of Logistics (Third Edition Edition). Kogan Page.</td><td></td><td>1</td></tr>
<tr><td>Zelenika, R. (2005). Logistički sustavi. Ekonomski fakultet u Rijeci.</td><td>5</td><td></td></tr>
<tr><td>Poletan Jugović, T. (2015). Robni tokovi. Pomorski fakultet Sveučilišta u Rijeci.</td><td>1</td><td></td></tr>
<tr><td>Baričević, H., Vilke, S. (2016). Logistika i sigurnost kopnenog prometa. Pomorski fakultet Sveučilišta u Rijeci.</td><td>1</td><td></td></tr>
<tr><td rowspan="6">Supplemental literature</td><td colspan="3">Faulin, J., Grasman, S., Juan, A., Hirsch, P. (2018). Sustainable Transportation and Smart Logistics: Decision-Making Models and Solutions. 1st Edition, Elsevier.</td></tr>
<tr><td colspan="3">Fahimnia, B., Bell, M., Hensher, D., Sarkis, J. (2015). Green Logistics and Transportation: A Sustainable Supply Chain Perspective, Springer.</td></tr>
<tr><td colspan="3">Zeimpekis, V., Aktas, E., Bourlakis, M., Minis, I. (2018). Sustainable Freight Transport Theory, Models, and Case Studies, Springer.</td></tr>
<tr><td colspan="3">Kramberger, T., Potočan, V., Ipavec, V.M. (2016). Sustainable Logistics and Strategic Transportation Planning, IGI Global.</td></tr>
<tr><td colspan="3">Golinska, P., Hajdul, M. (2012). Sustainable Transport: New Trends and Business Practices, Springer.</td></tr>
<tr><td colspan="3">van Nunen, J., Huijbregts, P., Rietveld, P. (2011). Transitions Towards Sustainable Mobility New Solutions and Approaches for Sustainable Transport Systems, Springer.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of established learning outcomes</td><td colspan="3">The quality of studies is monitored in accordance with the ISO 9001 system and in accordance with European standards and guidelines for quality assurance implemented at the Faculty of Maritime Studies in Split. Once a year, the results of the pass are analysed, and appropriate measures are adopted.</td></tr>
<tr><td>Other (according to the proposer's opinion)</td><td colspan="3"></td></tr>
</table>

2.16. List of teachers and associates by subject

Subject	Teachers and associates
Scientific research methodology	Zlatan Kulenović, Hrvoje Dodig
Organization of scientific projects and basics of bibliometrics	Nenad Vulić, Joško Šoda
Maritime expert systems	Hrvoje Dodig
Intelligent transport systems in maritime studies	Pero Vidan
Strength and vibrations of marine propulsion systems	Nenad Vulić
Modelling and simulation of marine propulsion systems	Nikola Račić
Energy efficiency of marine systems	Maja Krčum
Technical supervision of maritime vessels	Ivan Komar
Mathematical methods in maritime studies	Tatjana Stanivuk
Modelling and optimization of maritime transport systems	Danko Kezić, Anita Gudelj
Energy efficiency in maritime traffic	Maja Krčum
Advanced algorithms in traffic control systems	Igor Vujović, Petar Matić
Sustainable maritime transport system from the aspect of ecology and environmental protection	Gorana Jelić Mrčelić, Merica Slišković, Tina Perić
Forensic hydrography models and simulations	Josip Kasum
Synthesis of monitoring systems in high-risk sea areas	Rino Bošnjak, Danko Kezić
Methodology of maritime operations design	Ivica Pavić
Maritime route planning	Zvonimir Lušić
Sustainable transport and logistics	Luka Vukić

2.17. Teacher data

Title, name and surname	Full Prof. Zlatan Kulenović
Subject taught in the proposed study programme	Scientific research methodology
GENERAL INFORMATION	
Address	Put Plokita 83, Split
Telephone	021 537 769
E-mail address	zlatan@pfst.hr
Personal website	
Year of birth	1954
Personal identification number from the Register of Scientists	226014
Scientific or artistic title and date of last election	Permanent scientific advisor 2.2.2009.
Scientific-teaching, artistic-teaching or teaching title and date of last election	Full professor tenured 2.2.2009.
Field and field of election to scientific or artistic title	Field of technical sciences, field of mechanical engineering
DATA ON CURRENT EMPLOYMENT	
Institution of employment	Faculty of Maritime Studies, University of Split
Date of employment	Since 1996.
Job title (professor, researcher, associate, etc.)	Professor
Field of work	Mechanical engineering-naval engineering, machine mechanics and structures, technical physics
Function	
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Technical Sciences
Institution	Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb
Place	Zagreb
Date	9.7.1987.
INFORMATION ABOUT ADVANCED TRAINING	
Year	1980.-1982., 1984.-1986.
Place	Zagreb
Institution	Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb
Field of study	Experimental methods of structural mechanics
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	Germany (3)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	English (3)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	Russian (2)
SUBJECT COMPETENCES	

Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	Undergraduate, graduate, and postgraduate studies in mechanical engineering, technology, and maritime engineering at the University of B. Luka, University of Split, and University of Rijeka. Subjects: Mechanics, Technical Mechanics, Resistance of Materials, Strength of Materials, Mechanisms, Vibrations, Fundamentals of Design, Fundamentals of Mechanical Engineering, Experimental Methods of Structural Analysis, Technical Drawing, Descriptive Geometry, Engineering Graphics, Machine Elements, Marine Machine Elements, Mechanics of Marine Structures, Marine Hydraulic and Pneumatic Systems, Physics, Engineering Physics, Technical Physics, Theory of Elasticity, Dynamic Structures, Structural Mechanics of Marine Systems.
Authorship of university/college textbooks in the subject area	1. Z. Kulenović, Zbirka riješenih ispitnih zadataka iz otpornosti materijala, Univerzitet u Banja Luci, Mašinski fakultet, Banja Luka 1980. 2. Z. Kulenović, Mehanizmi, Univerzitet u Banja Luci, Mašinski fakultet, Banja Luka 1991. 3. Z. Kulenović, Mehanika I, Univerzitet u Banja Luci, Mašinski fakultet, Banja Luka 1995. 4. Z. Kulenović, Čvrstoća elemenata pomorskih konstrukcija, Riješeni zadaci, Sveučilište u Splitu, Visoka pomorska škola u Splitu, Split 2001. 5. Z. Kulenović, Mehanika krutih tijela, Odjel za studij mora i pomorstva Sveučilišta u Splitu, Split 2002. 6. Z. Kulenović, Tehnička fizika, Odabrana poglavlja, Odjel za studij mora i pomorstva Sveučilišta u Splitu, Split 2002. 7. Z. Kulenović, Nauka o čvrstoći, Visoka pomorska škola Sveučilišta u Splitu, Split 2003. 8. Z. Kulenović, Tehničko crtanje, Sveučilište u Splitu, Visoka pomorska škola u Splitu, Split 2003. 9. Z. Kulenović, Primijenjena mehanika, Čvrstoća, Pomorski fakultet Sveučilišta u Splitu, Split 2005. 10. Z. Kulenović, Čvrstoća materijala, Pomorski fakultet Sveučilišta u Splitu, Split 2007. 11. Z. Kulenović, Mehanika I, Pomorski fakultet Sveučilišta u Splitu, Split 2007. 12. Z. Kulenović, Mehanika II, Pomorski fakultet Sveučilišta u Splitu, Split 2008. 13. Z. Kulenović, Mehanika elemenata pomorskih konstrukcija, Pomorski fakultet Sveučilišta u Splitu, Split 2009. 14. Z. Kulenović, Čvrstoća materijala, Drugo dopunjeno izdanje, Pomorski fakultet Sveučilišta u Splitu, Split 2010. 15. Z. Kulenović, Elementi brodskih strojeva i konstrukcija, Pomorski fakultet Sveučilišta u Splitu, Split 2012. 16. Z. Kulenović, Tehnička mehanika za pomorce, Pomorski fakultet Sveučilišta u Splitu, Split 2013. 17. Z. Kulenović, Tehnička mehanika I, Pomorski fakultet Sveučilišta u Splitu, Split 2013. 18. I. Vujović, I. Kuzmanić, Z. Kulenović, Dielectric Materials' Selection for Marine Applications, LAP Lambert Academic Publishing, Saarbrücken 2014, Germany. 19. Z. Kulenović, Osnove inženjerska mehanike, Pomorski fakultet Sveučilišta u Splitu, Split 2016.

Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. I. Kuzmanić, Z. Kulenović, I. Vujović, Contribution to cross-platform programming in integrated ship's systems, 20th International Research/Expert Conference „Trends in the Development of Machinery and Associated Technology“ TMT 2016, Mediterranean Sea Crusing, 24th September – 1st October, 2016. pp. 269 – 272. 2. I. Vujović, Z. Kulenović. I. Kuzmanić, New Algorithm for Optimal Dielectric Selection in Marine Environment, Brodogradnja/Shipbuilding 66 (2015), 3, 39-48. 3. J. Šoda, I. Vujović, Z. Kulenović, Analysis of the Vibration Signal Using Time-Frequency Methods, Transactions of FAMENA 39 (2015), 3, 23-34. 4. I. Vujović, I. Kuzmanić, Z. Kulenović, Relationship of Advences in Electronics and Maritime Traffic, with Case Study of Fall Detection in Smart Cabins, Book of Proceedings of 7th International Marine Science Conference IMSC 2017, Solin, 2017. 5. 5. Igor Vujović, Miro Petković, Zlatan Kulenović, Ivica Kuzmanić, Video analysis application as part of autonomous ship's IOT, 12th International Scientific Conference Development and Modernization of Production, RIM 2019, Sarajevo, September 18-20. 2019., pp. 222-227.
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	I. Vujović, I. Kuzmanić, Z. Kulenović, N. Maleš, Additive Manufacturing of Spare Parts in Maritime Industry – Technology Transfer in Mariner Education, 21st International Research/Expert Conference “Trends in the Development of Machinery and Associated Technology”, 18-22 September 2018., Karlovy Vary, Czech Republic, pp. 277-280.
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical competencies?	University of Banja Luka. Hvar High School.
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	Croatian Military Academy "Petar Zrinski" - Recognition to the Head of the PSP organizational unit of the Department of Marine and Maritime Studies of the University of Split for the cooperation achieved and contribution to teaching and management of the scientific study.

Title, name and surname	Assist. Prof. Hrvoje Dodig
Subject taught in the proposed study programme	Scientific research methodology Maritime expert systems
GENERAL INFORMATION	
Address	Podglavica 8
Telephone	098 1909 426
E-mail address	hdodig@pfst.hr
Personal website	www.hdodig.com
Year of birth	1972
Personal identification number from the Register of Scientists	358544
Scientific or artistic title and date of last election	-
Scientific-teaching, artistic-teaching or teaching title and date of last election	Assistant professor, 01.05.2018.
Field and field of election to scientific or artistic title	Electrical engineering
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies
Date of employment	23.11.2016.
Job title (professor, researcher, associate, etc.)	Assistant professor
Field of work	Electronics, Numerical methods in electrical engineering
Function	Vice Dean for Science
EDUCATIONAL DATA – Highest degree achieved	
Title	Ph.D.
Institution	Wessex Institute of Technology (University of Wales)
Place	Southampton, UK
Date	12.07.2012.
DATA ABOUT ADVANCED TRAINING	
Year	2003
Place	Southampton, UK
Institution	Wessex Institute of Technology (University of Wales)
Field of study	Numerical methods in electrical engineering
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2	English, 5 (excellent)
Foreign language and language proficiency on a scale from 2	-
Foreign language and language proficiency on a scale from 2	-
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	-
Authorship of university/college textbooks in the subject area	-
Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	• Dodig, Hrvoje; Vukša, Srđan; Bukljaš, Mihaela; Vidan, Pero; „Edge Element Calculation of Radar Cross Section of Small Maritime Targets with Respect to Height of Radar Antenna// 13th International Conference on Marine Navigation and Safety of Sea Transportation", Abstracts / Weintrit, Adam - Gdynia, 2019, 36-37 / Weintrit, Adam (ur.). Gdynia, 2019. str. 36-37 (lecture, international review, abstract, scientific)

	• Cvetković Mario, Dodig, Hrvoje, Poljak Dragan: „Numerical Comparison of Compound and Extracted Eye Models for High Frequency Dosimetry", International journal for engineering modelling, 31 (2018), 1-2; 1-13 doi:10.31534/engmod.2018.1-2.si.01_bdny • Dodig, Hrvoje; Cvetković, Mario; Poljak, Dragan; "On the Computation of Singular Integrals over Triangular Surfaces in R3", Boundary Elements and other Mesh Reduction Methods XXXXI / Cheng, A.H.D.; Syngellakis, S. (ur.). Southampton, Billerca: Wessex Institute of Technology Press, Computational Mechanics International Inc, 2018. str. 95-105 • Poljak, Dragan; Šesnić, Silvestar; Cvetković, Mario; Šušnjara, Anna; Dodig, Hrvoje; Lallechere, Sebastien; Drissi, Khalil El Khamlichi: "*Stochastic Collocation Applications in Computational Electromagnetics*", Mathematical problems in engineering, 2018, No, 1917439, doi: 10.1155/2018/1917439 • Cvetković, Mario; Dodig, Hrvoje; Poljak, Dragan: "A Study on the use of Compound and Extracted Models in the High Frequency Electromagnetic Exposure Assessment", Mathematical problems in engineering, 2017, No. 7932604, doi:10.1155/2017/7932604 • Dodig, Hrvoje, "A boundary integral method for numerical computation of radar cross section of 3D targets using hybrid BEM/FEM with edge elements", Journal of computational physics, 348 (2017), 790-802 doi:10.1016/j.jcp.2017.07.043
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	-
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	-
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical competencies?	-
PRIZNANJA I NAGRADE	
Recognitions and awards for teaching and scientific work/artistic work	-

