



University of Rijeka
FACULTY OF MARITIME STUDIES



Postgraduate university study programme

MARITIME AFFAIRS

Academic year 2020/2021

Scientific area:
TECHNICAL SCIENCES

Scientific field:
TRAFFIC AND TRANSPORT TECHNOLOGY

Course description



Basic and optional courses list

MODULES / COURSES LIST							
Semester: I							
MODULE	COURSE TITLE	COURSE COORDINATOR	L	E	S	ECTS	STATUS*
Basic module (A)	Scientific Research Methods	Associate professor Ana Perić Hadžić, PhD	12			6	Ob.
	Design and Analysis of Simulation Experiments	Full professor Dragan Čišić, PhD	12			6	Op.
	Selected topics in computational data analysis and machine learning	Assistant professor Marko Valčić, PhD	12			6	Op.
	Numerical modeling and optimal control in engineering	Associate professor Nelida Črnjarić-Žić, PhD Full professor Senka Maćešić, PhD	12			6	Op.
Basic module (B)	Numerical modeling and optimal control in engineering	Full professor Zlatan Car, PhD	12			6	Op.
	Port Systems	Full professor Alen Jugović, PhD Full professor Bojan Hlača, PhD	12			6	Op.
	Multimodal Transport Networks	Full professor Serdo Kos, PhD Assistant professor David Brčić, PhD	12			6	Op.
	System approach to maritime affairs	<i>Professor emeritus</i> Pavao Komadina, PhD	12			6	Op.
	Decision-making techniques in traffic	Full professor Svjetlana Hess, PhD	12			6	Op.
Semester: I / II							
MODULE	COURSE TITLE	COURSE COORDINATOR	L	E	S	ECTS	STATUS
Nautical Sciences	Hydrographic activity and safety of navigation	Full professor Josip Kasum, PhD	12			6	Op.
	Integrated maritime safety and traffic system control	<i>Professor emeritus</i> Pavao Komadina, PhD	12			6	Op.



	Ionospheric effects on satellite navigation systems	Full professor Serđo Kos, PhD Assistant professor David Brčić, PhD	12			6	Op.
	Concepts and Capabilities of Navigation Information Systems	Assistant professor Srđan Źuškin, PhD Assistant professor David Brčić, PhD	12			6	Op.
	Containerization functions in the maritime transportation	Associate professor Renato Ivće, PhD	12			6	Op.
	Maritime Safety of the Ship	Full professor Robert Mohović, PhD	12			6	Op.
	International Maritime Safety and Environment Protection System	Full professor Damir Zec, PhD Associate professor Vlado Franćić, PhD	12			6	Op.
	Research in international maritime education and training (MET)	Assistant professor Sandra Tominac Coslovich, PhD	12			6	Op.
	Modelling and analysis of maritime traffic flow	Associate professor Vlado Franćić, PhD Full professor Damir Zec, PhD	12			6	Op.
	Sea Shipping Optimization	Full professor Mirano Hess, PhD	12			6	Op.
	Assessment and management of maritime navigational risks	Associate professor Đani Mohović, PhD	12			6	Op.
Marine Power and Engineering Systems	Analysis of mechanical behavior of engineering elements subjected to creep and relaxation	<i>Professor emeritus</i> Josip Brnić, PhD	12			6	Op.
	Alternative fuels and emissions of harmful substances from marine energy systems	Assistant professor Radoslav Radonja, PhD	12			6	Op.
	Strength, Fatigue and Fracture of Marine Structures	Associate professor Goran Vukelić, PhD Lech Murawski, PhD	12			6	Op.
	Dynamic effects on the stability of the ship	Assistant professor Anton Turk, PhD	12			6	Op.



	Selected chapters of the marine microclimate systems	Associate professor Predrag Kralj, PhD	12			6	Op.
	Marine diesel engines selected chapters	Associate professor Tomislav Senčić, PhD Associate professor Dean Bernečić, PhD	12			6	Op.
	Modeling maintenance of ship's propulsion system	Full professor Ivica Šegulja, PhD	12			6	Op.
	Ship's propulsion plants optimisation	Assistant professor Josip Orović, PhD	12			6	Op.
Marine Electrical Engineering	Battery and hybrid power plants on marine vessels	Assistant professor Aleksandar Cuculić, PhD	12			6	Op.
	Maritime Electronics Micro- and Nano-Technologies	Full professor Boris Sviličić, PhD	12			6	Op.
	Electric propulsion	Associate professor Dubravko Vučetić, PhD	12			6	Op.
	Cooperative Intelligent Transport Systems	Assistant professor Jasmin Čelić, PhD	12			6	Op.
	Modelling the Integrated Ship's Information System	Full professor Mato Tudor, PhD	12			6	Op.
	New Technologies in Diagnostics and Control Systems	Full professor Vinko Tomas, PhD	12			6	Op.
	Maritime Cyber Risk Management	Full professor Boris Sviličić, PhD	12			6	Op.
	Optical technologies in maritime industry	Associate professor Irena Jurdana, PhD	12			6	Op.
	Guidance and motion control of marine vehicles	Full professor Vinko Tomas, PhD Assistant professor Marko Valčić, PhD	12			6	Op.
Maritime Logistics and Management	Maritime Domain Allocation and Coastal Zone Management	Assistant professor Borna Debelić, PhD	12			6	Op.
	Economics of Infrastructure projects in port system	Full professor Alen Jugović, PhD	12			6	Op.
	Economy of Public Private Partnerships	Associate professor Ana Perić Hadžić, PhD	12			6	Op.



	Green transport and logistics services: initiatives, influencing factors and impact on performance	Pietro Evangelista, PhD	12			6	Op.
	Intelligent transport systems in maritime transport	Full professor Natalija Kavran, PhD	12			6	Op.
	Research directions in supply chain management	Full professor Dragan Čišić, PhD	12			6	Op.
	Information management in seaport clusters	Associate professor Edvard Tijan, PhD	12			6	Op.
	Management of sustainable development of nautical tourism	Full professor Daniela Gračan, PhD	12			6	Op.
	Sustainability marketing in transportation	Associate professor Marija Ham, PhD	12			6	Op.
	Supply Chain Analytics	Assistant professor Marinko Maslarić, PhD	12			6	Op.
	Information security and business continuity in logistics	Assistant professor Saša Aksentijević, PhD	12			6	Op.
Transport System	Planning of Cargo Flows and Transport Route Valorisation	Full professor Tanja Poletan Jugović, PhD	12			6	Op.
	Container Terminal Operation	Full professor Sönke Reise, PhD	12			6	Op.
	Expert system in maritime transport	Full professor Zvonko Kavran, PhD	12			6	Op.
	Methodology of shipping service quality measurement	Associate professor Ines Kolanović, PhD	12			6	Op.
	Modelling tactical logistical problems on Container Terminals	Assistant professor Neven Grubišić, PhD	12			6	Op.
	Land use – Transport Planning	Full professor Ljudevit Krpan, PhD	12			6	Op.
	Legal framework for maritime domain and sea ports management	Associate professor Biserka Rukavina, PhD	12			6	Op.
	Sustainability of Inland Transport Systems	Assistant professor Siniša Vilke, PhD	12			6	Op.



Marine and Coastal Protection	Environmental risks in the maritime industry	Assistant professor Žarko Koboević, PhD	12			6	Op.
	Oceanography	Full professor Goran Kniewald, PhD	12			6	Op.
	Legal aspects of the protection of the marine environment	Full professor Axel Luttenberger, PhD	12			6	Op.
	Ballast water management and risk assessment	Full professor Damir Zec, PhD Matej David, PhD	12			6	Op.
	Coastal management and sustainable development	Associate professor Mirjana Kovačić, PhD	12			6	Op.
Naval Systems	Geopolitics and geostrategy	Full professor Serđo Kos, PhD Slavko Barić, PhD	12			6	Op.
	Navy combat systems	Assistant professor Luka Mihanović, PhD	12			6	Op.
	Law of the Armed Conflicts at Sea	Full professor Axel Luttenberger, PhD	12			6	Op.
	Strategic planning and leadership	Full professor Robert Fabac, PhD	12			6	Op.

*STATUS: Ob. – Obligatory, Op. – Optional.



BASIC COURSE

Basic description		
Course coordinator	Associate professor Ana Perić Hadžić, PhD	
Course title	Scientific Research Methods	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Basic	
Year	1 / I	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION

1. Course objectives

The main objectives of the course are:

- To explain the concept of scientific research methods as a set of different procedures to science used in scientific research, to investigate and expose the results of scientific research in the domain of science or scientific discipline.
- To enable PhD students understanding that scientific methods, that are used in all scientific research independent of the scientific area, consist of procedures or groups of activities that make up the structure of scientific research: identifying the scientific problem, the explanation of the phenomenon (problem setting hypothesis), to test the hypothesis and forecast and the conclusion of the problem on the basis of the hypothesis test.
- To explain the basic knowledge of the terms of the methodology and technology of scientific research and training of PhD students to apply in writing different types of papers.
- To familiar postgraduates with the principles of a doctoral dissertation as the original, the original scientific research, which is the methodology of processing and the contribution of science suitable for establishing doctoral students the ability to act as an independent researcher.