Title, name and surname	Full Prof. Nenad Vulić
Subject taught in the proposed study programme	Organization of scientific projects and basics of bibliometrics Strength and vibrations of marine propulsion systems
GENERAL INFORMATION	
Address	Sukoišanska 37, 21000 Split
Telephone	021 321 447, 091 517 0660
E-mail address	nenad.vulic@pfst.hr
Personal website	tkojetko.irb.hr/znanstvenikDetalji.php?sifznan=19239
Year of birth	1960.
Personal identification number from the Register of Scientists	184346
Scientific or artistic title and date of last election	Scientific advisor, 21. January 2009.
Scientific-teaching, artistic-teaching or teaching title and date of last election	Full professor tenured, 18. December 2013.
Field and field of election to scientific or artistic title	Field of technical sciences, field of mechanical engineering
DATA ON CURRENT EMPLOYMENT	
Institution of employment	Faculty of Maritime Studies, University of Split
Date of employment	1. August 2015.
Job title (professor, researcher, associate, etc.)	Professor
Field of work	Marine engineering
Function	Director of the Research and Development Centre
EDUCATIONAL DATA – Highest degree achieved	
Title	Dr. sc.
Institution	Faculty of Mechanical Engineering and Naval Architecture
Place	Zagreb
Date	27. October 1995.
DATA ABOUT ADVANCED TRAINING	
Year	-
Place	-
Institution	-
Field of study	-
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	English, 5 (excellent)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	German, 3 (good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	-
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	Ship propulsion system, Modelling and simulation of ship systems, Mechanics of marine structures (graduate study of marine engineering); Ship machine elements, Mechanisms and vibrations (undergraduate study of marine engineering); Machine elements (undergraduate study of naval architecture); Machine elements 1, Machine elements 2 (professional study of structural engineering)
Authorship of university/college textbooks in the subject area	*Tehnička pravila HRB (they are not textbooks, but are used as such in teaching certain Subjects):* • *Rules for the Classification of Ships, Part 7-Machinery Installation,* Croatian Register of Shipping, Split, 2013. • *Rules for the Classification of Ships, Part 9-Machinery Installation,* Croatian Register of Shipping, Split, 2015.

Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	• N. Vulić, I. Pavlović, M. Vulić, *Implementing educational software MDSolids in the calculations of marine shafting alignment,* International Maritime Science Conference (IMSC 2019), April 11th-12th 2019, Book of Proceedings, Budva, 2019, pp. 335-343. • L. Roldo, N. Vulić, *Friction stir welding for marine applications: mechanical behaviour and microstructural characteristics of Al- Mg-Si-Cu plates,* Transactions on Maritime Science (ToMS), 08 (2019) 1, pp. 75-83. • N. Vulić, I. Šuljić, I. Šuljić, *Comparison of IACS Classification Societies Propeller Strength Calculations*, 18th International Conference on Transport Science (ICTS 2018), June 14th-15th 2018, Conference Proceedings, Portorož, 2018. pp. 409-415. • D. Mrsić, M. Vulić, N. Vulić, *Loading factors within the strength calculation procedure for involute marine gears with parallel axes*, Contemporary Issues in Economy & Technology (CIET 2018), June 1st-2nd 2018, Conference Proceedings, Split, 2018. pp. S245- S256. • N. Vulić, I. Komar, P. Jurišić, *Selection and evaluation of marine shafting torsional vibrations calculation software*, 7th International Maritime Science Conference (IMSC 2017), April 20th-21st 2017, Book of Proceedings, Solin, 2017. pp. 221-229.
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	-
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5	Calculations for the arrangement of the return line for two new buildings in DIV Brodosplit
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical competencies?	~~Training for teachers and administrative staff as part of the EU~~ project ME4Catalogue (Mechanical Engineering for Catalogue) at FESB 2014.
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	-

Title, name and surname	Asst. Prof. Joško Šoda
Subject taught in the proposed study programme	Organization of scientific projects and basics of bibliometrics
GENERAL INFORMATION	
Address	Liveja II 28
Telephone	
E-mail address	jsoda@pfst.hr
Personal website	
Year of birth	1974
Personal identification number from the Register of Scientists	248935
Scientific or artistic title and date of last election	Senior Scientific Associate, 25.10.2019.
Scientific-teaching, artistic-teaching or teaching title and date of last election	assistant professor 2015
Field and field of election to scientific or artistic title	Field of technical sciences, field of electrical engineering
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies
Date of employment	01. October 2012.
Job title (professor, researcher, associate, etc.)	professor
Field of work	Process automation, signal processing, automation
Function	
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Science.
Institution	Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB)
Place	Split
Date	11. June 2010.
DATA ABOUT ADVANCED TRAINING	
Year	
Place	
Institution	
Field of study	
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	English, 5 (excellent)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	At the Faculty of Maritime Studies, he was the lecturer of the following Subjects: a. undergraduate study: Digital Electronics, Electronic Safety Systems in Maritime Affairs, Automation of Ship Mechanical Systems II, Automation in Maritime Traffic, Ship Automatic Control. graduate study: Process Measurements and Instrumentation, Automatic Control of Vessels, Automation of Ship Propulsion,
Authorship of university/college textbooks in the subject area	Process measurements and instrumentation (presentation), graduate study

Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	1.Šoda, J., Majić, M., Vujović, I., Sorić, B., An Overview on a Future Trends and Smart Technologies in Maritime, 8th International Maritime Science Conference, Budva, Crna Gora, 11-12.04.2019., p.p. 647-653. 2.Vujović, I., Šoda, J., Kuzmanić, I., Doppler spectrum type contribution to BER in fiber optic communication channel, Engineering Review, 36(2016), 1, str. 71-79. , 3. Novkinić, B., Vujović, I., Šoda, J., Marine Environment Influence on Fiber Optic Systems Operation, Transactions on Maritime Science, 4(2015), 1, str. 23-34. 4. Vujović, I., Šoda, J., Kuzmanić, I., Utjecaj tehnologije 3D tiskanja na raspoloživost brodskih sustava, Naše more, 62(2015), 4, sup., p.p. 93-96. 5. Kuzmanić, I., Vujović, I., Šoda, J., The Impact of the Noise in the Fibers to Vessel's Communications, Proceedings of 17th International Conference on Transport Sceince, Portorož, Slovenija, 21-22.05.2015., p.p. 195. – 199.
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical competencies?	
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	

Title, name and surname	Full Prof. Pero Vidan
Subject taught in the proposed study programme	Intelligent transport systems in maritime studies
GENERAL INFORMATION	
Address	Don Frane Bulića 68, Solin
Telephone	
E-mail address	pvidan@pfst.hr
Personal website	
Year of birth	1976.
Personal identification number from the Register of Scientists	288456
Scientific or artistic title and date of last election	Scientific advisor
Scientific-teaching, artistic-teaching or teaching title and date of last election	Full professor, 20. September 2019.
Field and field of election to scientific or artistic title	Technical area, traffic and transport technology
DATA ON CURRENT EMPLOYMENT	
Institution of employment	Faculty of Maritime Studies in Split
Date of employment	01.03.2006.
Job title (professor, researcher, associate, etc.)	Full professor
Field of work	Traffic and transportation technology
Function	dean
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Science
Institution	Faculty of Transport Sciences
Place	Zagreb
Date	July 2010.
DATA ABOUT ADVANCED TRAINING	
Year	/
Place	/
Institution	/
Field of study	/
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	English, 5 (excellent)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	German, 3 (good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	/
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	Master on ships of 3000 GT and larger. Doctor of Science in the field of logistics and transport technologies. Completed MCRM Subject Oxford Academy: Basic and Leadership, total duration of two weeks.
Authorship of university/college textbooks in the subject area	

Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. Vidan, Pero; Mrvica, Ante; Bošnjak, Rino. Prijedlog modela nadzora putnika i vozila u pomorskom prometu Republike Hrvatske. // Pomorstvo journal of maritime studies. 26 (2012) ; 277-287 (article, scientific), attached text of the paper URL link to work URL link to work 2. Vidan, Pero; Stanivuk, Tatjana; Bielić, Toni. Effectiveness and Ergonomics of Integrated Navigation System. // Transactions on Maritime Science. 1 (2012) , 1; 17-21 (article, scientific). URL link to work 3. Bielić, Toni; Vidan, Pero; Mohović, Robert. Podložnost kao bitan čimbenik pomorskih nezgoda. // Pomorstvo journal of maritime studies. 24 (2011), 2; 247-260 (preliminary communication, scientific). 4. Mulić, Rosanda; Vidan, Pero; Reić, Luka.
	Causes and Consequences of Fatigue on Board // 6th International Conferece of Ports and Waterways-POWA 2011-Prometno tržište intermodalnost i liberalizacija / Jolić, NAtalija (ur.). Zagreb: Fakultet prometnih znanosti Zagreb, 2011. 42-55 (invited lecture, international review, published paper, scientific). 5. Vidan, Pero; Bošnjak, Rino; Popović, Željka. Analysis of facts of human errors // Luke i plovni putovi-POWA 2013 / Fakultet prometnih znanosti (ur.). Zagreb: Faculty of Transport and Traffic Sciences University of Zagreb Vukelićeva 4, 10000 Zagreb, Croatia, 2013. 1-5 (invited lecture, international review, published paper, scientific).
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical	/
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	0

Title, name and surname	Full Prof. Nikola Račić, PhD
Subject taught in the proposed study programme	Modelling and simulation of marine propulsion systems
GENERAL INFORMATION	
Address	Slavonska 4
Telephone	0913701007
E-mail address	nikola.racic@pfst.hr
Personal website	
Year of birth	23.02.1968.
Personal identification number from the Register of Scientists	188444
Scientific or artistic title and date of last election	Permanent Scientific Advisor, July 4, 2018.
Scientific-teaching, artistic-teaching or teaching title and date of last election	Full Professor (First Choice), September 27, 2018.
Field and field of election to scientific or artistic title	Field of technical sciences, field of Mechanical Engineering
DATA ON CURRENT EMPLOYMENT	
Institution of employment	Faculty of Maritime Studies in Split
Date of employment	November 1, 1991
Job title (professor, researcher, associate, etc.)	Full Professor (1st choice)
Field of work	Marine Engineering
Function	
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Science
Institution	Faculty of Engineering, University of Rijeka
Place	Rijeka
Date	10.10.2008.
DATA ABOUT ADVANCED TRAINING	
Year	2008.
Place	Split
Institution	Brodosplit, Tvornica dizel motora d.o.o.
Field of study	Marine engineering, marine engines, engine testing
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	English, 4 (very good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	Italian, 3 (good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	PD BS Ship steam generators and heat turbines, PD PN Ship energy systems, PD BS Ship transshipment systems, D BS propulsion systems, D BS Marine energy systems
Authorship of university/college textbooks in the subject area	

Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	- Muše A., Jurić Z., Račić N., Radica G.: Modelling, performance improvement and emission reduction of large two-stroke diesel engine using multi-zone combustion model, Journal of Thermal Analysis and Calorimetry, Published: 23 January 2020. - Perić T., Račić N., Mihanović V.: Evaluation model of marine pollution by wastewater from Cruise Ships, Teorija i praksa brodogradnje i pomorske tehnike, svezak 70/3, str 79-92,2019. - Vukičević M., Račić N., Ivošević Š.: Piston ring material in a Two-stroke engine which sustains wear due to catalyst fines, Teorija i praksa brodogradnje i pomorske tehnike, svezak 70/2, str 155-169, 2019. - Muše A., Radica G., Račić N., Jurić Z.: Modelling and optimization of slow speed two stroke marine Diesel engine using Multi yone combustion model, 4th Internacional Conference on Smart and Sustainable Tehnologies, 2019. - Perić T., Račić, N.: Cruise ship traffic in the Adriatic Sea, Environmental impact, 8th Internacional Maritime Science Conference, 2019.
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	2002-2013. Researcher on the project No. 0069009, funded by the Ministry of Science, Education and Sports of the Republic of Croatia, entitled: Numerical simulations and optimization of diesel engines. 2013.- Researcher on the CROATIAN-MONTENEGRIN scientific project in the field of marine engineering: Possibility of reducing pollution emissions from ships in the Montenegrin and Croatian parts of the Adriatic by implementing the Marpol Convention Annex VI. 2014.-Researcher on the project No. 544257-TEMPUS-1-2013-1- ME-TEMPUS-JPCR “Mared”.
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical	
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	

Title, name and surname	Asst. Prof. Zdeslav Jurić
Subject taught in the proposed study programme	Energy efficiency of marine systems
GENERAL INFORMATION	
Address	Iločka 5
Telephone	0
E-mail address	zdeslav@pfst.hr
Personal website	www.pfst.hr/~zjuric
Year of birth	1974
Personal identification number from the Register of Scientists	276782
Scientific or artistic title and date of last election	
Scientific-teaching, artistic-teaching or teaching title and date of last election	assistant professor, May 10, 2016
Field and field of election to scientific or artistic title	field of technical sciences, field of mechanical engineering, branch of process and energy engineering
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies
Date of employment	4/1/2002
Job title (professor, researcher, associate, etc.)	assistant professor
Field of work	process and energy engineering
Function	vice dean for education
EDUCATIONAL DATA – Highest degree achieved	
Title	PhD
Institution	University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture
Place	Split
Date	2/23/2011
DATA ABOUT ADVANCED TRAINING	
Year	2011
Place	Zagreb
Institution	University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture
Field of study	Energy efficiency measures on ships
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	English, 3 (good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	Thermodynamics and Heat Transfer; Marine Engineering; Undergraduate Technical Mechanics; Marine Yacht and Marina Technologies, Maritime Management, Maritime Nautical Science; Undergraduate Marine Refrigeration and Air Conditioning; Marine Engineering, Undergraduate
Authorship of university/college textbooks in the subject area	

Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	Bratić, K.; Stazić, L.; Mišura, A.; Jurić, Z.: „ Spare Parts Optimization Using A Planned Maintenance System, 8th International Maritime Science Conference (lecture, international review, published paper, scientific) Jurić, Z.; Račić, N.; Dobrota, Đ.: „Thermodynamic Analysis of Onboard Compressed Air Supplied System,17th International Conference on Transport Science – ICTS 2015, Portorož, Slovenija (lecture, international review, published paper, scientific).
Professional and scientific papers on teaching methodology and quality published in the last five	
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical competencies?	
PRIZNANJA I NAGRADE	
Recognitions and awards for teaching and scientific work/artistic work	

Title, name and surname	Assoc. Prof. Ivan Komar
Subject taught in the proposed study programme	Technical supervision of maritime vessels
GENERAL INFORMATION	
Address	Paraćeva 5, 21000 Split
Telephone	+385 91 380 7011
E-mail address	ivan.komar@pfst.hr
Personal website	www.pfst.hr
Year of birth	1953
Personal identification number from the Register of Scientists	291705
Scientific or artistic title and date of last election	Scientific advisor, 10.07. 2019.
Scientific-teaching, artistic-teaching or teaching title and date of last election	Associate Professor, 01.11.2017.
Field and field of election to scientific or artistic title	Field of technical sciences, field of traffic technology and transport, branch of maritime and river transport
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies
Date of employment	10/1/2006
Job title (professor, researcher,	Professor
Field of work	Marine Engineering
Function	Head of PPO
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Science
Institution	University of Rijeka, Faculty of Maritime Studies
Place	Rijeka
Date	1/11/2012
DATA ABOUT ADVANCED TRAINING	
Year	2019: Wartsila Instructor ERS 5000 Techsim V.8.8 2016: Instructor BS simulator Kongsberg Neptune ERS; 2016: Instructor BS simulator Transas ERS 5000; 2013: Instructor BS simulator Transas ERS 5000; 2009: AutoCAD: drawing in plane, advanced drawing in plane, 3D modelling. 2007: Instructor BS simulator Transas ERS 4000;
Place	Split, Kotor
Institution	Croatian Register of Shipping, Faculty of Maritime Affairs in Kotor, ALGEBRA Polytechnical,
Field of study	Marine engineering
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2	English, 5 (excellent)
Foreign language and language proficiency on a scale from 2	Russian, 3 (good)
Foreign language and language proficiency on a scale from 2	German 2 (sufficient)

SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	. 1. Marine propulsion systems (Undergraduate BS) . 2. Marine engines (Undergraduate BS) . 3. Plant preparation and control (Undergraduate BS) . 4. Maintenance management (Undergraduate BS) . 5. Technical supervision and classification (Undergraduate BS) . 6. Maintenance systems (Graduate BS) . 7. Maintenance and reliability of marine machinery systems (Graduate PET)
Authorship of university/college textbooks in the subject area	Komar,I.; Lalić,B., „Sea Transport Air Polution“, (poglavlje u knjizi) // Curent Air Quality Issues / Yazd University: In Tech CC BY, 2015. Str: 165-202. DOI: 10.5772/59720 (ISBN 978-953-218);
Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	Komar, I., Vulić, N., Roldo, L., Hydrodynamic and Elastohydrodynamic Lubrication Model to Verify the Performance of Marine Propulsion Shafting, Transactions of FAMENA, Volume 37, No.1,(2013); str.15-27, (ISSN: 1333-1124). Roldo, L., Komar, I., Vulić, N., Design and Materials Selection for Environmentally Friendly Ship Propulsion System, Strojniški vesnik-Journal of Mechanical Engineering 58(2012)/12 str. 709-715, DOI: 10.5545/sv-jme.2012.601, (ISSN: 0039-248). Komar, I., Vulić, N., Antonić, R., Specific of shaft alignment for ships in service, PROMET – Traffic & Transportation Scientific Journal on Traffic and Transportation Research. 21 (2009) , 5; str.349-357, (ISSN: 0353-5320). Komar, I., Antonić, R., Kulenović, Z., Experimental tuning of marine diesel engine speed controller parameters on engine test bed, Transactions of FAMENA, 33 (2009) 2; str.51-70, (ISSN: 1333-1124). Lalić, B.; Komar, I.; Nikolić, D., „Optimization of Ship Propulsion Diesel Engine to Fulfill the New Requirements for Exhaust Emission“, Transactions on Maritime Science (ToMS), April 2014, Vol.3, No.1 3(2014), 1; 20-31. Lalić, B., Kliškić, M., Komar, I., Analiza korozijskog djelovanja u cilindru brodskoga sporohodnoga dvotaktnog dizelskog motora, Naše more, znanstveni časopis za more i pomorstvo, Vol.60 No.1-2, Str. 8-15, Dubrovnik, 2013. (ISSN: 0469-6255). Lalić, B., Komar, I., Dobrota, Đ., Structural Modifications for Improving the Tribological Properties of the Cylinder Unit in Two stroke Slow Speed Marine Diesel Engine, Transactions on maritime science- ToMS. Vol. 1 (2012), No. 2, str.89-95 Roldo, L.; Komar, I.; Vulić, N., Materials selection and software application as design tools for marine propulsion shafting bearings, DESIGN 2012, Marjanović, Dorian (ur.). Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb; The Design Society, Glasgov, 2012. Str. 679-686, Cavtat, 2012. Komar, I.; Dobrota, Đ.; Lalić, B., New methods in suppression the risk of ship's diesel engine crankcase explosions, IMSC 2012, Rosanda Mulić, (ur.). Split : Faculty of Maritime Studies, Split Zrinsko-frankopanska 38,, 2012. Str.193-202, Split,2012
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	Project leader for the Faculty of Maritime Studies "Functional integration of the University of Split, PMF-ST, PF-ST and KTF-ST through the development of scientific and research infrastructure in the Three Faculties Building (KK.01.1.1.02.0018)" funded by the EU

	Leader of the international scientific research project entitled: "Possibilities for reducing pollutant emissions from ships in the Montenegrin and Croatian parts of the Adriatic by implementing Annex VI of the MARPOL Convention" co-financed by the Ministry of Education, Science and Technology of the Republic of Croatia within the framework of the joint Croatian-Montenegrin cooperation for 2013/14. Leader of the project no. 250-2502209-2364, financed by the Ministry of Education, Science and Technology of the Republic of Croatia under the title: New technologies in diagnostics and management of ship propulsion systems. (2012-2014) Researcher on the project no. 250-2502209-2366: Management of ship energy systems in conditions of failure and breakdown (2007-2012).
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	Governing Board for the Field of Technical Sciences: Decision on Scientific Excellence 04.07.2018.

Title, name and surname	Assoc. Prof. Tatjana Stanivuk
Subject taught in the proposed study programme	Mathematical Methods in Maritime Studies
GENERAL INFORMATION	
Address	Ruđera Boškovića 37, 21000 Split
Telephone	+385(0)913807013
E-mail address	tstanivu@pfst.hr
Personal website	
Year of birth	1970.
Personal identification number from the Register of Scientists	324390
Scientific or artistic title and date of last election	Senior Scientific Associate, October 18, 2017
Scientific-teaching, artistic-teaching or teaching title and date of last election	scientific and teaching title: associate professor, January 30, 2018
Field and field of election to scientific or artistic title	field of technical sciences, field of traffic and transport technologies
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies
Date of employment	1. September 2007.
Job title (professor, researcher, associate, etc.)	associate professor
Field of work	scientific research, teaching
Function	subject teacher
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Science
Institution	University of Split, Faculty of Economics
Place	Split
Date	8. June 2012.
DATA ABOUT ADVANCED TRAINING	
Year	
Place	
Institution	
Field of study	
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	English, 4 (very good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	French, 2 (sufficient)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	Applied Mathematics in Navigation, Mathematics 1, Mathematics 2 and Mathematics 3 in undergraduate studies at the Faculty of Maritime Studies, University of Split Mathematics 4, Applied Mathematics and Operations Research in graduate studies at the Faculty of Maritime Studies, University of Split; Mathematics in undergraduate studies at the Department of Marine Studies, University of Split Mathematics 1 and Mathematics 2 in undergraduate studies in Military Maritime Studies, University of Split Introduction of new teaching content within the above subjects as well as new subjects (e.g. Applied Mathematics in Navigation and Applied Mathematics).

Authorship of university/college textbooks in the subject area	Tomašević, M., Ristov, P., Stanivuk T.: Metodologija znanstvenog istraživačkog rada - statističke metode u istraživanju. sveučilišni udžbenik, Pomorski fakultet Sveučilišta u Splitu, Split, 2007, ISBN: 978-953-6655-46-5.
Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. Mišura, Antonija; Stanivuk, Tatjana; Čišić, Dragan: Attitudes on Introduction of Electric Ships in the Coastal Maritime Traffic of the Republic of Croatia. // Multidisciplinarni znanstveni časopis Pomorstvo. 33 (2019), 1; 84-91. 2. Stanivuk, Tatjana; Bošnjak, Rino; Franić, Branko: Accident Statistics and Key Performance Indicators in Marine Offshore Industry. // Naše more: znanstveni časopis za more i pomorstvo. 66 (2019) , 1; 19-27. 3. Stanivuk, Tatjana; Juričević, Ivan; Žanić Mikuličić, Jelena: Maritime lighthouses in the Republic of Croatia – safety of navigation and/or tourist attraction. // Transactions on Maritime Science. 7 (2018) , 1; 33-40. 4. Stanivuk, Tatjana; Medić, Boris; Medić, Marta: Statistički prikaz inspekcijskih pregleda sigurnosti plovidbe pri hrvatskom Ministarstvu pomorstva prometa i infrastrukture tijekom proteklih pet godina. // Suvremeni promet: časopis za pitanja teorije i prakse prometa. 35 (2015) , 3-4; 186-189 5. Stanivuk, Tatjana; Medić, Boris; Medić, Marta: Statistical Review of the Annual Report on the Performance of Maritime Safety Inspection in Croatia. // Transactions on Maritime Science. 4 (2015), 1; 41-51.
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	1. Stanivuk, Tatjana; Dašić, Predrag; Aščić, Amna: Approximation of Global Competitiveness Index (GCI) for Croatia using Polynomial Regression Model // 7th International Conference Economics and Management based on New Technologies EMoNT-2017, Vrnjačka Banja: SaTCIP Publisher Ltd., 2017. 22-31. 2. Stanivuk, Tatjana; Sanchez Varela, Zaloa; Laušić, Marina; Markić, Kristijan: Role of Mathematics in Education of Nautical Engineer // Book of Proceedings 8th International Maritime Science Conference, Kotor: CIP, 2019. 11-21.
	3. Stanivuk, Tatjana; Galić, Stipe; Bojanić, Mia: Mathematics as a Science and Marine Activity Follow Each Other Throughout History. // Transactions on Maritime Science. 6 (2017) , 1; 55-60. 4. Stanivuk, Tatjana; Relja, Ajka; Pejković, Toni: Važnost primjene diferencijalnih jednadžbi u pomorstvu – primjeri iz prakse. // Suvremeni promet. 37 (2017) , 5/6; 283-288. 5. Stanivuk, Tatjana; Šarac, Marina; Laušić, Marin: Rješavanje problema ukrcaja teških tereta na brod pomoću matematičkog izračuna. // Suvremeni promet : časopis za pitanja teorije i prakse prometa. 36 (2016), 1-2; 38-42.
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	. 1. "Establishment of a referral base for research on the influence of weather conditions on video surveillance in maritime traffic" ERDBSIWCMVS (number 2673/2017), Project financed by the Ministry of Science, Education and Sports of the Republic of Croatia, 03/09/2018. - 09.03.2020. . 2. CEEPUS Network “Research, Development and Education in Precision Machining - CIII-RS-0507". (2018. -), Network Partner. . 3. “New Technologies in Diagnostics and Management of Marine Propulsion Systems”, (250-2502209-2364), Project funded by the Ministry of Science, Education and Sports of the Republic of Croatia (2007. - 2015.). . 4. Pilot Project “Not Books but Knowledge”, University of Split (2016.).

	5. “Maritime Management for the 21st Century – Sustainable and Intelligent Development of the Coastal Area through the Development of Occupational Standards and Qualification Standards in the Field of Maritime Management and the Improvement of the University Graduate Study of the Same Name”, (H.R.3.1.15-0033), University of Split, Faculty of Maritime Studies, 19.06.2015-18.09.2016.
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical competencies?	During the study - completed teaching programme; Participation in the work of regional and county expert councils of mathematics teachers - 10 certificates of professional development; Passing the professional exam - certificate for work in mathematics teaching from the Ministry of Education and Sports of the Republic of Croatia; and permanent individual professional development in the pedagogical-psychological and didactic-methodical areas; Leader of teaching activities lasting several thousand hours from 2001 to the present.
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	Recognition - In 2011, she was nominated by students and also selected as one of the thirteen Best Professors at the University of Split.