2. Course enrolment requirements

No special requirements

3. Expected course learning outcomes

After finishing the course students will be able

1. To demonstrate a systematic understanding and conduct scientific research skills and methods in a particular scientific field or scientific discipline,
2. To interpret and apply the methodology and technology research in writing works in a appropriate way, at the level of postgraduate study (essay, critical review, scientific work)
3. To demonstrate the ability to understand, design, implementation and customization of serious scientific process in a particular scientific field or scientific discipline,
4. To develop generic skills for continuous advancement in theoretical and / or applied research and development of new techniques, ideas and approaches
5. To apply critical analysis, evaluation and synthesis of new and complex ideas, making judgments on complex issues
6. To develop an ability of written presentation of conclusions and results of the original research to scientific, professional and the general public in a clear and efficient way.



4. Course content

About Science, Science and Research, Scientific, scientific and professional work. Concept and classification methodology of scientific research. Basic features of the scientific method: objectivity, reliability, precision, systematic and generality. Review of the scientific method. The technology of scientific research: identifying scientific problem, hypothesis, selection and analysis of topics (titles), development of a plan of research, compiling working bibliography, collecting and studying literature and scientific information, solving the above problem, formulating research results, application of research results, check the application results research. Write text and technical processing of scientific work.

5. Teaching methods	☒ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other simulators _____
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6. Comments

7. Student's obligations

Student requirements along attendance, seminars and workshops are based on independent tasks related to research current topics in the field PhD students interest and the publication or presentation of his research before the scientific and professional community.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	2,5	Experimental work	
Written exam	1	Oral exam	1	Essay		Research	1
Project		Sustained knowledge check		Report		Practice	
Portfolio		Publication or presentation of research					

9. Assessment and evaluation of student's work during classes and on final exam

The learning outcomes are validated and evaluated through the monitoring of students' work on the study, the results of research and the manner and quality of the publication or presentation of research.

10. Assigned reading (at the time of the submission of study programme proposal)

1. Zelenika, R.: Metodologija i tehnologija izrade znanstvenog i stručnog djela, Pisana djela na stručnim i sveučilišnim studijima, knjiga peta, Ekonomski fakultet u Rijeci, Rijeka, 2011.
2. Žugaj, M.: Metodologija znanstveno-istraživačkog rada, Fakultet organizacije i informatike, Varaždin, 1997.
3. Baban, Lj.: Primjena metodologije znanstvenog istraživanja, Ekonomski fakultet Sveučilišta J. J. Strossmayera u Osijeku, Osijek, 1993.
4. Ivanović, Z.: Metodologija izrade znanstvenog i stručnog djela, Hotelijerski fakultet u Opatiji Sveučilišta u Rijeci, Opatija, 1996.

11. Optional / additional reading (at the time of proposing study programme)

1. Kulenović, Z.: Metodologija istraživačkog rada, Pomorski fakultet Sveučilišta u Splitu, Split 2005.
2. Žugaj, M., Dumičić, K., Dušak, V.: Temelji znanstvenoistraživačkog rada : metodologija i metodika , 2. dopunjeno i izmijenjeno izdanje, Varaždin, Tiva , 2006



3. Charles, A.: Izvori podataka u istraživanju i pisanju znanstvenih radova i disertacija, Pomorstvo, godina 14., Split, 2000.
4. Doktorski studiji, Nacionalna zaklada za znanost, visoko školstvo i tehnologijski razvoj Republike Hrvatske, Zagreb, 2006.
5. Dunleavy, P.: Kako napisati disertaciju, Fakultet političkih znanosti Sveučilišta u Zagrebu, Zagreb, 2005

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Zelenika, R.: Metodologija i tehnologija izrade znanstvenog i stručnog djela, Pisana djela na stručnim i sveučilišnim studijima, knjiga peta, Ekonomski fakultet u Rijeci, Rijeka, 2011.	2	
Žugaj, M.: Metodologija znanstveno-istraživačkog rada, Fakultet organizacije i informatike, Varaždin, 1997.	5	

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

The quality of studies is evaluated in accordance with the ISO 9001 system and in accordance with European standards and guidelines for quality assurance which is carried out at the Faculty of Maritime Studies. Once a year, analyses the results of transience and make appropriate measures.



OPTIONAL COURSES

Basic description		
Course coordinator	Full professor Dragan Čišić, PhD	
Course title	Design and Analysis of Simulation Experiments	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
1. Course objectives		
The aim of this course is to teach students to design and analyze experiments. Students will learn about input data analysis, fitting distributions to data and design of experiments. Furthermore student will learn to analyze output of the simulation experiments,		
2. Course enrolment requirements		
No		
3. Expected course learning outcomes		
Understanding the design and analysis of experiments. . Defining experimental design using different DOE methodologies. Fitting data to distributions. Analysis of the output data , including verification and error estimation.		
4. Course content		
Analysis of the input data. Hypothesis on the distribution family . Chi-square test . Kolmogorov-Smirnov test Selection of distributions in the absence of data. Analysis of the data connections. Simple linear regression The inclusion interaction of independent variables in the model . Using regression model input data in simulation Planning simulation experiments. The basic idea of planning simulation experiments Design of simulation experiments Complete 2 'factorial design Partial 2 " Q factor design System performance measures. Output analysis of the system. Two systems results analysis		
5. Teaching methods	☒ lectures ☒ seminars and workshops ☐ exercises ☒ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____
6. Comments		
7. Student's obligations		
Project, research , seminar		



8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	1	Experimental work	1
Written exam		Oral exam		Essay		Research	2,5
Project	1	Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Project, research , seminar

10. Assigned reading (at the time of the submission of study programme proposal)

Jack P.C. Kleijnen: Design and Analysis of Simulation Experiments

11. Optional / additional reading (at the time of proposing study programme)

Angela Dean Daniel Voss Design and Analysis of Experiments

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Jack P.C. Kleijnen: Design and Analysis of Simulation Experiments	1	5

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Assistant professor Marko Valčić, PhD	
Course title	Selected topics in computational data analysis and machine learning	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i>
Acquiring general and advanced knowledge and skills that are required to carry out various computational data analyses and to deploy appropriate data-driven models within the research scope that are based on selected statistical, machine learning and/or computational intelligence methods and algorithms.
<i>2. Course enrolment requirements</i>
None.
<i>3. Expected course learning outcomes</i>
To perform system identification based on various model concepts. To design and implement appropriate filter for data processing, including pre- and post-processing. To design and implement appropriate estimator (e.g. Kalman filter, particle filter, Bayes estimator, etc.). To understand basic and advanced concepts and methods for parameter and state estimation. To perform spectral analysis and to use obtained results for further applications in engineering. To be able to analyse data and to deploy appropriate data driven machine learning model in terms of prediction, clustering or classification. To properly evaluate deployed machine learning model in terms of training, validation and testing. To properly visualize required results and to analyse performance indexes. To calibrate deployed model in order to avoid problems like overfitting, generalization issues, etc. To be able to properly define optimization problem, i.e. to set up the cost function with or without constraints in matrix form, to select appropriate solver, to find the optimal solution computationally, and to interpret the results properly. To perform sensitivity and uncertainty analysis in the context of model reliability, stability, risk assessment and future decision making.
<i>4. Course content</i>
Organizing data: data import and pre-processing, descriptive statistics, data transformation, data visualization. Identification of data driven models: linear models, state-space models, nonlinear black-box models, time series identification, recursive model identification. Filtering and estimation: moving average filter, low-pass filter, Kalman filter, particle filter, Bayesian estimation, parameter and state estimation. Statistical signal processing: spectral analysis and transforms. Statistics and machine learning data analysis: function approximation, linear regression analysis, nonlinear regression, cluster analysis, classification, nonparametric supervised learning, high-dimensional data and dimensionality reduction, support vector machine, random number generation, Monte Carlo simulations. Neural networks: data and training styles, training algorithms, deep networks, multilayer neural networks, dynamic neural networks, radial basis neural networks, self-



organizing maps. Fuzzy inference systems and neuro-adaptive learning. Engineering optimization: unconstrained and constrained nonlinear optimization, multi-objective optimization algorithms, linear programming and mixed-integer linear programming, quadratic programming, nonlinear programming, direct search algorithms, genetic algorithms. Evaluation of data driven models: training, validation, testing, error and noise, overfitting, generalization, regularization, model performance indexes, visualization of results, model retraining and calibration, sensitivity and uncertainty analysis, risk analysis and decision making.

5. Teaching methods	☒ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____
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6. Comments	-
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7. Student's obligations

Course attendance (consultations), solving project assignment, preparing and presenting the seminar.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	1,5	Experimental work	
Written exam		Oral exam		Essay		Research	1
Project	3	Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Course attendance (consultations), project research work, preparation and presentation of assigned seminar.

10. Assigned reading (at the time of the submission of study programme proposal)

Valčić, M., 2017. Selected topics in computational data analysis and machine learning. Lecture Notes, Faculty of Maritime Studies Rijeka, University of Rijeka, Rijeka, Croatia.