Title, name and surname	Full Prof. Danko Kezić
Subject taught in the proposed study programme	Modelling and optimization of maritime traffic systems Synthesis of control systems in high-risk sea areas
GENERAL INFORMATION	
Address	Velebitska 7
Telephone	0
E-mail address	danko.kezic@pfst.hr
Personal website	www.pfst.hr/~danko
Year of birth	1960
Personal identification number from the Register of Scientists	197501
Scientific or artistic title and date of last election	
Scientific-teaching, artistic-teaching or teaching title and date of last election	full professor tenured,9/29/2016
Field and field of election to scientific or artistic title	field of technical sciences, field of electrical engineering (scientific advisor), field of technology and transport (scientific associate)
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies
Date of employment	10/1/1992
Job title (professor, researcher, associate, etc.)	full professor in permanent position
Field of work	Marine Electrical Engineering, Power Electronics, Automation
Function	
EDUCATIONAL DATA – Highest degree achieved	
Title	PhD
Institution	Faculty of Electrical Engineering and Computer Science,
Place	Zagreb
Date	12/4/2003
DATA ABOUT ADVANCED TRAINING	
Year	2005
Place	Split
Institution	Maritime Faculty in Split
Field of study	Maintenance of nautical simulator
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	English, 4 (very good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	Italian, 3 (good)
KOMPETENCIJE ZA PREDMET	

Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	At the Maritime Faculty in Dubrovnik, he is working on the organization of the Ship Power Engineering and Electronics studies and introducing the following Subjects: Microelectronics I, (lecturer and supervisor until 1993, lec. 1993 – 1995) - in Dubrovnik, Mikro-elektronika II, (lecturer and supervisor until 1993, lec. 1993 – 1995) – in Dubrovnik, Mikro-elektronika III, (lecturer and supervisor until 1993, lec. 1993 – 1995) – in Dubrovnik, Maintenance and reliability of ship's electronic devices, (presented and ex until 1993, presented 1993 – 1998), - in Dubrovnik and Split Measurements in electronics, (presented and ex until 1993, presented 1993 – 1995) - in Dubrovnik,
	Ship's power electronics, (lecturer and supervisor until 1993, lec. 1993 – 1998) – in Dubrovnik. At the Faculty of Maritime Studies, University of Split, he has been teaching since 1995 in the subjects B1.4. and B1.6. and has innovated the Subject Shipboard Process Computers and Information Systems (lecturer and instructor since 1996) – in Dubrovnik and Split. Since the academic year 2004/2005, he has been working on introducing new programmes for the three-year undergraduate university study programme in Maritime Electrical and Information Technology and the graduate university study programme in Maritime Electrical and Information Technology according to the Bologna Process. At the undergraduate university study programme, he has introduced the following Subjects: Computer Control of Technical Systems, Electronic Security Systems in Maritime Affairs, Computer Networks. At the graduate university study programme, he has innovated, introduced or participated in the introduction of the following Subjects: Mechatronics, Discrete Control Systems. At the postgraduate professional master's study programme in nautical science, he has introduced the Subject Application of Simulators and Trainers in Maritime Affairs. The interuniversity doctoral study programme in maritime studies introduces the Subject "Control of Robotic Production Systems".
Authorship of university/college textbooks in the subject area	*Power Electronics – a manual for simulation of converter circuits,* Faculty of Maritime Studies, University of Split, 2007, ISBN: 978-953-6655-41-0 (electronic edition available on the Internet www.pfst.hr). Radio Engineering for Marine Sailors - Web Script 2014

Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	Belamarić G., Kezić D, " Modeliranje i simuliranje piratskih napada uz pomoć hibridnih vremenskih Petrijevih mreža", Naše More, vol 64, no. 1, 2017, str. 1-8. Bošnjak R., Kezić D, Vidan P.: " Methodology of synthesis of the supervisors by using Petri net", Brodogradnja,. Vol 68, No. 3/2017, pp.57-66. – Preliminary communication. Mlačić. D,.Kezić. Matić P.,:"Analiza rada upravljačkog sustava brodskog generator pare", Proc. of 38th Conference on Transportation Systems with International Participation Automation in Transportation 2018, 14.-18.11.2018., Osijek, pp 32 -36. Bošnjak, R., Kezić, D., Vidan, P., & Kavran, Z. (2019). Collision prevention in Singapore Strait by using timed Petri net. *Transport*, 1-10. https://doi.org/10.3846/transport.2019.11623 Bošnjak. R., Kezić. D, Mikelić., Perić, T.:*"Synthesis of supervisor with aim for collision prevention within vessel traffic system"*, Proc. of 39th Conference on Transportation Systems with International Participation Automation in Transportation 2019, 27.-298.11.2019., Split, pp 42-47.
Professional and scientific papers on teaching methodology and quality published in the last five	
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5	
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical	
PRIZNANJA I NAGRADE	
Recognitions and awards for teaching and scientific work/artistic work	

Title, name and surname	Assoc. Prof. Anita Gudelj
Subject taught in the proposed study programme	Modelling and optimization of maritime transport systems
GENERAL INFORMATION	
Address	Velebitska 58, Split
Telephone	0913807023
E-mail address	anita@pfst.hr
Personal website	
Year of birth	1970
Personal identification number from the Register of Scientists	278411
Scientific or artistic title and date of last election	Scientific advisor 6.6.2019.
Scientific-teaching, artistic-teaching or teaching title and date of last election	Associate Professor 14.12.2016.
Field and field of election to scientific or artistic title	Social sciences, field of information and communication sciences, branch of information systems and informatics
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies
Date of employment	1.3.1997.
Job title (professor, researcher, associate, etc.)	Assoc. Prof.
Field of work	Information systems and informatics
Function	President of the Quality Improvement Committee, ECTS Coordinator
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Science
Institution	University of Zagreb, Faculty of Organization and Informatics
Place	Varaždin
Date	2.12.2010
DATA ABOUT ADVANCED TRAINING	
Title	
Institution	
Place	
Date	
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	English, 4 (very good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of	Applications of Electronic Computers 1, Applications of Electronic Computers 2, Maritime Nautical Studies, undergraduate study
Authorship of university/college textbooks in the subject area	Applications of electronic computers, textbook

Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. Vidan, P.; Gudelj, A.; Čorić, M; Vukša, S. (2019) Contribution to safety of navigation by introducing of new technologies in fairway marking // Journal of applied engineering science (JAS), 18. 2. Čorić, M.; Gudelj, A.; Lušić, Z.; Mandžuka, S. (2019), E-Navigation Architecture Overview and Functional Connection Analysis // NAŠE MORE: znanstveni časopis za more i pomorstvo, 66 (2019), 3; 120-129 3. Krčum, M., Zubčić, M.; Gudelj, A. (2018), A Review and Comparison of Ship Power Simulation Methods. Naše more, Vo. 65. No.4 pp. 284-288. 4. Kavran, N.; Gudelj, A.; Medić, D. (2018) Petri Net Model for Drone Search and Rescue Actions at Sea. Advances in Decision Technology and Intelligent Information Systems, Volume XIX, Tecumseh, Canada: The International Institute for Advanced Studies (IIAS), pp. 30-35 5. Krčum, M.; Gudelj, A.; Tomas, V. (2018), Optimal Design of Ship's Hybrid Power System for Efficient Energy // Transactions on maritime science, 7, 1 pp. 23-32
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5	
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical competencies?	Study of Mathematics and Informatics, University of Split, Faculty of Natural Sciences and Mathematics and Educational Sciences in Split. Achieved the title of Professor of Mathematics and Informatics.
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	Distinguished Scholarship Award for outstanding scholarship that significant contributes to and advances knowledge in the field of decision technology. Awarded by: The International Institute for Advanced Studies in Systems Research and Cybernetics, Baden - Baden, 2. August 2018.

Title, name and surname	Assoc. Prof. Maja Krčum
Subject taught in the proposed study programme	Energy efficiency in maritime traffic
GENERAL INFORMATION	
Address	Bijankinijeva 8, Split
Telephone	0913807000
E-mail address	mkrcum@pfst.hr
Personal website	-
Year of birth	1958
Personal identification number from the Register of Scientists	173265
Scientific or artistic title and date of last election	Senior Scientific Associate 26. 02. 2020.
Scientific-teaching, artistic-teaching or teaching title and date of last election	Assoc. Prof. 6.03. 2020.
Field and field of election to scientific or artistic title	Technical sciences, field of transport and traffic technology, branch of maritime and river transport
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies
Date of employment	1.11.1989.
Job title (professor, researcher, associate, etc.)	assistant professor
Field of work	Power systems, Application of high voltage technologies, Quality management
Function	Head of the MEIT institute, director of the Centre for Quality
EDUCATIONAL DATA – Highest degree achieved	
Title	PhD
Institution	University of Rijeka, Faculty of Maritime Studies
Place	Rijeka
Date	26.07.2012.
DATA ABOUT ADVANCED TRAINING	
Year	2006; 2016; 2019;
Place	Split
Institution	Kongsberg; Croatian Register of Shipping; University of Split
Field of study	Simulator work; Quality management system; English language
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	English, 5 (excellent)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	Italian, 4 (very good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	1. High Voltage Technologies - Marine Engineering (graduate), Faculty of Maritime Studies in Split 2. Renewable Resources - Marine Electrical and Information Technologies (graduate) 3. Quality Management in Maritime Affairs - Maritime Nautical Studies (graduate)
Authorship of university/college textbooks in the subject area	. 1. Electrical Machines I, script, University of Split, Study Centre for Professional Studies, Split, 2009. . 2. Krčum, M.: Electrical Machines II, script, University of Split, Study Centre for Professional Studies, Split, 2009.

	3. Krčum, M.: Repetition with laboratory exercises in electrical machines, University of Split, Study Centre for Professional Studies, Split, 2009.
Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. Dlabač, Tatijana; Ćalasan, Martin; Krčum, Maja; Marvučić Nikola: PSO-BASED PID CONTROLLER DESIGN FOR SHIP SUBJECT-KEEPING AUTOPILOT // *Brodogradnja : časopis brodogradnje i brodograđevne industrije,* **70** (2019), 4; UDC 629.5.017.3:629.3.027.2, 15 doi:10.21278/brod70401 (international review, preliminary communication, scientific) 2. Krčum, Maja; Zubčić, Marko; Dlabač, Tatjana. Electromechanical Analysis of the Medium Voltage Earthing Switch due to Short-Time and Peak Withstand Current Test // *Energies,* **12** (2019), 16; 3189, 17 doi:10.3390/en12163189 (international review, article, scientific) 3. Petković, Miro; Zubčić, Marko; Krčum, Maja; Vujović, Igor Maritime Green Solution for Traffic Congestion// *TransNav 2019* / Weintrit, Adam; Neumann, Tomasz (ur.). Gdynia; Poland, 2019. str. 48-48 (lecture, international review, abstract, scientific) 4. Krčum, Maja; Plazibat, Veljko; Šekularac - Ivošević, Senka: Valuation of Transport Service Characteristics Relevant to the Establishment of Fast Inter-City Lines in Sea-Borne Passenger Traffic // Transactions on Maritime Science, Vol 7 No 2 (2018), 174-183 doi:10.7225/toms.v07.n02.007 (international review, preliminary announcement, scientific) 5. Krčum, Maja; Zubčić, Marko; Gudelj, Anita:A Review and Comparison of Ship Power Simulation Methods // *Naše more,* **Vo. 65. No.4** (2018), 284-288 doi:10.17818/NM/2018/4SI.22 (international peer-review, review paper, scientific).
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	Kuzmanić, Ivica; Krčum, Maja; Vujović, Igor: Contribution to Marine Electrical Engineering and Information Technologies Curriculum // 7th International Maritime Science Conference - Book of Proceedings / Vidan, Pero; Račić, Nikola; Twrdy, Elen; Skočibušić, Mihaela Bukljaš; Radica, Gojmir; Vukić, Luka; Mudronja, Luka (ur.). Split: Sveučilište u Splitu, Pomorski fakultet u Splitu, 2017. str. 187-192
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical competencies?	
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	

Title, name and surname	Assoc. Prof. Igor Vujović
Subject taught in the proposed study programme	Advanced algorithms in traffic control systems
GENERAL INFORMATION	
Address	Pazdigradska 22
Telephone	0913807016
E-mail address	ivujovic@pfst.hr
Personal website	www.pfst.hr/~ivujovic
Year of birth	1972.
Personal identification number from the Register of Scientists	260951
Scientific or artistic title and date of last election	Senior Scientific Associate, Electrical Engineering 9.2.2018. 17.2.2016. parallel selection for Research Associate in the scientific field of technical sciences – field of traffic and transport technologies
Scientific-teaching, artistic-teaching or teaching title and date of last election	Associate Proffesor 05/02/2018
Field and field of election to scientific or artistic title	Technical Sciences, Electrical Engineering – Senior Research Associate Technical Sciences, Transport Technology – Research Associate (parallel selection)
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies
Date of employment	7/1/2001
Job title (professor, researcher, associate, etc.)	Assoc. Prof.
Field of work	Electrical engineering, transport technology
Function	Editor-in-chief of the scientific journal ToMS, head of the postgraduate study, president of the Internal Review Committee, president of the Postgraduate Study Committee, project manager, laboratory manager
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Science
Institution	FESB
Place	Split
Date	10/19/2011
DATA ABOUT ADVANCED TRAINING	
Year	
Place	
Institution	
Field of study	
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	English, 4 (very good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5	German, 2 (sufficient)
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	For years, he has been giving lectures and exercises in the Subjects New Technologies of Electrical Materials (graduate study) and New Technologies in Diagnostics and Control (graduate study). For the last two years, he has not been giving exercises (he used to do them), but only lectures in Modelling and Simulation in Electrical Engineering. At the undergraduate study level, he is teaching a Subject in programming Modern Technical Software Packages. At the undergraduate study level, he is teaching a part of the Subject Fundamentals of Electrical Engineering 1, which is related to electrical materials.