Kutz, J.N., 2013. Data-Driven Modeling & Scientific Computation: Methods for Complex Systems & Big Data. Oxford University Press, New York, NY, USA.

Goodfellow, I., Bengio, Y., Courville, A., 2016. Deep Learning. The MIT Press, Cambridge, MA, USA. Available online: <http://www.deeplearningbook.org/>

Barber, D., 2012. Bayesian Reasoning and Machine Learning. Cambridge University Press, London, UK. Available online: <http://www.cs.ucl.ac.uk/staff/d.barber/brml/>

Hastie, T., Tibshirani, R., Friedman, J., 2016. The Elements of Statistical Learning: Data Mining, Inference, and Prediction. 2nd Ed., Springer, New York, NY, USA. Available online: <http://statweb.stanford.edu/~tibs/ElemStatLearn/>

11. Optional / additional reading (at the time of proposing study programme)

Brandt, S., 2014. Data Analysis: Statistical and Computational Methods for Scientists and Engineers. Springer, Heidelberg, Germany.



Cherkassky, V., Mulier, F.M., 2007. Learning from Data: Concepts, Theory, and Methods. 2nd Ed., IEEE Press, John Wiley & Sons, Inc., New York, NY, USA.

Theodoridis, S., 2015. Machine Learning: A Bayesian and Optimization Perspective. Academic Press - Elsevier, San Diego, CA, USA.

Xue, D., Chen, Y., 2016. Scientific Computing with MATLAB. 2nd Ed., CRC Press, Taylor & Francis Group, Boca Raton, FL, USA.

Belegundu, A.D., Chandrupatla, T.R., 2011. Optimization Concepts and Applications in Engineering. 2nd Ed., Cambridge University Press, New York, NY, USA.

Rao, S.S., 2009. Engineering Optimization: Theory and Practice. 4th Ed., John Wiley & Sons, Inc., New York, NY, USA.

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Valčić, M., 2017. Selected topics in computational data analysis and machine learning. Lecture Notes, Faculty of Maritime Studies Rijeka, University of Rijeka, Rijeka, Croatia.	e-learning	1-5
Kutz, J.N., 2013. Data-Driven Modeling & Scientific Computation: Methods for Complex Systems & Big Data. Oxford University Press, New York, NY, USA.	2	1-5
Goodfellow, I., Bengio, Y., Courville, A., 2016. Deep Learning. The MIT Press, Cambridge, MA, USA. Available online: http://www.deeplearningbook.org/	Available online	1-5
Barber, D., 2012. Bayesian Reasoning and Machine Learning. Cambridge University Press, London, UK. Available online: http://www.cs.ucl.ac.uk/staff/d.barber/brml/	Available online	1-5
Hastie, T., Tibshirani, R., Friedman, J., 2016. The Elements of Statistical Learning: Data Mining, Inference, and Prediction. 2nd Ed., Springer, New York, NY, USA. Available online: http://statweb.stanford.edu/~tibs/ElemStatLearn/	Available online	1-5

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Associate professor Nelida Črnjarić-Žic, PhD Full professor Senka Maćešić, PhD	
Course title	Numerical modeling and optimal control in engineering	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i>
Knowledge of the mathematical modeling based on ordinary differential equations, partial differential equations, and meta-models, necessary for solving problems in engineering. Knowledge of optimal control principles necessary for recognition of optimization problems in engineering practice. Mathematical definition of problems and its solution through the application of appropriate methods and software.
<i>2. Course enrolment requirements</i>
None
<i>3. Expected course learning outcomes</i>
Correctly interpret fundamental ideas and characteristics of the numerical methods in modeling, as well as their advantages and defects. Define typical mathematical models in engineering; recognize and describe them within engineering problems. Set mathematical formulation of the problem; analyze complexity and solvability of the problem. Connect engineering knowledge with mathematical optimization methods and to recognize and describe optimization problems in engineering practice. Give mathematical formulation of the optimization problems; analyze effect of formulation variations, complexity and solvability of the problem. Classify methods, explain fundamental ideas in various methods; compare methods by their properties and area of application. Explore possibilities of problem solution through application of software and/or development of new software. Compare different approaches. Analyze optimization results; improve results through combination and variation of methods and approaches.
<i>4. Course content</i>
Models based on ordinary differential equations. System dynamics and chaos. Numerical solution with the finite difference method. Runge-Kutta methods. Models based on partial differential equation. Conservation laws for mass, momentum and energy. Finite difference methods. Introduction to finite element and finite volume methods. Optimal control problems in stationary and non-stationary phenomena. Optimal shape design. Parameter calibration problems. Optimization problems of permutation and optimal grouping type. Optimization methods. Powell methods. Steepest descent methods and conjugate gradient direction methods (CGD). Simplex method. Evolutionary and stochastic algorithms.



5. Teaching methods		☒ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____			
6. Comments							
7. Student's obligations							
Course attendance (consultations), solving project assignment, preparing and presenting the seminar.							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation		Seminar paper	1,5	Experimental work	
Written exam		Oral exam		Essay		Research	4
Project		Sustained knowledge check		Report		Practice	
Portfolio							
9. Assessment and evaluation of student's work during classes and on final exam							
Course attendance, project, seminar paper.							
10. Assigned reading (at the time of the submission of study programme proposal)							
Chapra, S.C., Canale, R.P.: Numerical methods for engineers, McGraw Hill Book Co., 1989 Strang, G.: Computational science and engineering, Wellesley-Cambridge Press, Cambridge, 2007 Press, W.H., Taukolsky, S.A., Flannery, B.P., W.T.: Numerical recipes, Cambridge Press, 1986 Winston, W. L.: Operations Research Application and Algorithms, Duxbury Press, Belmont, 1993. Goldberg, E. D.: Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley Publishing Company, New York, 1989.							
11. Optional / additional reading (at the time of proposing study programme)							
LeVeque, J.R., Finite Volume Methods for Hyperbolic Problems, Cambridge Univ. Press, 2002 Cheney, W., Kincaid, D.: Numerical mathematics and computing, Thomson Brooks/Cole, 2004.							
12. Number of assigned reading copies with regard to the number of students currently attending the course							
Title				Number of copies		Number of students	
Chapra, S.C., Canale, R.P.: Numerical methods for engineers, McGraw Hill Book Co., 1989				1		5	
Strang, G.: Computational science and engineering, Wellesley-Cambridge Press, Cambridge, 2007				1		5	
Press, W.H., Taukolsky, S.A., Flannery, B.P., W.T.: Numerical recipes, Cambridge Press, 1986				1		5	
Winston, W. L.: Operations Research Application and Algorithms, Duxbury Press, Belmont, 1993.				1		5	
Goldberg, E. D.: Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley Publishing Company, New York, 1989.				1		5	
13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences							
Student's feedback by means of survey organized by the University.							



Basic description		
Course coordinator	Full professor Zlatan Car, PhD	
Course title	Intelligent systems in marinetime and transport	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
Provides a theoretical and practical knowledge of the problems in modelling, simulation and analysis of complex intelligent system, which is based on the study of specific structures and applications of modern architecture in marinetime and transport.		
<i>2. Course enrolment requirements</i>		
No conditions.		
<i>3. Expected course learning outcomes</i>		
Analyze trends in modern marinetime and transport environment (globalization, computerization, ecology, etc.). Define intelligence system. Define and describe the individual modern concepts of modelling systems. Analyze the application of the methodology reconfiguration and modularity. Analyze the application of artificial intelligence methods to optimize marinetime and transport systems. Describe virtual reality in the design process and reconfiguration of the system. Describe the relationship between humans and production systems. Implement the modelling of complex systems using the readymade software programs. Analyze the application of object modelling.		
<i>4. Course content</i>		
Analysis of trends in modern manufacturing environment. Analysis of CIM production; definition of classical CIM production in modern manufacturing environment. Multi-agent based intelligent manufacturing. Introduction in new concepts for addressing the shortcomings in the organization, information sharing and control of classical CIM production systems; fractal, holonic, and biological. Fractal Manufacturing Systems; Holonic Manufacturing Systems; definition, Biological Production Systems; definitions, basic individuals, problems, applications. The introduction of mass terms customization and active reconfiguration of production systems. Methods for optimizing production systems based on artificial intelligence methods. Application of genetic algorithms, artificial neural networks and reinforcement learning method for modelling and management of modern production systems in real time		
<i>5. Teaching methods</i>	☒ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other _____



6. Comments							
7. Student's obligations							
Presence on teaching (consultation), resolving the project task and the preparation and exposure of seminars.							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation		Seminar paper	2,5	Experimental work	
Written exam		Oral exam		Essay		Research	3
Project		Sustained knowledge check		Report		Practice	
Portfolio							
9. Assessment and evaluation of student's work during classes and on final exam							
Attendance, activities in classes, projects, seminar.							
10. Assigned reading (at the time of the submission of study programme proposal)							
Ueda, K., 1994, Biological Manufacturing Systems, Kogyochosakai Pub. Comp. Tokyo. Koren, Y. and Ulsoy, A.G., 1997, Reconfigurable Manufacturing Systems, Engineering Research Center for Reconfigurable Machining Systems (ERC/RMS) Report #1, The University of Michigan. Warnecke, H.J., 1993, The Fractal Company A Revolution In Corporate Culture, Germany Bangsow S., 2010, Manufacturing Simulation with Plant Simulation and Simtalk: Usage and Programming with Examples and Solutions, Springer.							
11. Optional / additional reading (at the time of proposing study programme)							
Langton, C.G., editor, 1994, "Artificial Life III", Addison-Wesley. Banks J., Carson S.J., Nelson L.B., Nicol M.D., 2009, Discrete-Event System Simulation (5th Edition), Prentice Hall							
12. Number of assigned reading copies with regard to the number of students currently attending the course							
Title				Number of copies		Number of students	
Bangsow S., 2010, Manufacturing Simulation with Plant Simulation and Simtalk: Usage and Programming with Examples and Solutions, Springer.				1		2	
Banks J., Carson S.J., Nelson L.B., Nicol M.D., 2009, Discrete-Event System Simulation (5th Edition), Prentice Hall				1		2	
13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences							
Student's feedback by means of survey organized by the University.							



Basic description		
Course coordinator	Full professor Alen Jugović, PhD Full professor Bojan Hlača, PhD	
Course title	Port Systems	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION

1. Course objectives

The overall objective is to point out the existing models of management port systems in the world and the role and importance of the individual ports for the whole system, but also its position and importance within the port system. At the same time the aim is to point out the relationship and the importance of determining the direction of development of each port, the necessary investments and the dynamics of investment in order to realistically and responsibly followed the real needs of individual ports, but also features individual port system. Special attention will be the port system of the national port and port system of county and local ports, and organizational models of port authorities and the business environment within which the port. The course objective is to point out the importance of creating a comprehensive port policy, but also compatible port policy that has its support in the transport and economic policy. In this connection, part of the lecture will relate to the definition of the role of logistics in the entire transport chain, in which sea ports are the starting and ending point.

2. Course enrolment requirements

3. Expected course learning outcomes

1. Connect and compare various features of the management system seaports
2. Define and determine the significance and role of each entity in the port system
3. Measure the effectiveness of the concession system in the port areas
4. Identify problems and shortcomings in the operations of the port authorities and port concessionaires
5. Establish the importance of logistics in the development of sea ports
6. Introduce and implement modern logistic strategies to finding appropriate solutions to the requirements of the carrier, the owner of the goods and the environment.

4. Course content

- Iskustva/oblici i značajke upravljanja lučkim sustavima u Svijetu i Europi
- Subjekti i funkcije upravljanja lukama otvorenim za javni promet
- Upravljanje koncesijskim odnosima na lučkom području u funkciji razvoja gospodarstva i poduzetništva
- Analiza i ocjena postojećeg stanja luka od državnog, županijskog i lokalnog značenja u RH



- Definiranje optimalnih modela upravljanja lučkim sustavom te organizacijskih modela upravljanja lučkim upravama
- Prezentirati učinke lučke logistike na konkurentsko profiliranje lučkog i prometnog sustava s ciljem efikasnog i efektivnog uključivanja u europski prometni sustav.

5. Teaching methods	☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☒ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____
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6. Comments

7. Student's obligations

Attending lectures and field work. Examination through activities in class and final oral exam.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam	1	Essay		Research	2
Project		Sustained knowledge check		Report		Practice	
Portfolio		Article	2,5				

9. Assessment and evaluation of student's work during classes and on final exam

The student is evaluated through activities in lectures, research and dedicated article (essay) and final oral exam.

10. Assigned reading (at the time of the submission of study programme proposal)

- 1.) Jugović, Alen: Upravljanje morskom lukom, Rijeka : Pomorski fakultet; 2012.
- 2.) Hlača, Bojan: Lučka Logistika, Pomorski fakultet Sveučilišta u Rijeci, Rijeka, 2016.
- 3.) Wayne-K-Talley: Port Economics, Routledge, Taylor and Francis Group, London & New York, 2009.
- 4.) Cullinane, Wayne & Talley, Kevin: Port Economics, Jai Press (Elsevier), 2006.

11. Optional / additional reading (at the time of proposing study programme)

- 1.) Coto-Millán, Pablo, Pesquera, Miguel Angel, Castanedo, Juan: Essays on port economics, 2010, xviii.
- 2.) Hlača, Bojan: Upravljanje prometnim koridorima, Veleučilište u Rijeci, Rijeka, 2011.

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students
Jugović, Alen: <u>Upravljanje morskom lukom</u> , Rijeka, Pomorski fakultet, 2012.	50	20
Hlača, Bojan: <u>Lučka Logistika</u> , Pomorski fakultet Sveučilišta u Rijeci, Rijeka, 2016.	20	20

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Serđo Kos, PhD Assistant professor David Brčić, PhD	
Course title	Multimodal Transport Networks	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> One of the fundamental characteristics of today's global transportation system is multimodalism, which explores the dynamic and evolution in the legal, economic, technical and technological domain. Basic aim of this course is to introduce students of doctoral study "Pomorstvo", with the relevant segment of multimodalism, in the technical and technological domain, and that are "multimodal transportation networks", on which are now based all modern multimodal transport systems. Next to current scientific solutions that are now applied to continuously development and improvements, the goal of the course is to indicate the specific target areas within the "multi-modal transport networks" which are still subject of research, or are insufficiently researched.
<i>2. Course enrolment requirements</i> Lectures' attendance, individual assignments and research in one segment of the topic.
<i>3. Expected course learning outcomes</i> Course expected learning outcomes on the basis of which the students, after completing and passing the course will be able to: 1. Explain dynamical structure of multimodal transport networks, 2. Analyse and evaluate multimodal transport supply chains, 3. Analyse and evaluate, on the multi-criteria analysis' basis, the productivity, economics and profitability of different types of transport, 4. Explain and to structure the forming of multimodal transport networks 5. Design/model vertical and horizontal network structures, 6. Explain hierarchical relationships and dual descriptions of multimodal networks, 7. Design/model and optimize project tasks of multimodal transport networks, 8. Analyse and evaluate fundamental variables and characteristics of important types of multimodal transport networks, 9. Analyse and evaluate sensitivity and reliability of multimodal transport networks, 10. Analyse and evaluate transport network flows (equilibrium, nodes and arches), 11. Analyse and evaluate network planning, 12. Analyse and evaluate longitudinal and radial multimodal transport networks.



4. Course content

Multimodality. Mobility of people and goods. Supply chain in the MM transport, evaluation of various transportation modes.

The formation of multi-modal transportation network. Vertical and horizontal network structures, Types and categories of networks.

Hierarchical relations in transport networks. Dual descriptions of MM networks. General formulation of MM transport network projects.

Fundamental variables and characteristics of major types of transport networks. Corridors and network patterns, single-level and multi-level MM networks, sensitivity and reliability of MM network.

Transportation network flows. Network balance. Nodes and arches. One origin/more origins – one destination/more destinations. Alternative routes. Multiple demands.

Network planning. Network planning architecture, longitudinal and radial MM networks.

5. Teaching methods	X lectures	X individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☐ exercises	☐ laboratories
	☐ long distance education	X mentorship
	☐ fieldwork	☐ other _____

6. Comments	Nil
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7. Student's obligations

Lectures, individual assignment and research.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	5,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Assessment and evaluation of student's work is conducted through research of specified topic related to the course opus.

10. Assigned reading (at the time of the submission of study programme proposal)

Rob van Nes: Design of multimodal transport networks , Delft University Press, Delft, 2002.
M.C.J. Bliemer: Analytical Dynamic Traffic Assignment with Interacting User-Classes: Theoretical Advances and Applications using a Variational inequality Approach, Delft university Press, Delft, 2001.
Serdjo Kos, Zdenka Zenzerović: Modelling the Transport Process in Marine Container Technology, Promet, Vol. 15. , No. 1, Zagreb, 2003.



11. Optional / additional reading (at the time of proposing study programme)

- Hess, M., Hess, S. & Kos, S. (2008) On Transportation system with deterministic Service Time , Promet , Vol. 20., No. 5, Zagreb, str. 283 – 290.
- Kos, S. & Bukša, J. (2004) Comparative analyses Ro-Ro/Container Ship of Feeder Service – Lošinj's plovodba, Pomorstvo, Vol. 18, Rijeka.
- Kos, S. (2003) Productivity of Full Container Ship and Energy-Economy of its Propulsion Plant, Promet, Vol. 15, No. 2, Zagreb, 2003.
- Kos, S., Brčić, D. & Karmelić, J. (2010) Structural Analysis of Croatian Container Seaports. Pomorstvo: Scientific journal of maritime research. 24 (2). str. 189-209.
- Kos, S., Šamija, S. & Brčić, D. (2012) Multimodal transport in the function of the port system containerization development. Proceedings of the 2012 International Conference on Transport Sciences (ICTS). Univerza v Ljubljani, Fakulteta za pomorstvo in promet. Portorož, Slovenija, 28. 5. 2012.
- Kos, S., Šamija, S. & Brčić, D. (2012) The impact of logistic systems performances on the quality of services in multimodal transport. Proceedings of 4th International Maritime Science Conference (IMSC). str. 50-61. University of Split, Faculty of Maritime Studies. Split, Hrvatska, 16-17. 6. 2012.
- Kos, S., Vilke, S. & Brčić, D. (2016) Redirection of the World Traffic Flow Far East – Europe via the Adriatic Sea. 2nd Annual International Conference on Transportation. Athens Institute for Education and Research (ATINER), Athens. Athens, 6-9.6.2016.
- Kos, S., Zenzerović, Z. (2004) Model of Optimal Cargo Transport Structure by Full Container Ship on Predefined Sailing Route, Promet, Vol. 16, No. 1, Zagreb.