Authorship of university/college textbooks in the subject area	For all Subjects he teaches, he has teaching materials on the faculty's website, either in the form of presentations or in the form of scripts. I. Kuzmanić, R. Vlašić, I. Vujović, Elektrotehnički materijali, Sveučilište u Splitu, Visoka pomorska škola u Splitu, Split, 2001., ISBN 953-6655-31-4
Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. I. Vujović, I. Kuzmanić, Case study on wavelet choice based on statistical image quality measures, Turkish Journal of electrical engineering & computer sciences, vol. 25, no. 4, pp. 2846-2859, 2017. 2. I. Vujović, I. Kuzmanić, Wavelet Energy and the Usefulness of its Powers in Motion Detection, Advances in Electrical and Computer Engineering, vol.17, no.2, pp.61-70, 2017 3. I. Vujović, I. Kuzmanić, Oil Spills Detection from SAR Images Using Wavelets, Turkish Journal of Maritime and Marine Sciences, vol. 4, no. 1, pp. 73-80, 2018. 4. M. Rogić Vidaković, A. Jerković, T. Jurić, I. Vujović, J. Šoda, N. Erceg, A. Bubić, M. Zmajević Schönwald, P. Lioumis, D. Gabelica, Z. Đogaš, Neurophysiologic markers of primary motor cortex for laryngeal muscles and premotor cortex in caudal opercular part of inferior frontal gyrus investigated in motor speech disorder: a navigated transcranial magnetic stimulation (TMS) study, Cognitive Processing, vol. 17, no. 4, pp. 429-442, 2016. 5. I. Vujović, Z. Kulenović, I. Kuzmanić, New Algorithm for Optimal Dielectric Material Selection in Marine Environment, Brodogradnja, vol. 66, no. 3, pp. 39-48, 2015.
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	1. Uspostava referalne baze za istraživanje utjecaja vremenskih prilika na video nadzor u pomorskom prometu, 9.3.2018-9.3.2022. 2. "Funkcionalna integracija Sveučilišta u Splitu, PMF-ST, PFST te KTF-ST kroz razvoj znanstveno - istraživačke infrastrukture u Zgradi tri fakulteta" (1.9.2018- 1.4.2021.) KK.01.1.1.02.0018 3. H.R.3.1.15-0033 „Pomorski menadžment za 21. Stoljeće – održiv i inteligentan razvoj obalnog područja kroz razvoj standarda zanimanja i standarda kvalifikacije u području Pomorskog menadžmenta te unapređenja istoimenog sveučilišnog diplomskog studija“ (19.6.2015-18.9.2016) 4. Upravljanje mobilnim robotima i vozilima u nepoznatim i dinamičkim okruženjima, 036-0363078-3018, 2007, FER 5. Nove tehnologije u dijagnostici i upravljanju brodskih porivnih sustava (250-2502209-2364)
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical competencies?	Teaching process and teacher competences in higher education, INTERIV project, January 2019 (30 hours) Workshop "Mentoring in postgraduate studies, an obligation or a challenge?" Workshop "Responsible Research"
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	

Title, name and surname	Asst. Prof. Petar Matić
Subject taught in the proposed study programme	Advanced algorithms in traffic control systems
GENERAL INFORMATION	
Address	Križanićeva 7
Telephone	098 735 196
E-mail address	pmatic@pfst.hr
Personal website	
Year of birth	1981.
Personal identification number from the Register of Scientists	291716
Scientific or artistic title and date of last election	Scientific associate 19.4.2017.
Scientific-teaching, artistic-teaching or teaching title and date of last election	Assistant professor 10.10.2018.
Field and field of election to scientific or artistic title	Scientific associate in the field of technical sciences, electrical engineering, automation and robotics
DATA ON CURRENT EMPLOYMENT	
Institution of employment	Faculty of Maritime Studies in Split, University of Split
Date of employment	1.1.2007.
Job title (professor, researcher, associate, etc.)	Assistant professor
Field of work	Electrical engineering, Automation
Function	Head of studies for marine electrotechnical and IT technologies
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Science (technical sciences/electrical engineering/automatics and robotics)
Institution	FESB, University of Split
Place	Split, Croatia
Date	12.12.2014.
DATA ABOUT ADVANCED TRAINING	
Year	15/9/2012 – 13/7/2013
Place	MS Zuiderdam
Institution	Holland-America Line
Field of study	Marine electrical engineering
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2	English, 5 (excellent)
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	Ship automation 2, Ship mechanical systems automation 1, Ship propulsion system automation, Automation and control, Automation in maritime transport, Ship electrical engineering and electronics, Ship electrical machines and systems, Ship electrical systems, Ship electrical devices, Ship automatic control, Discrete control systems, Power electronics, Micro and personal computers, Modelling and simulation in electrical engineering (Matlab/Simulink), Fundamentals of automation, Navigation practice, Ship systems management practicum, Application of electronic computers 1, Computer control of technical systems.

Authorship of university/college textbooks in the subject area	R. Antonić, P. Matić, Osnove automatizacije i upravljanja, ISBN: 978-953-6655-44-1, Pomorski fakultet u Splitu, 2007.
Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. Vujović, Igor; Kuzmanić, Ivica; Matić, Petar. Environmental influence on the safety and reliability of electrical and communication systems // Engineering review, 37 (2017), 1; 57-66 2. Matić, Petar; Golub Medvešek, Ivana; Perić Tina. System Identification in Difficult Operating Conditions Using Artificial Neural Networks // TRANSACTIONS ON MARITIME SCIENCE, 4 (2015), 2; 105-112 doi:10.7225/toms.v04.n02.001 3. Šoda, Joško; Vujović, Igor; Matić, Petar. Wind Disturbance Suppression in Autopilot Design // Naše more: znanstveni časopis za more i pomorstvo, 62 (2015), 4; 243-246 doi:10.17818/NM/2015/4.1
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical competencies?	
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	

Title, name and surname	Full Prof. Gorana Jelić Mrčelić
Subject taught in the proposed study	Sustainable maritime transport system from the aspect of ecology and environmental protection
GENERAL INFORMATION	
Address	Vukovarska 57, Split
Telephone	913806998
E-mail address	gjelic@pfst.hr
Personal website	
Year of birth	1973
Personal identification number from the Register of Scientists	252566
Scientific or artistic title and date of last election	
Scientific-teaching, artistic-teaching or teaching title and date of last election	full professor 28/11/2019
Field and field of election to scientific or artistic title	Biotechnical sciences, agriculture, ecology and environmental protection
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies
Date of employment	1/6/1996
Job title (professor, researcher, associate, etc.)	full professor
Field of work	Ecology and environmental protection
Function	Vice Dean for Development and International Cooperation
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Science
Institution	University of Zagreb, Faculty of Agriculture
Place	Zagreb
Date	26/11/2004
DATA ABOUT ADVANCED TRAINING	
Year	
Place	
Institution	
Field of study	
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to	English, 5 (excellent)
Foreign language and language proficiency on a scale from 2 (sufficient) to	Italian, 3 (good)
Foreign language and language proficiency on a scale from 2 (sufficient) to	French, 2 (sufficient)
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	undergraduate PM: Maritime History undergraduate BS: Corrosion and Material Protection undergraduate PN: Ship Maintenance graduate PM, BS, PN: Marine Technologies graduate PM, PN: Integrated Coastal Zone Management
Authorship of university/college textbooks in the subject area	

Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. Čampara, Leo; Slišković, Merica; Jelić Mrčelić, Gorana. 2019. Key Ballast Water Management Regulations with a View on Ballast Water Management Systems Type Approval Process. Naše more 66(2) 2. Jelić Mrčelić, Gorana; Penović Buble, Martina; Žanić Mikuličić, Jelena. 2018. Integrated Coastal Zone Management in the Republic of Croatia, Conference Proceedings ICTS 2018 - The 18th International Conference on Transport Science, Portorož, Slovenija, 14-16 lipanj 2018. 3. Slišković, Merica; Ukić Boljat, Helena; Jelaska, Igor; Jelić Mrčelić, Gorana. 2018. Review of Generated Waste from Cruisers: Dubrovnik, Split, and Zadar Port Case Studies. Resources, 7(4) 4. Vorkapić, Aleksandar; Komar, Ivan; Jelić Mrčelić, Gorana. 2016. Shipboard ballast water treatment systems on seagoing ships. Transactions on Maritime Science, 5(1) 5. Slišković, Merica; Jelić Mrčelić, Gorana; Ukić, Helena. Marine litter pollution from nautical tourism in the Adriatic Sea. The 7th International Conference on Maritime Transport, 27.-29. lipanj, 2016, Barcelona, Španjolska, 2016.
Professional and scientific papers on teaching methodology and quality published in the last five years	
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical competencies?	
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	

Title, name and surname	Full Prof. Merica Slišković
Subject taught in the proposed study programme	Sustainable maritime transport system from the aspect of ecology and environmental protection
GENERAL INFORMATION	
Address	Cesta mira 18b, Split
Telephone	021/619474
E-mail address	merica.sliskovic@pfst.hr
Personal website	
Year of birth	1973
Personal identification number from the Register of Scientists	252443
Scientific or artistic title and date of last election	
Scientific-teaching, artistic-teaching or teaching title and date of last election	Full Professor, November 28, 2019.
Field and field of election to scientific or artistic title	Biotechnical sciences, agriculture, ecology and environmental protection
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies
Date of employment	01.11.1998.
Job title (professor, researcher, associate, etc.)	Associate Professor
Field of work	Ecology and Environmental Protection
Function	Head of Study Military Maritime Studies
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Science
Institution	University of Zagreb, Faculty of Agriculture
Place	Zagreb
Date	23. February 2007.
DATA ABOUT ADVANCED TRAINING	
Year	2016, 2005 and 2012, 2007
Place	
Institution	Lloyds Maritime Academy, London (United Kingdom) Universitat Politecnica de Catalunya (UPC) – online CARNet
Field of study	Marine Pollution Prevention and Management Subject Modelling of ecological systems and Management of renewable resources; **Advanced Subject in System Dynamics** E-learning Tutoring Academy (SRCE)
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2	English, 5 (excellent)
Foreign language and language proficiency on a scale from 2	Italian, 3 (good)
Foreign language and language proficiency on a scale from 2	
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	Marine Ecology, Undergraduate Studies Protection of the Sea and Marine Environment, Undergraduate Studies

Authorship of university/college textbooks in the subject area	Marine Ecology, Digital Handbook
Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. Miletić, I.; Mladineo, I.; Orhanović, S.; Pavela-Vrančić, M.; Slišković, M.; Jelić Mrčelić, G. The influence of feeding on muscle tissues composition in cage reared bluefin tuna (Thunnus thynnus). Acta Adriatica, 60 (2019), 1; 69-78. 2. Čampara, L.; Slišković, M.; Jelić Mrčelić, G. Key Ballast Water Management Regulations with a View on Ballast Water Management Systems Type Approval Process. Naše more, 66 (2019), 2; 78-86 doi:10.17818/nm/2019/2.5 3. Slišković, M.; Povž, M.; Jakšić, G.; Piria, M.; Jelić Mrčelić, G. Biometric traits and ecology of sichel, Pelecus cultratus (Linnaeus, 1758) with notes on its recent status in the middle flow of the Danube River tributaries (Slovenia and Croatia), Pakistan J. Zool., vol. 50(0), (2018). DOI: http://dx.doi.org/10.17582/journal.pjz/2018.50 4. Slišković, M.; Ukić Boljat, H.; Jelaska, I.; Jelić Mrčelić, G. Review of Generated Waste from Cruisers: Dubrovnik, Split, and Zadar Port Case Studies // Resources, 7 (2018), 4; 72, doi:10.3390/resources7040072 5. Soldo, A.; Fredotović, M.; Šaran, A.; Slišković, M.; Mihanović, Vice; Jelić Mrčelić, Gorana. Economic and social impact of marine sport and recreational fisheries in Croatia.Croatian journal of fisheries. Ribarstvo, 76 (4) (2018),176-198. DOI:10.2478/cjf-2018-0019
Professional and scientific papers on teaching methodology and quality published in the last five	
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	1. Internationalization of the study programmes of Marine Fisheries and Military Maritime Studies at the University of Split UP.03.1.1.02.0046; project applicant: University of Split. Duration: 12 October 2018 - 11 October 2021. Project leader for PFST: Assoc. Prof. Dr. Sc. Merica Slišković. 2. Maritime Educational Standard in Shipping and Ship Management (MEDUSA); project applicant: Faculty of Maritime Studies, University of Rijeka. Duration: 23 March 2019 - 22 September 2021. Project leader for PFST: Assoc. Prof. Dr. Sc. Merica Slišković. 3. Maritime Management for the 21st Century - Sustainable and Intelligent Development of the Coastal Area through the Development of Occupational Standards and Qualification Standards in the Field of Maritime Management and the Improvement of the University Graduate Study of the Same Name, Dr. Sc. Merica Slišković, expert project manager 4. KIKLOP- Development of qualifications and innovative methods of acquiring competences in logistics and maritime transport, project leader: Faculty of Maritime Studies in Rijeka, partner: Faculty of Maritime Studies in Split, Ph.D. Merica Slišković as a researcher and project coordinator. 5. TEMPUS “Modernizing and harmonizing maritime education in Montenegro and Albania” MarED, Applicant University of Montenegro, Partner University of Split (leader for PFST and UNIST Assoc. Prof. Dr. Sc. Pero Vidan), Ph.D. Merica Slišković as a researcher. **Professional studies:** 1. Preliminary maritime study for anchorages in Split-Dalmatia County, Phase I, commissioned by Split-Dalmatia County, head Assoc. Prof. Dr. Sc. Pero Vidan, Split, 2017, Dr. Sc. Merica Slišković as part of the expert team. 2. Maritime study for the installation of pontoons for seaplane reception on the part of the Knez Domagoj coast in the Split City Port, commissioned by European Coastal Airlines d.o.o., head Assoc. Prof. dr. Sc. Pero Vidan, Split, 2015; dr. Sc. Merica Slišković part of the expert team.

	3. Maritime study for concession fields-fish farms in the Lamjana zone (G, B, VŠ1, VŠ2, VŠ3), commissioned by Cromaris d.d., executed by the Faculty of Maritime Studies in Split, Split, 2014, led by asst. dr. sc. Zvonimir Lušić, dr. sc. Merica Slišković part of the expert team.
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical competencies?	*CARNet E-learning Tutoring Academy (SRCE)* Workshop Active learning in STEM education organized by the Faculty of Science, University of Split and Penn State University Workshop on Pedagogical and Didactic Competencies (30 hours) organized by the Faculty of Philosophy, University of Split
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific	University of Split Science Award for contribution to the field of biotechnical sciences for 2019.

Title, name and surname	Asst. Prof. Tina Perić
Subject taught in the proposed study programme	Sustainable maritime transport system from the aspect of ecology and environmental protection
GENERAL INFORMATION	
Address	Sarajevska 46 e, 21000 Split
Telephone	021619450
E-mail address	tina.peric@pfst.hr
Personal website	
Year of birth	1984.
Personal identification number from the Register of Scientists	315735
Scientific or artistic title and date of last election	Scientific associate, 5.7.2017.
Scientific-teaching, artistic-teaching or teaching title and date of last election	Assistant professor, 10.10.2017.
Field and field of election to scientific or artistic title	Technical sciences, traffic technology and transportation
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies in Split
Date of employment	10.10.2017.
Job title (professor, researcher, associate, etc.)	Assistant professor
Field of work	traffic technology and transport, ecology and marine protection
Function	Head of the Department of Marine Engineering
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Science
Institution	University of Rijeka, Faculty of Maritime Studies
Place	Rijeka
Date	9.11.2016.
DATA ABOUT ADVANCED TRAINING	
Year	2019
Place	Ashurst, Southampton, UK
Institution	Wessex Institute
Field of study	Short Subject on Computer Assisted Oil Spill Environmental Assessments in Land and Water
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	English, 5 (excellent)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	
Authorship of university/college textbooks in the subject area	

Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. Perić, T.; Mihanović, V.; Golub Medevešek, I.: Analysis of Cruise Ship Traffic in the Port of Split; Journal of Applied Engineering Science, 17 (2019), 3; 304-310. 2. Perić, T.; Mihanović, V.; Račić N.: Evaluation Model of Marine Pollution by Wastewater from Cruise Ships; Brodogradnja, 70 (2019), 3; 79-92. 3. Perić, T.; Komadina, P.; Račić N.: Wastewater Pollution from Cruise Ships in the Adriatic Sea; Promet – Traffic & Transportation, 28 (2016), 4; 425-433. 4. Perić, T.: Wastewater Pollution from Cruise Ships in Coastal Sea Area of the Republic of Croatia; Pomorstvo: Scientific Journal of Maritime Research, 30 (2016), 2; 160-164. 5. Golub Medvešek, I.; Šoda, J.; Perić T.: Fault Tree Analysis in the Reliability of Heavy Fuel Oil Supply; TOMS, 3 (2014), 2; 131-136.
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	Study of the sustainable development of ship traffic of cruisers in the port of Split Projekt *Sustainable development of BLUE economies through higher Education and innovation in Western Balkan Countries (BLUEWBC)*
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical competencies?	Training "Teaching Process and Teacher Competencies in Higher Education" lasting 30 hours as part of the InteRiV project Workshop "Mentoring in Postgraduate Studies, Obligation or Challenge?"
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	

Title, name and surname	Full Prof. Josip Kasum
Subject taught in the proposed study programme	Forensic hydrography models and simulations
GENERAL INFORMATION	
Address	Osječka 52. 21000 Split
Telephone	00385912157064
E-mail address	jkasum@pfst.hr
Personal website	./.
Year of birth	1961.
Personal identification number from the Register of Scientists	222324
Scientific or artistic title and date of last election	scientific advisor, 15. 09. 2010.
Scientific-teaching, artistic-teaching or teaching title and date of last election	full professor tenured, 24. 05.2016.
Field and field of election to scientific or artistic title	technical sciences, fields of traffic and transport technologies
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University Department of Forensic Sciences, University of Split
Date of employment	2015.
Job title (professor, researcher, associate, etc.)	full professor with permanent position
Field of work	transportation systems forensics, maritime and underwater security, corporate security, forensic engineering
Function	laboratory manager
EDUCATIONAL DATA – Highest degree achieved	
Title	PhD
Institution	Faculty of Maritime Studies, University of Rijeka
Place	Rijeka
Date	2002.
DATA ABOUT ADVANCED TRAINING	
Year	continuously at various institutions
Place	
Institution	
Field of study	Technical sciences, fields of traffic technology and transport, branch of maritime and river transport: • certified engineer for maritime and river transport, • permanent court expert and • a number of basic and other maritime authorisations.
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	English, 4 (very good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	1. Electronic navigation, 2. Electronic navigation devices, 3. International maritime safety system, 4. Maritime communications, 5. Navigation integrated systems, 6. Ergonomics of navigation subsystems, 7. Hydrographic engineering and 8. Maritime telecommunications market. Faculty of Maritime Studies in Split (Pd, D and Dr. level)

Authorship of university/college textbooks in the subject area	1. Maritime Radio Service, HHI, 2006.
Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. Prodan, T., Kasum, J., Stošić, M., Ugrin, Ć., Security Challenges and Guideline Proposals for the Development of Underwater Security, National security and the future 20 (1-2), 71-84, 2019 2. Kasum, J., Pilić, M., Jovanović, N., Pienaar, H., Model of Forensic Hydrography, Transactions on maritime science 8 (02), 246-252, 2019 3. Kasum J., Pilić M., Jovanović N., Pienaar H.,, Model of Forensic Hydrography, Transactions on maritime science 8 (02), 246-252, 2019. 4. Kasum J., Primorac Ž., Pilić M., The Influence of Island Infrastructure on Security, Sustainability and Development of Nautical Tourism, Mediterranean Islands Conference, 2019. 5. Kasum J., Žanić Mikuličić J., Kolić V., Safety Issues, Security and Risk Management in Nautical Tourism, Transactions on maritime science 7 (02), 184-188, 2018. 6. Žanić Mikuličić J., Kasum J., Jugović A, Distribution of Maritime Safety Information and Improvement Measures for Safety of Navigation, NAŠE MORE: znanstveno-stručni časopis za more i pomorstvo 65 (3), 164-168, 2018. 7. Cvjetković S.J., Kasum J., Tokić T., Lightning protection on non-convention vessels in dynamic conditions, Journal of Engineering Research and Application 8 (Issue 2), pp.68-74, 2018. 8. Jeličić T., Modrić D, Kasum J., Standardization of colours on charts, Međunarodni znanstveni skup Tiskarstvo & dizajn, 2017. 9. Jeličić T., Žiljak J., Kasum J., Modrić D., Protection of nautical charts against counterfeiting by applying InfraReDesign hidden image technology, Međunarodni znanstveni skup Tiskarstvo & dizajn, 2016.
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	./.
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	1. Development of a study for the provision of multimodal information in traffic (project associate) 2. IPA Cross-border Programme Croatia – Montenegro. "Joint promotion and improvement of the level of safety of nautical tourism in the Dubrovnik-Neretva County and on the Montenegrin coast" (creation and cooperation)
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical	./.
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	1. Recognition for contribution to the development of the University of Split, 2010. 2. Recognition for contribution to the development of the Polytechnic of Šibenik

Title, name and surname	Asst. Prof. Rino Bošnjak
Subject taught in the proposed study programme	Synthesis of control systems in high-risk sea areas
GENERAL INFORMATION	
Address	Ulica 141 brigade. br.20
Telephone	098363968
E-mail address	rino.bosnjak@pfst.hr
Personal website	
Year of birth	1975
Personal identification number from the Register of Scientists	328504
Scientific or artistic title and date of last election	Scientific associate, 18.10.2017.
Scientific-teaching, artistic-teaching or teaching title and date of last election	Assistant professor 12.01.2018.
Field and field of election to scientific or artistic title	Field of technical sciences, field of traffic and transport technologies
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies
Date of employment	01.04.2011.
Job title (professor, researcher, associate, etc.)	Assistant professor
Field of work	Liquid cargo transportation technology, modern transport technologies, e-navigation and autonomous ships, ergonomics of navigation subsystems, basic safety
Function	Training centre director
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Science
Institution	Faculty of Transport and Traffic Engineering, University of Zagreb
Place	Zagreb
Date	27.04.2017.
DATA ABOUT ADVANCED TRAINING	
Year	2000-2011
Place	Ship and abroad
Institution	ER Schiffahrt and GearBulk
Field of study	Captain of long voyages
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	English, 5 (excellent)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	French, 3 (good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the	

Authorship of university/college textbooks in the subject area	
Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. Bošnjak, R.; Kezić, D.; Vidan, P.; Kavran, Z.: Collision Prevention in Singapore strait by using timed petri net; TRANSPORT Vilnius, VGTU journal, Gediminas University, ISSN 1648-4142 / eISSN 1648-3480 Article in press https://doi.org/10.3846/transport.2019.11623, pp. 01-10, (article, scientific); 2. Bošnjak, R.; Kezić, D.; Vidan, P.; Metodologija sinteze nadzornika pomoću vremenskih Petrijevih mreža, Shipbuilding: Theory and Practice of Naval Architecture, Marine Engineering and Ocean Engineering. Vol 68 (2017), Number 3; pp. 57-66 (article, scientific). 3. Bošnjak, R.; Belamarić, G.; Pavić, I.; Ristov, P.; Analiza karakteristika i operacija kod upotrebe pomorskih azimutalnih kontrolnih uređaja, KOREMA 2018, International conference, scientific article. 4. Bošnjak. R., Kezić. D., Belamarić.: "Prijedlog poboljšanja VTS sustava u području uskih kanala", Proc. of 36th Conference on Transportation Systems with International Participation Automation in Transportation 2016, 9.-12.11.2016. Krapina – Maribor, pp 96-99. 5. Bošnjak, R.; Paradžik, I.; Brodovi za prijevoz komprimiranog prirodnog plina i CNG tehnologija: Kapetanov glasnik, Vol. 36 (2019), 10-16. (article, professional).
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	Professional and scientific projects: 1. VIF project "Ship Motion Data Base" project applicant: University of Split. Duration: October 2018. - PFST leader: Assoc. Prof. Dr. Sc. Marko Katalinić, Rino Bošnjak as researcher 2. Project Sustainable development of BLUE economies through higher Education and innovation in Western Balkan countries-BLUEWBC, contract number: 2019-2009/001-001, project associate 1. 3. Scientific project "Integration of intermodal water transport systems in the European transport network", project code: 135-1352586-2588, 01.01.2012 - 31.12.2013., programme code: 1352586 at the Faculty of Transport Sciences in Zagreb, project associate
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical	Pedagogical didactic competences workshop (30 hours) organized by the Faculty of Philosophy in Split as part of the InteRiV project
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	

Title, name and surname	Asst. Prof. Ivica Pavić
Subject taught in the proposed study programme	Methodology for maritime operations design
GENERAL INFORMATION	
Address	Ruđera Boškovića 37, Split
Telephone	0915914048
E-mail address	ipavic71@pfst.hr
Personal website	
Year of birth	1971.
Personal identification number from the Register of Scientists	307130
Scientific or artistic title and date of last election	Scientific associate 15. 06. 2016.
Scientific-teaching, artistic-teaching or teaching title and date of last election	assistant professor 28.02.2017.
Field and field of election to scientific or artistic title	technical sciences, traffic technology and transport, maritime and river transport
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies
Date of employment	3.7.2017.
Job title (professor, researcher, associate, etc.)	professor
Field of work	technical sciences, traffic technology and transport, Institute of Maritime Nautical Studies
Function	professor
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Science
Institution	University of Rijeka, Faculty of Maritime Studies
Place	Split
Date	1.6.2012.
DATA ABOUT ADVANCED TRAINING	
Year	
Place	
Institution	
Field of study	
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	English, 4 (very good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the	Passenger Transport Technology, PN (PD) Hydrographic Engineering I and II, PTJM (D) Cargo in Maritime Transport, PN and PM (PD). Electronic Navigation, Maritime Department, University of Zadar (PD).
Authorship of university/college textbooks in the subject area	
Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. Raffanelli, I., Mišković, J., Pavić, I. *Concepts of Recognition of Seagoing Service and Certificates to Crew Members of Warships in Accordance with the STCW Convention*, Transactions on Maritime Science, Vol. 14, Split, 2018.