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Rob van Nes: Design of multimodal transport networks, Delft University Press, Delft, 2002.	1	
M.C.J. Bliemer: Analytical Dynamic Traffic Assignment with Interacting User-Classes: Theoretical Advances and Applications using a Variational inequality Approach, Delft university Press, Delft, 2001.	1	
Serdjo Kos, Zdenka Zenzerović: Modelling the Transport Process in Marine Container Technology , Promet , Vol. 15, No. 1, Zagreb, 2003.	1	

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Professor emeritus Pavao Komadina, PhD	
Course title	System approach to maritime affairs	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> The main course objective is to analyse the existing overview of the system approach to maritime affairs. These objectives are related to the state approach and worldwide in the maritime industry. The new maritime industry developing possibilities and prospective (along with realization) also appear as scientific course objectives.
<i>2. Course enrolment requirements</i> -
<i>3. Expected course learning outcomes</i> Students are expected to be able to: 1. Analyse and define the maritime system through the different aspects in maritime industry 2. Interpret maritime industry through the analyses of different system and subsystem approach 3. Defined and apply the basics of maritime system characteristics as a disciplinary system 4. Compare maritime systems through the different maritime activities 5. Compare the economic and non-economic activities of the maritime system at the international level Analyse maritime development on the basis of EU guidelines
<i>4. Course content</i> • Maritime education systems in the world. • Education systems for nautical officers and engineers in Croatia. • The history of ships and shipping in last 20 years. • Shipping in Croatia yesterday, today and tomorrow (from 1945 till nowadays). • Maritime different concessions according to the Croatian law. • Different type of Coast Guard in the maritime world and the Croatian Coast Guard model. • Vessel Traffic Management System (VTMS) and navigation safety routing system. • Problem of shipyards in Croatia. • LNG terminal in Omišalj bay (land terminal vs Floating Storage Regasification Unit - FSRU). • Container terminal Brajdica. • Container terminal Zagrebačka obala. • Nord Adriatic future ports development (Trieste, Venice, Koper and Rijeka). • Passenger ship types and coastal ports connection



5. Teaching methods		☒ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____			
6. Comments							
7. Student's obligations							
The students' obligations, together with the class attendance, are based on maritime affair research. Research results need to be presented through the written seminar assignment and oral exam.							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation		Seminar paper	3	Experimental work	
Written exam		Oral exam		Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio		Project work					
9. Assessment and evaluation of student's work during classes and on final exam							
Learning outcomes are checked through the research by getting relevant results, data analyses and written seminar (paper) work submission in the field of maritime affairs.							
10. Assigned reading (at the time of the submission of study programme proposal)							
1. Kovačić, M., Komadina, P., Upravljanje obalnim područjem i održivi razvoj, Pomorski fakultet Sveučilišta u Rijeci, Rijeka, 2011. 2. Leggate, H., McConville, J., Morvillo, A., International Maritime Transport – Perspectives, Routledge, Taylor and Francis, 2005. 3. Wilson, J., Carriage of Goods by Sea, (5th Ed 2004), Longman							
11. Optional / additional reading (at the time of proposing study programme)							
1. Alderton, P.: Sea Transport: Operation and Economics, (5th Ed), London, 2004. 2. Branch, A.: Elements of Shipping (7th Ed), London, 1996. 3. Brodie, P.: Commercial Shipping Handbook Lloyds of London Press, 1999. 4. McConville, J.: Economics of Maritime Transport, Theory and Practice, London, Witherby, 1999.							
12. Number of assigned reading copies with regard to the number of students currently attending the course							
Title		Number of copies		Number of students			
Kovačić, M., Komadina, P., Upravljanje obalnim područjem i održivi razvoj, Pomorski fakultet Sveučilišta u Rijeci, Rijeka, 2011		10					
Leggate, H., McConville, J., Morvillo, A., International Maritime Transport – Perspectives, Routledge, Taylor and Francis, 2005.		2					
Wilson, J., Carriage of Goods by Sea, (5th Ed 2004), Longman		2					
13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences							
Student's feedback by means of survey organized by the University. The system quality is monitored in accordance the ISO 9001 standards, EU standards and quality insurance guidelines at the Faculty of Maritime Studies Rijeka. Once a year, the results are analysed and appropriate measure are taken.							



Basic description		
Course coordinator	Full professor Svjetlana Hess, PhD	
Course title	Decision-making techniques in traffic	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i>
The basic objective of this chapter is to provide students that, as future employees in a particular transport company, they can: - assess the current state of business transport company indicating which processes and states of a system are key and which are critical, then to determine its inefficient operation and low capacity utilization, - identify the role and position of specific transport companies in their business environment, - use the adopted methods to improve the business performance of transport enterprises and to increase competitiveness in the service market, - explore measures of performance and potential indicators of a specific transport company
<i>2. Course enrolment requirements</i>
<i>3. Expected course learning outcomes</i>
1. define and examine the factors influencing the demand for transport services 2. compare and discuss the advantages and limitations of methods for forecasting in the specific case 3. choose the method or combination of methods that will be most effective to obtain reliable results 4. evaluate demand and apply the appropriate method for determining the demand for transport services 5. anticipate demand for transport services 6. test and explain the results 7. compare various computer programs for obtaining outcome of transport demand 8. apply the results in real business environment
<i>4. Course content</i>
Management of transportation systems by applying general systems theory: Basic principles of general systems theory. ST-structure. UC-structure. Quantitative methods and decision models in transport systems. Selected methods. Regression analysis in traffic forecasting. Case Study.



5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other _____					
6. Comments							
7. Student's obligations							
Adoption of the materials provided for the course content and the publication of one scientific paper in the journal Base A or B.							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation	1	Seminar paper	1	Experimental work	
Written exam		Oral exam	1	Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							
9. Assessment and evaluation of student's work during classes and on final exam							
Development of independent work assignments based on practical examples (learning outcomes 1-5) evaluated with 2 ECTS, assessment on the final exam is 1 ECTS and the final version of the scientific work for publication in the journal (learning outcomes 1-8) with 3 ECTS.							
10. Assigned reading (at the time of the submission of study programme proposal)							
1. Hess, S., Planiranje prometne potražnje, Pomorski fakultet u Rijeci, Rijeka, 2010. 2. Brajdić, I., Matematički modeli i metode poslovnog odlučivanja, Fakultet za menadžment u turizmu i ugostiteljstvu, Opatija, 2013. 3. Babić, Z., Modeli i metode poslovnog odlučivanja, Ekonomski fakultet Split, Split, 2011.							
11. Optional / additional reading (at the time of proposing study programme)							
1. Bahovec, V., Erjavec, N., Uvod u ekonometrijsku analizu, Element d.o.o., Zagreb, 2009. 2. Vukadinović, S., Popović, J., Slučajni procesi i njihova primjena u saobraćaju i transportu, IRO Građevinska knjiga, Beograd, 1989. 3. Šošić, I., Primijenjena statistika, Školska knjiga, Zagreb, 2004. 4. Schroeder, R., Upravljanje proizvodnjom, MATE d.o.o., Zagreb, 1999.							
12. Number of assigned reading copies with regard to the number of students currently attending the course							
Title				Number of copies		Number of students	
Hess, S., Planiranje prometne potražnje, Pomorski fakultet u Rijeci, Rijeka, 2010.				5		1	
Brajdić, I., Matematički modeli i metode poslovnog odlučivanja, Fakultet za menadžment u turizmu i ugostiteljstvu, Opatija, 2013.				3		1	
Babić, Z., Modeli i metode poslovnog odlučivanja, Ekonomski fakultet Split, Split, 2011.				1		1	
13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences							
Student's feedback by means of survey organized by the University.							



Basic description		
Course coordinator	Full professor Josip Kasum, PhD	
Course title	Hydrographic activity and safety of navigation	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
The course provides a scientific methodological approach to study the relationship between hydrographic activity and safety of navigation. The specific objectives are relating to: exploring the role of the International Hydrographic Organization (International Hydrographic Organization - IHO) in the area of maritime safety, strengthen knowledge about models hydrographic activities and the maintenance of that part of the safety of navigation, and exploration of methodological approaches in the hydrographic activity.		
<i>2. Course enrolment requirements</i>		
None		
<i>3. Expected course learning outcomes</i>		
1. Explain the relationship between hydrographic activity and safety of navigation. 2. Describe the characteristics of organized hydrographic activities. 3. Synthesize relationship between hydrographic activity and safety of navigation in dynamic conditions. 4. Recommended the optimal way of establishing hydrographic activities. 5. Verify the activities of hydrography.		
<i>4. Course content</i>		
The role of the International Hydrographic Organization (International Hydrographic Organization-IHO) and maritime. The organizational structure of Hydrographic Organization IHO and member states. The organizational structure of the Croatian Hydrographic Institute - HHI. Models of production of basic products of hydrographic organizations. The production of charts and nautical publications. National coordinators for maritime safety information and hydrographic organization. Structure and services of national coordinators. Methodological approaches to hydrographic activity and reambulation. Application of automation in the process of hydrographic activities.		
<i>5. Teaching methods</i>	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____
<i>6. Comments</i>		



7. Student's obligations

Attendance lectures, exercises, exam

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper		Experimental work	
Written exam	2	Oral exam	3,5	Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

During exercise: modeling, simulation, presenting
During the exam: theoretical knowledge

10. Assigned reading (at the time of the submission of study programme proposal)

1. <http://www.iho.int/srv1/>
2. Hydrographic Surveying, NOAA, USA, 2002.
3. Handbook of Maritime Conventions, Commite Maritime International, 2001.
4. Bowditch, N.: American Practical Navigator, DMAHC, USA, 2004.
5. Hydrographic Manual, NOAA, USA, 1976.

11. Optional / additional reading (at the time of proposing study programme)

1. Zakon o hidrografskoj djelatnosti (NN br. 68/98) i Zakon o izmjenama i dopunama Zakona o hidrografskoj djelatnosti (NN br. 163/03)
2. Pravilnik o uvjetima koje moraju ispunjavati pravne osobe za obavljanje hidrografskih djelatnosti (NN br. 162/98)
3. Kasum, J.: Radioslužba za pomorce, HHI, 2008.

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students
1. http://www.iho.int/srv1/	Internet	
2. Hydrographic Surveying, NOAA, USA, 2002.	Internet	
3. Handbook of Maritime Conventions, Commite Maritime International, 2001.	Internet	
4. Bowditch, N.: American Practical Navigator, DMAHC, USA, 2004.	Internet	
5. Hydrographic Manual, NOAA, USA, 1976.	Internet	

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Professor emeritus Pavao Komadina, PhD	
Course title	Integrated maritime safety and traffic system control	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> The main course objective is to analyse systematic approach in the integrated maritime safety and traffic system control. The main course objective is also developing and creating an integral maritime management model within the framework of integral management of coastal and marine areas that will conserve natural resources in a coordinated manner and ensure sustainable economic development of the maritime security with maximum economic benefits.
<i>2. Course enrolment requirements</i> -
<i>3. Expected course learning outcomes</i> Students are expected to be able to: 1. Analyze and interpret state measures in the function of raising navigation safety 2. Analyze the current development of the International Adriatic Monitoring System and the management of the entire coastline area 3. Modeling and Interpreting the Technical Surveillance System for the Adriatic 4. Analyze the precondition for navigation of maritime traffic on the terminal and harbour areas 5. Analyze the impacts of safety navigation parameters on the maritime navigation and control measures
<i>4. Course content</i> - Measures taken by States which achieve a certain level of navigation safety. - Measures to prevent accidents and measures to reduce the consequences of marine casualties. - Ensuring a satisfactory level of protection of human life at sea, seafarers, fishermen, tourists, passengers on passenger ships and other persons staying at sea for longer or shorter periods - Ensuring a satisfactory level of ecological protection of the sea, air and coastal areas, and the provision of material goods (ships and cargo) in the transport of the Adriatic Sea. - The international monitoring system of the Adriatic and the management of the entire coastal and maritime area - Creation of organizational and legal preconditions for the creation of the Adriatic Coast Guard, as an international one - Maritime Traffic Control and Management System



- Analysis and creation of preconditions for the full direction of shipping as at terminal directions, as well as in port areas.
- Modelling of a common technical system for the Adriatic navigation
- Creating a knowledge base and decision-making models, especially for the purpose of increasing security
- Determining criteria for risk assessment, with the aim of determining metrics, levels of acceptable security of risks and effects of investments for risk reduction
- Determining preventive procedures for increasing the security of ports and maritime passenger traffic
- Analysis of the impact on maritime traffic guidance and control measures for safety navigation parameters
- The model of education system for employees

5. Teaching methods	☒ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____
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6. Comments

7. Student's obligations

The students' obligations, together with the class attendance, are based on Integrated maritime safety and traffic system control. Research results need to be presented through the written seminar assignment and oral exam.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	3	Experimental work	
Written exam		Oral exam		Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio		Project work					

9. Assessment and evaluation of student's work during classes and on final exam

Learning outcomes are checked through the research by getting relevant results, data analyses and written seminar (paper) work submission in the field of Integrated maritime safety and traffic system control.

10. Assigned reading (at the time of the submission of study programme proposal)

1. Beard, T., Lauter L. H., The Coast Guard, 2004.
2. Cicin - Sain, B., Knecht, R., Integrated Coastal And Ocean Management, Concepts And Practices, Gunnar Kullenberg Island Press, 1998.
3. Clark, J. R., Coastal Zone Management Handbook CRC - Press; 1 edition, 1996.

11. Optional / additional reading (at the time of proposing study programme)

1. Towards a European Integrated Coastal Zone Management (ICZM) Strategy: General Principles and Policy Options DG ENV. B. 3. 1 February, 2001.
2. <http://ec.europa.eu/environment/pubs/studies.htm>



12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Beard, T., Lauter L. H., The Coast Guard, 2004.	2	
Cicin - Sain, B., Knecht, R., Integrated Coastal And Ocean Management, Concepts And Practices, Gunnar Kullenberg Island Press, 1998	2	
Clark, J. R., Coastal Zone Management Handbook CRC - Press; 1 edition, 1996.	2	

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.

The system quality is monitored in accordance the ISO 9001 standards, EU standards and quality insurance guidelines at the Faculty of Maritime Studies Rijeka. Once a year, the results are analysed and appropriate measure are taken.



Basic description		
Course coordinator	Full professor Serđo Kos, PhD Assistant professor David Brčić, PhD	
Course title	Ionospheric effects on satellite navigation systems	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> To develop knowledge and understanding in the structure of the ionosphere, the ionospheric effects on satellite navigation systems' performance and operation, especially in regard to system and stochastic measurement errors arising from the space weather and ionospheric effects on GNSS, the means and the methods for ionospheric monitoring, and the methods and procedures for mitigation of space weather and ionospheric effects on GNSS performance and operation.
<i>2. Course enrolment requirements</i> Nil
<i>3. Expected course learning outcomes</i> Course expected learning outcomes on the basis of which the students, after completing and passing the course will be able to: 1. Explain structural elements of the ionosphere, 2. Analyze and evaluate relevant solar disturbances, geomagnetic environment, vertical ionospheric profile, and basic ionospheric models, 3. Explain the measurement techniques for monitoring of ionospheric conditions, 4. Analyze and evaluate <i>in situ</i> measurements, 5. Analyze and evaluate ionospheric effects to the performance of satellite derived position, 6. Design/model local ionospheric dynamics, 7. Explain mitigation procedures of ionospheric effects on satellite navigation systems, 8. Design/model multi-criterial analysis of satellite and terrestrial monitoring results, 9. Design/model advanced digital signal processing, 10. Explain auxiliary and extended satellite navigation systems, 11. Analyze and evaluate identification of service disturbance for determination of position using satellite navigation systems (risk assessment), 12. Explain correction models for satellite navigation systems.
<i>4. Course content</i> Dynamics of ionosphere (nature and sources of space weather and ionospheric disturbances, solar-terrestrial environment, geomagnetic environment, formation and dynamics of ionospheric layers, vertical ionospheric profile, ionospheric models).



Ionospheric measurement techniques. Radio wave techniques. Coherent and incoherent scatter radars. Optical methods. Lidar. *In situ* measurements. Probes. Mass spectrometers. Fluxgate magnetometers.

Ionospheric effects on GNSS operation (architecture of a satellite navigation system, satellite component, control component, user component, radio propagation medium, satellite positioning error budget)

Ionospheric effects on GNSS positioning performance (GNSS ionospheric error, GNSS ionospheric delay, ionospheric scintillation, local ionospheric dynamics, other sources of GNSS positioning performance disturbances)

Ionospheric monitoring for satellite navigation (essential parameters of space weather, geomagnetic and ionospheric condition, monitoring instruments, satellite monitoring, terrestrial monitoring, internet archives of space weather and ionospheric observables, principles and methods for observable analysis)

Mitigation of space weather and ionospheric effects on GNSS performance and operation (modernisation and enhancements of core GNSS, advanced digital signal processing, GNSS assistance and augmentation systems, correction models, temporal GNSS performance deterioration alerts)

5. Teaching methods	X lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	X individual assignment ☐ multimedia and network X laboratories X mentorship ☐ other _____
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6. Comments	Nil
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7. Student's obligations

Lectures, individual assignment and research.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	4,5
Project		Sustained knowledge check	1	Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Assessment and evaluation of student's work is conducted through research of specified topic related to the course opus.