	2. Pavić, I., Mišković, J., Sanchez-Varela, Z., *Application of The MARPOL Convention on warships,* Proceedings of 18th International Conference on Transport Science, ICTS 2018, Portorož, Slovenija, 2018. 3. Kasum, j., Mišković, J., Pavić, I., *The role of regional electronic navigational charts coordinating centres in the provision of ENC services,* Proceedings of 18th International Conference on Transport Science, ICTS 2018, Portorož, Slovenija, 2018. 4. Ruščić, P., Pavić, I., *Analiza IHO-ove sheme za zaštitu ENC podataka*, Kapetanov glasnik, br. 33, Split, 2017. 5. Pavić, I., *The Proposal of Additions to the Education of the Ship Security Officer*, The Turkish Online Journal of Educational technology, August 2015, Special Issue for INTE 2015, Sakarya, 2015.
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5	
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical	*"Teaching process and teacher competences in higher education"*, Education, Faculty of Philosophy, University of Split, 2019.
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	

Title, name and surname	Assoc. Prof. Zvonimir Lušić
Subject taught in the proposed study programme	Maritime route planning
GENERAL INFORMATION	
Address	Vinkovačka 13, Trogir
Telephone	0
E-mail address	zlusic@pfst.hr
Personal website	
Year of birth	1971
Personal identification number from the Register of Scientists	288482
Scientific or artistic title and date of last election	Senior Scientific Associate 15/06/2016.
Scientific-teaching, artistic-teaching or teaching title and date of last election	Associate Professor 14/12/2016.
Field and field of election to scientific or artistic title	Field of technical sciences, field of traffic and transport technologies, branches of maritime and river transport
DATA ON CURRENT EMPLOYMENT	
Institution of employment	Faculty of Maritime Studies, University of Split
Date of employment	01/05/2005.
Job title (professor, researcher, associate, etc.)	Associate Professor
Field of work	Maritime navigation
Function	Head of the Nautical Institute
EDUCATIONAL DATA – Highest degree achieved	
Title	PhD
Institution	Maritime Faculty of Science in Rijeka
Place	Rijeka
Date	19/07/2010
DATA ABOUT ADVANCED TRAINING	
Year	2013&2017
Place	Portorož/Gdynia
Institution	Portorož Maritime Faculty/ Gdynia Maritime University
Field of study	Application of navigation simulators in research and teaching
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	English, 4 (very good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	• Navigation I, II, III, IV (Maritime Nautical Science, two-year and four-year university) • Maritime Navigation Systems and Processes I, II, III, IV, (Maritime Systems and Processes, four-year university) • Navigation I and II (Yacht and Marina Management, two-year) Terrestrial Navigation (Maritime Nautical Science/Maritime Management/Maritime Technologies for Yachts and Marinas/Maritime Systems and Processes, undergraduate) • Astronomical Navigation (Maritime Nautical Science/Maritime Management/Maritime Technologies for Yachts and Marinas/Maritime Systems and Processes, undergraduate and graduate)

	• Fundamentals of Navigation (Marine Engineering, undergraduate) • Elements of Navigation (Maritime Management/Maritime Technologies for Yachts and Marinas, undergraduate) • Navigational Practice (Maritime Nautical Science, undergraduate) Professional Practice (Maritime Nautical Science, undergraduate)
Authorship of university/college textbooks in the subject area	Lušić, Z.: *Astronomska navigacija*-skripta, Pomorski fakultet u Splitu, 2012. Lušić, Z.: *Terestrička navigacija-autorizirana predavanja*, Pomorski fakultet u Splitu, 2012. Lušić, Z.: Elementi plovidbe-autorizirana predavanja, Pomorski fakultet u Splitu, 2017.
Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. Lušić, Z.: *Astronomical position without observed altitude of the celestial body*, The Journal of Navigation (0373-4633) 71 (2018); 454-466. 2. Lušić, Z.; Bakota, M.; Pušić, D.: *Use of ECDIS in Astronomical navigation,* ICTS 2018, Maritime Transport and Logistics Science Conference proceedings, 2018., 212-219. 3. Lušić, Z.; Bakota, M.; Mikelić, Z.: *Human errors in ECDIS related accidents,* Book of Proceedings-7th International Maritime Science Conference, 2017, 230-242 4. Lušić, Z. Čorić, M.: Models for Estimating the Potential Number of Ship Collisions, The Journal of Navigation (0373-4633) 68 (2015), 735-749. 5. Lušić, Z., Kos, S., Galić, S. *Standardisation of Plotting Subjects and Selecting Turning Points in Maritime Navigation,* PROMET - Traffic&Transportation, 26 (2014), 313-322.
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	1. Lušić, Z.; Bakota, M.; Čorić, M.; Skoko, I.: *Seafarer Market – Challenges for the Future, Transactions on Maritime Science* – ToMS (1848-3305), 8-1 (2019), 62-74 2. Lušić, Z.: *Novi preddiplomski studij Pomorske nautike na Pomorskom fakultetu u Splitu*, Kapetanov glasnik 29-2014, HHI/PFST, Split, 2014, 22-25.
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	- Scientific (internal) project ‘‘Application of radiolocation in SAR operations’’-University of Split-Faculty of Maritime Affairs, 2018. - Project leader Assoc. Prof. Dr. Zvonimir Lušić - Scientific project ‘‘Research on environmental impacts on the operation of satellite navigation systems in maritime navigation’’, Faculty of Maritime Affairs, University of Rijeka, principal investigator: Prof. Dr. Serđo Kos, PhD Zvonimir Lušić, member of the project team, 2019... - Medusa Project-Maritime Educational Standard in Shipping and Ship Management, project leader Faculty of Maritime Affairs in Rijeka, project leader Assoc. Prof. Dr. Ana Perić Hadžić, partner Faculty of Maritime Affairs in Split, PhD Zvonimir Lušić, member of the project team, 2019... - Project "Internationalization of the study programmes of Marine Fisheries and Military Maritime Studies of the University of Split" (UP.03.1.1.02.0046), University of Split, head of PFST: Assoc. Prof. Dr. Sc. Merica Slišković, Dr. Sc. Zvonimir Lušić, member of the project team, 2018... - Preparation of the study "Common methodology for the analysis of potential traffic flows" and "Analysis of potential market flows of the port of Split" for the needs of the international project CHARGE, contractor Faculty of Maritime Studies in Split, client L.U. Split, 2018.

Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical	Experience in teaching, training and education of seafarers since 2002, six years of sailing on ships, and as part of regular education.
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	0

Title, name and surname	Asst. Prof. Luka Vukić
Subject taught in the proposed study programme	Sustainable transport and logistics
GENERAL INFORMATION	
Address	Papandopulova 29, Split
Telephone	/
E-mail address	luka.vukic@pfst.hr
Personal website	/
Year of birth	1989.
Personal identification number from the Register of Scientists	354292
Scientific or artistic title and date of last election	Scientific associate, 4.12.2019.
Scientific-teaching, artistic-teaching or teaching title and date of last election	Assistant professor, 19.4.2019.
Field and field of election to scientific or artistic title	Field of Technical Sciences, scientific field Traffic and Transport Technology
DATA ON CURRENT EMPLOYMENT	
Institution of employment	University of Split, Faculty of Maritime Studies
Date of employment	1.4.2016.
Job title (professor, researcher, associate, etc.)	Assistant professor
Field of work	Logistics and Transport Technology
Function	Head of Study Maritime Management
EDUCATIONAL DATA – Highest degree achieved	
Title	Doctor of Science
Institution	Faculty of Maritime Studies, University of Rijeka
Place	Rijeka
Date	31.5.2019.
DATA ABOUT ADVANCED TRAINING	
Year	/
Place	/
Institution	/
Field of study	/
NATIVE LANGUAGES AND FOREIGN LANGUAGES	
Native language	Croatian
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	English, 5 (excellent)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	Italian, 4 (very good)
Foreign language and language proficiency on a scale from 2 (sufficient) to 5 (excellent)	/
SUBJECT COMPETENCES	
Previous experience in teaching similar subjects (state the name of the subject, the study programme in which it was/is being taught, and the level of the study programme)	/
Authorship of university/college textbooks in the subject area	/

Professional, scientific and artistic works published in the last five years in the subject area (maximum 5 references)	1. Poletan Jugović, T., Vukić, L. (2016), *Competencies of logistics operators for optimisation the external costs within freight logistics solution*. Pomorstvo, 30(2), 120-127. 2. Kos, S., Vukić, L., Brčić, D. (2017), *Comparison of external costs in multimodal container transport chain*. Promet – Traffic &Transportation, 29(2), 243-252. 3. Vukić, L., Poletan Jugović, T., Kolanović, I. (2017), *External costs as competitive factor for affirmation of the Rijeka – Pivka railway route in the Baltic – Adriatic Corridor*, Scientific Journal of Maritime Research/ Pomorstvo, 31(2), pp. 102-110 4. Vukić, L., Peronja, I., Slišković, M. (2018), *Port Pricing in the North Port of Split: A Comparative Analysis*, Transactions on Maritime Science, 7 (1), pp. 59-70. doi:10.7225/toms.v07.n01.006 5. 5. Vukić, L., Ukić Boljat, H., Slišković, M. (2018), *Short Sea Shipping – an Opportunity for Development of the North Port of Split,* NAŠE MORE: znanstveno-stručni časopis za more i pomorstvo, 65, 3 Supplement, pp. 18-25. doi:10.17818/NM/2018/3.10
Professional and scientific papers on teaching methodology and quality published in the last five years (maximum 5 references)	/
Professional, scientific and artistic projects in the subject area that were carried out in the last five years (maximum 5 references)	Project of the Ministry of the Sea, Transport and Infrastructure - "National plan for the development of ports open to public traffic of county and local significance" EU project - "SIROCCO - Sustainable interregional coastal and cruise tourism through cooperation and joint planning", Mediterranean MED transnational cooperation programme; Scientific project of the Maritime Faculty in Rijeka with the support of the University of Rijeka - "Influence and effects of external costs and service quality on the valorization of the transport route" Project "CHARGE" - Capitalization and Harmonization of the Adriatic Region Gate of Europe, 2019 The project "InteRiv - Internationalization of the study programmes of Sea Fisheries and Military Maritime at the University of Split".
Within which programme and to what extent did the holder acquire methodological-psychological-didactic-pedagogical	InteRiv Project – Internationalization of Marine Fisheries and Military Maritime Studies at the University of Split - Workshop on Pedagogical and Didactic Competencies (30 hours)
RECOGNITIONS AND AWARDS	
Recognitions and awards for teaching and scientific work/artistic work	/

2.18. Optimal number of students

Considering the human and spatial capabilities, it is considered that the successful implementation of the curriculum of the University Postgraduate Study Programme in Maritime Technology can be carried out with a maximum of 15 students, and the optimal number of students for which the cost estimate was made is 5 students per academic year.

2.19. Estimated study costs per doctoral student

Doctoral students elected to the associate title of assistant and employed at the Faculty do not bear the regular cost of studies (hereinafter referred to as: tuition fees). These are subsidized by available funds from the state budget. If funds from the state budget do not cover their study costs, the difference is borne by the Faculty.

Doctoral students elected to the associate title of assistant and employed at another higher education institution or scientific institution pay tuition fees, other study costs and material costs of the doctoral dissertation themselves or are paid by the institution that sends them to study.

Doctoral students who are not selected for the associate title of assistant pay their own tuition, other study costs and material costs of the doctoral dissertation or are paid by the legal entity that sends them to study.

Tuition, tuition for doctoral students who are foreign citizens and other study costs, as well as the method and deadlines for payment, are determined by special decisions of the Faculty Council.

The registration fee covers the cost of studying related to:

- research,
- dissemination of scientific research results,
- organization of teaching,
- organization of public discussion,
- defence of dissertation,
- administrative costs.

Funds from postgraduate study fees are spent as prescribed by the "Regulations on the criteria and manner of using income of public higher education institutions and public scientific research institutes generated on the market from performing activities".

(1) The tuition fee is spent specifically, i.e. 67.0% for the scientific research work of the doctoral student (scientific equipment) and for other tasks (33.0%).

(2) Other tasks include the work of committees and teaching by guest lecturers:

- The cost of teaching Subjects through consultations is 5.5% gross per doctoral student for foreign lecturers (for the total hourly rate)
- Faculty teachers teach within the regular norm in a way that overtime is paid according to the University's hourly rate calculation regulations
- Public discussion 8.0%
- Doctoral thesis defence 19.0% per doctoral student
- Other costs 0.5% per doctoral student.

The tuition fee is set by the Faculty Council.

The costs of the printed doctoral thesis and any translation are paid by the doctoral student.

2.20. Method of monitoring the quality and success of the study programme implementation

The quality and success of the performance are continuously monitored by the head of the doctoral study programme, who reports to the Postgraduate Study Committee. The Postgraduate Study Committee reports on its work to the Faculty Council. The quality of the doctoral study programme is systematically monitored by the Faculty Quality Committee and the University of Split Quality Centre.

According to the European standards and guidelines for internal quality assurance in higher education institutions (according to the "Standards and Guidelines for Quality Assurance in the European Higher Education Area"), on the basis of which the University of Split determines quality management procedures, the proponent of a study programme is obliged to draw up a plan for quality assurance procedures for the study programme.
Documentation on which the component's quality assurance system is based:
• Regulations on the University Quality Improvement System
• Handbook on the Faculty Quality Assurance System
• Regulations on Studying at the University of Split
• Regulations on the Faculty Doctoral Studies
Description of procedures used to evaluate the quality of study programme
• for each procedure, it is necessary to describe the method (most often a survey for doctoral students or teachers, a self-evaluation questionnaire), specify the performers (compiler, university office), the method of processing the results and informing, and the implementation timeline • if it is described in an attached document, specify the name of the document and the article.