10. Assigned reading (at the time of the submission of study programme proposal)

Davis, K. (1990). Ionospheric Radio. Peter Peregrinus Ltd. London, UK.

Schunk, R and A Nagy. (2009). Ionospheres: Physics, Plasma Physics and Chemistry (2nd ed). Cambridge University Press. Cambridge, UK.

Parkinson, B W and J J Spilker, Jr. (eds). (1996). Global POsitioning System: Theory and Applications (Vol. I.). AIAA. Washington, DC.

Hapgood, M and A Thomson. (2010). Space Weather: Its Impact on Earth and Implications for Business. Lloyd's 360o Risk Insight. London, UK.

Kelley, M. C. (2009) The Earth's Ionosphere: Plasma Physics & Electrodynamics. Elsevier, London, UK.

Capderou, M. (2005). Satellites, Orbits and Missions. Springer Verlag France. Paris, France.



11. Optional / additional reading (at the time of proposing study programme)

Filjar, Renato; Kos, Serdjo; Krajnović, Siniša. Dst Index as a Potential Indicator of Approaching GNSS Performance Deterioration. // Journal of navigation. 66 (2013) , 1; 149-160.

Filjar, Renato; Kos, Tomislav; Kos, Serđo. Klobuchar - Like Local Model of Quiet Space Weather GPS Ionospheric delay for Northern Adriatic. // Journal of Navigation. 62 (2009) , 3; 543-554.

Kos, Serđo; Filjar, Renato; Brčić, David. GPS Performance Degradation Caused by Single Satellite Outage: a GPS PRN24 Croatia Case Study. // Pomorstvo : scientific journal of maritime research. 26 (2012) , 1; 165-179.

Filjar, Renato; Kos, Serđo; Brčić, David. Kvaliteta jednofrekvencijskog GPS pozicioniranja za vrijeme čileanskog potresa 2010. // Pomorstvo : scientific journal of maritime research. 25 (2011) , 2; 287-306.

Filjar, Renato; Brčić, David; Kos, Serđo. Single-frequency Horizontal GPS Positioning Error response to a moderate Ionospheric storm over Northern Adriatic // Advances in Marine Navigation / Weintrit, Adam (ur.). London : Taylor & Francis Group, 2013. Str. 49-56.

Filjar, Renato; Kos, Serđo; Brčić, David. RAISING PUBLIC AWARENESS OF SPACE WEATHER-INDUCED EFFECTS ON GNSS PERFORMANCE AND OPERATION IN CROATIA // Proceedings of the United Nations International Meeting on the Applications of Global Navigation Satellite Systems. 2011.

Brčić, David; Kos, Serdjo; Filjar, Renato. An assessment of geomagnetic activity-related technology failure risk based on patterns of Kp index dynamics in 2012 // Proceedings of 7th GNSS Vulnerabilities and Solutions Conference / Kos, Serdjo, Filjar, Renato (ur.). Rijeka : The Royal Institute of Navigation & University of Rijeka, Faculty of Maritime Studies, 2014. 61-82.

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Davis, K. (1990). Ionospheric Radio. Peter Peregrinus Ltd. London, UK.	1	
Schunk, R and A Nagy. (2009). Ionospheres: Physics, Plasma Physics and Chemistry (2nd ed). Cambridge University Press. Cambridge, UK.	1	
Parkinson, B W and J J Spilker, Jr. (eds). (1996). Global POsitioning System: Theory and Applications (Vol. I.). AIAA. Washington, DC.	1	
Hapgood, M and A Thomson. (2010). Space Weather: Its Impact on Earth and Implications for Business. Lloyd's 360o Risk Insight. London, UK.	1	
Capderou, M. (2005). Satellites, Orbits and Missions. Springer Verlag France. Paris, France.	1	

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Assistant professor Srđan Žuškin, PhD Assistant professor David Brčić, PhD	
Course title	Concepts and Capabilities of Navigation Information Systems	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION

1. Course objectives

The main course objective is to analyse the existing concepts and to create new development capabilities of navigation information systems in function to improve navigation safety and marine environment protection. The next objective is based on system issue analyses, identification of noticed problems and difficulties with system anomalies on Navigation Bridge Information Systems. Meanwhile, the aim of the course is analytical methods and data analyses adoption in order to achieve relevant theoretical knowledge of Integrated Electronic Information and correspondent systems that will improve voyage planning and monitoring in a coordinated, consistent and systematic way. The new developing possibilities of additional features and functions (along with realization) also appear as scientific course objectives.

2. Course enrolment requirements

Officer of the watch (OOW) over 500 GT or more (STCW II/1)

3. Expected course learning outcomes

Students are expected to be able to:

7. Create and evaluate the development capabilities and concepts of the Navigation Information System.
8. Self-evaluate and analyse the transition period between modern electronical navigation (e-navigation) and traditional terrestrial navigation.
9. Create and analyse the sustainable development possibilities and new navigation information displays.
10. Create the data base of information system differences with pros and cons analyses.
11. Analyse and self-evaluate the system problems with systematic anomalies and key constraints identification.
12. Create and explain operational procedures including: navigational and other data system collecting, voyage planning and monitoring with verification and voyage planning optimisation.
13. Create and evaluate the near future opportunity developments with additional system information's
14. Analyse the possibility of the user interface system development (integrated navigation bridge) with software tools, application or model creation in function of voyage planning optimisation.
15. Critical mind set opinion development based on the marine accidents and near miss investigations regarding inappropriate usage of on-board information system.
16. Develop the Decision-Making Process (DSS) in information system by using information navigation system data.



4. Course content

- Relevant international maritime regulations and legal framework with mandatory application requirements and relationship with the other navigation information system stakeholders.
- Relevant IHO, IMO and IEC standards.
- Concepts and analyses of the navigation information system architecture in function of system development.
- Research view of the navigation and non-navigation information.
- Data model analyses according to associated organization standards.
- System issues valorisation and key constraints synthesis with analyses.
- Various different specific factor analyses for the system functionality.
- Concepts and new condition creation in function of marine accidents reduction.
- New integrated system element development with analyses (Integrated Navigation System, Integrated Bridge, e-Navigation)
- Existing software tools and application analyses and future development in function of voyage planning optimisation.
- User interface interpretation and future development in function of raising navigation safety.

5. Teaching methods

- | | |
|--|---|
| ☒ lectures | ☒ individual assignment |
| ☐ seminars and workshops | ☐ multimedia and network |
| ☐ exercises | ☒ laboratories |
| ☐ long distance education | ☒ mentorship |
| ☐ fieldwork | ☐ other _____ |

6. Comments

For research projects is used TRANSAS MARINE NAVI TRAINER PROFESSIONAL (NT-Pro 5000) and ECIDS TRANSAS Navi Sailor 4000 at Faculty of Maritime Studies.

7. Student's obligations

The students' obligations, together with the class attendance, are based on navigation information system development possibility research. Research result will be presented through the project work and written seminar assignment.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	2	Experimental work	
Written exam		Oral exam		Essay		Research	1
Project		Sustained knowledge check		Report		Practice	
Portfolio		Project work	2,5				

9. Assessment and evaluation of student's work during classes and on final exam

Active class participation with navigation laboratory usage is essential for evaluating the learning outcomes during the course. Learning outcomes are checked through the research by getting relevant results, data analyses and written seminar (paper) work submission.



10. Assigned reading (at the time of the submission of study programme proposal)

1. Bole, G. A., Wall, D. A. & Norris, A. 2014. *RADAR and ARPA manual – Radar, AIS and Target Tracking for Marine Radar Users*, 3rd Edition, Butterworth-Heinemann
2. Instone, M. 2017. *ECDIS Procedures Guide*. Edinburgh: Witherby Publishing Group.
3. International Hydrographic Organisation. 2016. *Current IHO ECDIS and ENC Standards*. IHO, Monaco.
4. International Maritime Organization. 2010. *Performance Standards for Shipborne Radio-communications and Navigational equipment*. IMO, London, UK.
5. Norris, A. 2008. *Integrated Bridge Systems – RADAR and AIS*. Vol 1. London: The Nautical Institute
6. Norris, A. 2010. *ECDIS and positioning*. London: The Nautical Institute
7. Thornton, P. 2016. *The ECDIS Manual*. Edinburgh: Witherby Publishing Group.
8. Weintrit, A. 2009. *The Electronic Chart Display and Information System (ECDIS): An Operational Handbook*, CRC Press, Taylor & Francis Group, LLC
9. Witherby Publishing Group. 2017. *ECDIS Passage Planning and Watchkeeping*. Edinburgh: Witherby Publishing Group.