Evaluation of the work of teachers and associates	• Doctoral evaluation of teaching quality and teaching work through a survey • The survey is organized and conducted by the University Quality Centre • The survey is conducted every semester • The aggregate results of the survey are presented to the Postgraduate Study Council All procedures are carried out according to the Regulations on the organization and role of the quality management system of the University of Split and the Faculty of Maritime Studies in Split, according to the Regulations on the procedure for evaluating the quality of teachers and teaching by students of the University of Split, and according to the Regulations on the system for improving the quality of constituents.
Monitoring assessment and its alignment with expected learning outcomes	The Postgraduate Studies Committee monitors the alignment of assessments with learning outcomes.
Evaluation of the availability of resources (spatial, human, information) for the learning and teaching process	• Doctoral evaluation of the work of administrative and professional services and infrastructure for learning and student life through an electronic survey • The evaluation is carried out through an online questionnaire that doctoral students complete in all years of study, except the final ones • The survey is organized by the Centre for Quality Improvement of the University of Split • The processing of the survey results is carried out electronically at the University • The survey is carried out every year • The survey results are presented at the Faculty Council of the Faculty of Maritime Studies in Split

Availability and evaluation of support for doctoral students (mentoring, tutoring, advising)	• Doctoral students have access to administrative and professional services to support their work • The Faculty Council, upon the proposal of the Postgraduate Study Committee, appoints a mentor for the doctoral student who is a teacher of the doctoral study. The mentor provides advice to the doctoral student during the doctoral study, especially in the selection of subjects and the preparation of the dissertation. After each academic year, the mentor submits a report on the doctoral students work to the Postgraduate Study Committee. The doctoral student is obliged to submit a report on his/her work to the mentor once a year.
Monitoring of passing rates by subject and for the entire study programme	• Analysis of pass rates by subjects and studies is conducted once a year • Analysis of pass rates by studies is conducted by the University in cooperation with the Committee • Results of both analyses are presented at meetings of the Faculty Council
Participants' satisfaction with the programme as a whole	• Evaluation of the work of administrative and professional services and the infrastructure for learning and student life is carried out by students via an electronic survey • Evaluation is carried out via an online questionnaire that students-doctoral students complete upon completion of their studies • The survey is organized by the Centre for Quality Improvement of the University of Split. The processing of the survey results is carried out electronically at the University • The survey results are presented at the meetings of the Faculty Council
Procedures for obtaining feedback from external stakeholders (alumni, employers, labour market and	• Once a month, a member of the Board meets with the alumni presidents • Once a year, roundtables and workshops are organized with employers and other stakeholders
Other evaluation procedures carried out by the proposer	• Internal periodic assessment of the quality system is carried out once a year • Self-assessment is carried out every 5 years
Description of the procedures for informing external stakeholders about the study programme (doctoral students, employers, alumni)	• Web: www.pfst.hr • Media presentation

3. Organization of doctoral studies

The study organization is shown in Figure 1.

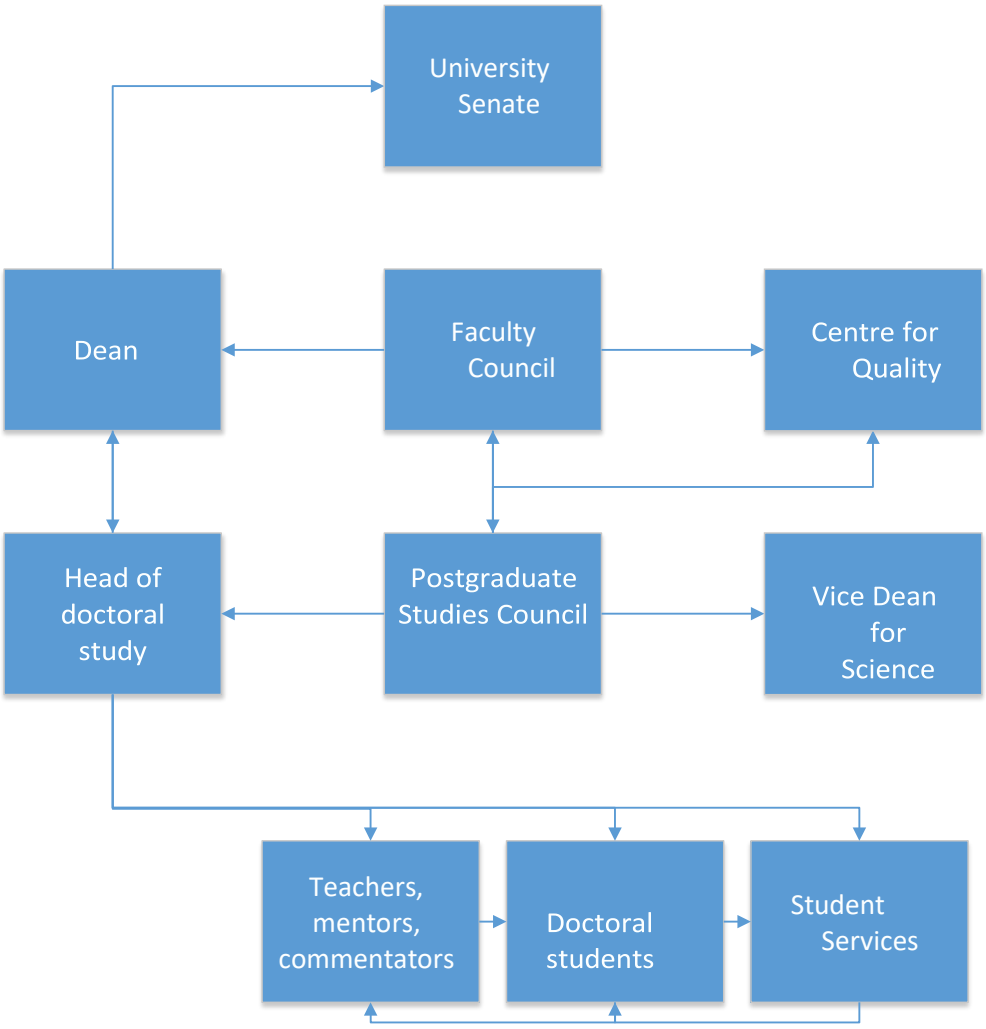

Figure 1. Organization of the doctoral study programme

The implementation of the Study is supervised by the competent authorities:
- Dean,
- Faculty Council,
- Postgraduate Studies Committee,
- Head of Postgraduate Studies
- Student Services.

The Faculty Council performs the following tasks within the framework of the postgraduate study programme:
- announces the competition for admission,
- decides on implementation depending on the number of doctoral students,
- entrusts the implementation of teaching,
- appoints the head of the study,
- appoints members of the Postgraduate Study Committee,
- approves the mentor and possible co-supervisor of the doctoral dissertation,
- approves the topic of the doctoral dissertation,
- appoints expert committees for accepting the topic, evaluating and defending the doctoral dissertation,
- considers and adopts the reports of the Postgraduate Study Committee,
- considers and decides on the cost of the Study,

- makes decisions on suspending doctoral students' doctoral obligations,
- proposes amendments to the study programme,
- determines the holders of new Subjects,
- resolves teaching, organizational, financial, technical and other issues related to the successful implementation of the postgraduate study.

The Faculty Council appoints the Doctoral Study Committee (hereinafter referred to as the Committee) as its permanent working body.
The PDS Committee consists of 5 members, the chairman of which is the Head of the Study. The PDS Committee performs the following tasks:

- prepares a proposal for entrusting teaching at the Studio,
- prepares proposals for regulations and other regulations on studies,
- conducts the tender process and enrols doctoral students in the study programme,
- solves students' requests with the authorization of the dean,
- performs other tasks related to the organization and implementation of the Studies,
- proposes to the dean and the Faculty Council the material operations of the Study,
- prepares materials for the sessions of the Faculty Council within its jurisdiction.

The head of the postgraduate university (doctoral) study programme (hereinafter referred to as the Head) is the president of the Postgraduate Study Committee.
The head is appointed by the Faculty Council upon the proposal of the Dean, primarily from among full or associate professors, and his mandate coincides with the mandate of the Dean.
The head coordinates the work of teachers on a particular study programme and performs other tasks related to the organisation and implementation of the study programme, and reports on this to the Postgraduate Study Committee and the Faculty Council.

The Student Service manages:

- records of registered doctoral candidates for the enrolment process, including the results of the process,
- personal records of enrolled students,
- records of issued certificates of completion of the Study and acquired academic degrees and titles,
- archives application forms for passed exams,
- ensures other conditions for the administrative operations of the Study.

The Postgraduate Study Committee, in agreement with the doctoral student, proposes a doctoral dissertation mentor to the Faculty Council.
The mentor may be a faculty member elected to a scientific-teaching position who has published at least 3 scientific papers in journals indexed in the Web of Science databases in the last 5 years in the scientific field of the doctoral dissertation. The mentor has a scientific-teaching position in a technical scientific field. The mentor is obliged to prepare a financial plan with a research flowchart for the doctoral student before enrolling in the study. The suitability of the mentor is assessed by the Postgraduate Study Committee and approved by the Faculty Council.
The mentor may be a professor emeritus.
The Faculty Council decides on the number of doctoral students that the mentor may supervise at the same time. A scientist from outside the Faculty who meets the criteria from the previous paragraphs of this article may be appointed as a doctoral student's mentor.
A mentor who is not an employee of the Faculty must sign a mentoring agreement with the Faculty.
In order to ensure the quality of the doctoral dissertation, co-supervision may be provided, if necessary (for example: interdisciplinary research, conducting research in multiple institutions).
The mentor and co-supervisor who took over the mentorship before retirement may bring that mentorship to an end, which is decided by the Faculty Council.
The Faculty Council decides on the appointment of the mentor and co-supervisor of the doctoral dissertation.

The mentor assists the doctoral student in selecting Subjects from the study programme, directs him to the literature and the application of appropriate scientific and research methods, assists the doctoral student in choosing a topic and writing a doctoral dissertation, monitors the quality of his work, and encourages and assists in writing scientific papers.

The Postgraduate Study Committee, in agreement with the mentor and the doctoral student, may propose one co-supervisor to the Faculty Council.
The mentor is obliged to submit a report on the work of the doctoral student to the Head once a year. The mentor/commentator may submit a reasoned request for termination of mentorship/commentary to the Faculty Council, which may relieve him of mentorship/commentary.

Before appointing a mentor, all obligations from the previous paragraphs of this article shall be fulfilled by the study advisor.

References

1. “Doctoral studies in Europe: excellence in researcher training”, LERU – League of European Research Universities, 2007.
2. “Final conclusions”, Bologna Seminar on ““Matching Ambition with Responsibilities and Resources”, Nice, 2006.
3. Bagaka's J, Bransteter I, Rispinto S, Badillo N. Exploring Student Success in a Doctoral Programme: The Power of Mentorship and Research Engagement. International Journal of Doctoral Studies. 2015; 10:323-342.
4. Bitusikova A, Bohrer J, Borosic I, et al. Quality Assurance in Postgraduate Education. Helsinki; European Association for Quality Assurance in Higher Education, 2010.
5. Bowen WG, Rudenstine NL. In Pursuit of the PhD. New York: Princeton University Press 1992.
6. Collins F. Scientists need a shorter path to research freedom. Nature. 2010;467:635-635. Medical Education Page 14 of 23
7. Conclusions and recommendations”, Bologna Seminar on “Doctoral Programmemes for the European Knowledge Society”, Şalzburg, 2005.
8. Council of Graduate Schools. Ph.D. Completion Project. Washington, 2008 [Cited 2016 Jun 8]. Available from: http://www.phdcompletion.org/
9. Cyranoski D, Gilbert N, Ledford H, Nayar A, Yahia M. The Phd Factory. Nature. 2011; 472:276-279.
10. Doktorski studiji, Hrvatska zaklada za znanost, 2006.
11. Elaborat doktorskog studija Strojarstvo. FESB, Split 2016.
12. Elgar FJ. PhD Degree completion in Canadian universities. Halifax; Dalhousie University, 2003.
13. Europe’s Universities – Looking Forward with Confidence, Prague Declaration, 2009.
14. Europe’s Universities beyond 2010: Diversity with a common purpose, Lisbon Declaration, 2007
15. European Science Foundation. Career Tracking of Doctorate Holders - Pilot Project Report. Strasbourg: European Science Foundation, 2015 [Cited 2016 Jun 8]. Available from: http://www.esf.org/serving-science/career-tracking/career-tracking-pilot.html
16. Gardner SK. Conceptualizing Success in Doctoral Education: Perspectives of Faculty in Seven Disciplines. Rev High Educ. 2009; 32:383-+.
17. Gravois J. In humanities, 10 years may not be enough to get a Ph.D. Chronicle of

Higher Education. 2007;53(47): pA1.
18. Gutlerner JL, Van Vactor D. Catalysing Curriculum Evolution in Graduate Science Education. Cell. 2013; 153:731-736.
19. National Center for Science and Engineering Statistics Directorate for Social, Behavioral and Economic Sciences. Doctorate Recipients from U.S. Universities. National Science Foundation, 2014 [Cited 2016 Jun 8]. Available from: www.nsf.gov/statistics/sed/.
20. Nettles MT, Millett CM. Three Magic Letters: Getting to Ph.D. Baltimore: The Johns Hopkins University Press 2006.
21. Principles for Innovative Doctoral Training. In: Report of Mapping Exercise on Doctoral Training in Europe. Brussels: European Commission 2011.
22. Sadlak J. Doctoral studies and qualifications in Europe and the United States and prospects. Bucharest: UNESCO 2004.
23. Seglen PO. Why the impact factor of journals should not be used for evaluating research. BMJ. 1997; 314:498-502.
24. The National Center for Science and Engineering Statistics. Arlington: The National Science Foundation, 2016. [Cited 2016 Jun 8]. Available from: http://www.nsf.gov/statistics/
25. van de Schoot R, Yerkes MA, Mouw JM, Sonneveld H. What Took Them So Long? Explaining PhD Delays among Doctoral Candidates. PloS One. 2013;8(7): e68839.
26. van der Westhuizen S, de Beer M, Bekwa N. Psychological Strengths as Predictors of Postgraduate Students' Academic Achievement. J Psychol Afr. 2011; 21:473-478.
27. Viđak M, Tokalić R, Marušić M, Puljak L, Sapunar D. Improving completion rates of students in biomedical PhD programmes: an interventional study. 2016, submitted

Internet sources

1. http://www.dzs.hr/Hrv_Eng/publication/2012/SI-1445.pdf
2. http://www.kvalifikacije.hr/fgs.axd?id=1061
3. http://www.unist.hr/Portals/0/docs/.../UNIST_STRATEGIJA_2015_2020_.pdf
4. http://www.unist.hr/Portals/0/docs/ostali%20dokumenti/Znanstveni%20%C4%8Dasopisi.pdf