11. Optional / additional reading (at the time of proposing study programme)

- Brčić, D., Kos, S. & Žuškin, S. 2015. *Navigation with ECDIS: Choosing the proper secondary positioning source*, International Journal on Marine Navigation and Safety of Sea Transportation (TransNav). 9(3): 317-326.
- Brčić, D., Kos, S. & Žuškin, S. 2016. *Partial structural analysis of the ECDIS EHO research: The handling part*. Proceedings of the 24th International Symposium on Electronics in Transport (ISEP). Electrotechnical Association of Slovenia & ITS Slovenia, Ljubljana, Slovenia.
- Brčić, D., Žuškin, S. & Barić M. 2017. *Observations on ECDIS education and training. Proceedings of 12th International Conference on Marine Navigation and Safety of Sea Transportation*. London: CRC Press, Taylor & Francis Group. Gdynia, 21-23.06.2017.
- Kos, S., Pušić, D. & Brčić, D. 2013. *Protection and Risks of ENC Data regarding Safety of Navigation*. Advances in Marine Navigation / Weintrit, Adam (ur.). London : Taylor & Francis Group: 165-170.
- Kos, S., Valčić, S. & Žuškin, S. 2014. *Updating of ECDIS System in Polar Regions*, Proceedings of 22nd International Symposium on Electronics in Transport, ISEP 2014, Electrotechnical Association of Slovenia & ITS Slovenia, Ljubljana.
- Kos, S., Žuškin, S. & Valčić, M. 2011. *On-line ECDIS system updating*, Proceedings of the 19th International Symposium on Electronics in Traffic, ISEP 2011, Electrotechnical Association of Slovenia & ITS Slovenia, Ljubljana, Slovenia 2011.
- Relevant international maritime organisations' documents, legal frameworks, reports and publications (IMO, IHO, IEC...)
- Žuškin, S., Brčić, D. & Kos, S. (2016) *Partial structural analysis of the ECDIS EHO research: The safety contour*. 7th International Conference on Maritime Transport. Universitat Politècnica de Catalunya, Barcelona. Barcelona.
- Žuškin, S., Brčić, D. & Šabalja, Đ. 2013. *A contribution to improving the standards of ECDIS training*. Scientific Journal of Maritime Research. 27(1): 131-148.
- Žuškin, S., Brčić, D. & Valčić, S. 2017. *ECDIS possibilities for Ballast Water Exchange adoption*. TransNav - International Journal on Marine Navigation and Safety of Sea Transportation. 11(3): 477-482.
- Žuškin, S., Valčić, M. & Rudan, I. 2011. *ECDIS System in Function of Sea Environment Protection*. Proceedings: Shaping Climate Friendly Transport in Europe: Key Findings and Future Directions, REACT, University of Belgrade, Belgrade, Serbia.



12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Bole, G. A., Wall, D. A. & Norris, A. 2014. RADAR and ARPA manual – Radar, AIS and Target Tracking for Marine Radar Users, 3rd Edition, Butterworth-Heinemann	2	
International Maritime Organization. 2010. Performance Standards for Shipborne Radio-communications and Navigational equipment. IMO, London, UK.	2	
International Hydrographic Organisation. 2016. Current IHO ECDIS and ENC Standards. IHO, Monaco.	on-line	
Instone, M. 2017. ECDIS Procedures Guide. Edinburgh: Witherby Publishing Group.	2	
Thornton, P. 2016. The ECDIS Manual. Edinburgh: Witherby Publishing Group.	2	
Witherby Publishing Group. 2017. ECDIS Passage Planning and Watchkeeping. Edinburgh: Witherby Publishing Group.	2	
Norris, A. 2008. Integrated Bridge Systems Vol 1. – RADAR and AIS. London: The Nautical Institute.	2	
Norris, A. 2010. Integrated Bridge Systems Vol 1. – ECDIS and positioning. London: The Nautical Institute.	2	
Weintrit, A. 2009. The Electronic Chart Display and Information System (ECDIS): An Operational Handbook, CRC Press, Taylor & Francis Group, LLC	2	

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.
The system quality is monitored in accordance the ISO 9001 standards, EU standards and quality insurance guidelines at the Faculty of Maritime Studies Rijeka. Once a year, the results are analysed and appropriate measure are taken.



Basic description		
Course coordinator	Associate professor Renato Ivče, PhD	
Course title	Containerization functions in the maritime transportation	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
The course objective is to introduce students with the importance of the container shipping industry in the global and regional context, and the forms of association of container shipping companies in order to provide competitive maritime transport services. It will also introduce students to the technical - technological characteristics of modern container ships, and with the research conducted in order to optimize ship's capacity.		
<i>2. Course enrolment requirements</i>		
<i>3. Expected course learning outcomes</i>		
1. explain the significance of container shipping 2. define the forms of association of container shipping companies in order to provide competitive maritime transport services 3. define the characteristics and specificities of modern container ships 4. explain the influential factors in the optimization of the container ship capacity 5. explain possible evaluation of ship's optimum capacity		
<i>4. Course content</i>		
The importance of containerization and its function in the global and regional context in the maritime transport. Forms of association of container shipping, a systematic review of the significant effects of association. Technical - technological characteristics of modern container ships. Trends in the container fleet, definition of criteria and their evaluation given the restrictions and requirements to achieve greater efficiency of maritime transport. Optimizing capacity container ship. Analysis and evaluation ship's optimum capacity indicators.		
<i>5. Teaching methods</i>	☐ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____
<i>6. Comments</i>		



7. Student's obligations

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	1	Experimental work	
Written exam		Oral exam	2	Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

10. Assigned reading (at the time of the submission of study programme proposal)

1. Cudahy, Brian J., "Box boatS: How Container Ships Changed the World", 2007. Transportation. Paper 1.
2. Perason, Roy, Container ship and shipping, Fairplay Publication, London 1988.
3. Stopford, M., Maritime economics, 2nd ed, Roatlledge, London, 2000.

11. Optional / additional reading (at the time of proposing study programme)

1. Container Shipping and Economic Development: A Case Study of A.P. Moller, Chopenhagen business school press, Chopenhagen, 2007.
2. Containerisation International, The National Magazine Company, LTD, London
3. Global Container Terminal Operators 2012, Annual Review and Forecast, Drewry Publishing, London
4. Serdo Kos, Productivity of Full Container Ship and Energy-Economy of its Propulsion Plant, Promet, Vol. 15, No. 2 , Zagreb , 2003.
5. Yap, W. Y.: Container shipping services and their impact on container port competitiveness, UPA University Press Antwerp, 2009;

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Robert Mohović, PhD	
Course title	Maritime Safety of the Ship	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i>
The aim of the chapter is to analyze the factors that affect the maritime safety of the ship. It is especially important to critically analyze and define elements important for planning and design of ports and waterways in particular the waterways in confined areas, which affect the maritime safety of the ship. The next goal is reflected in the defining criteria for the design from the standpoint of safety and protection of the marine environment, with special emphasis given to defining a measure of safety. The main objective of the chapter is the adoption of analytical method for calculation of design parameters as well as the recent methodologies for achieving these goals with the elements of maritime risk management.
<i>2. Course enrolment requirements</i>
No special requirements
<i>3. Expected course learning outcomes</i>
1. To demonstrate a systematic understanding of the field of course and mastery of the skills and methods related to maritime safety of the ship. 2. To demonstrate the ability to understand, design, implementation and customization of research process, thereby contributing to spreading the knowledge of maritime safety of the ship what students confirms by publishing their original results in recognized publications. 3. Acquire a capacity for critical analysis, evaluation and synthesis of existing and new ideas on maritime safety of the ship. 4. Be able to peers, throughout the scientific community and the broader community to communicate on their area of expertise. 5. Be capable in academic and professional contexts promote technological, social and cultural progress in the knowledge society through proposals for improved maritime safety of the ship as a benefits to the whole society.
<i>4. Course content</i>
The definition of the maritime safety of the ship and the analysis of influential factors. Comparative analysis of the impact of the types (technologies) of the ship to maritime safety of the ship. Maritime aspect of the planning and design of ports and waterways in confined areas. Defining criteria for the design and their weighting. Analysis and evaluation methodology in the field of maritime safety of the ship. Development of analytical method for calculation of design parameters. Human factor analysis and its impact on maritime



safety of the ship. Using the methods of risk analysis. Determination of criteria for maritime safety of the ship and research measures for its improvement with elements of risk management.

Application of the theory of risk in order to increase the safety of maritime navigation.

5. Teaching methods	☒ lectures	☒ individual assignment
	☒ seminars and workshops	☒ multimedia and network
	☐ exercises	☒ laboratories
	☐ long distance education	☒ mentorship
	☒ fieldwork	☒ other - simulators_____

6. Comments	It is expected that students who enroll in this course are experts from particular areas of navigational safety at sea.
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7. Student's obligations

Obligations of students along attendance, seminars and workshops are based on their research of various aspects of maritime safety of the ship in the field of nautical science and publication or presentation of their research in front the scientific and professional community.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam	1	Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio		Publication or presentation of research	2				

9. Assessment and evaluation of student's work during classes and on final exam

The learning outcomes are checked and evaluated through the monitoring of student research, the research results, and the manner and quality of the publication and presentation of research.

10. Assigned reading (at the time of the submission of study programme proposal)

1. PIANC (2014): „Harbour Approach Channels Design Guidelines” Report No. 121-2014.
2. Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan (2009): „Technical Standards and Commentaries for Port and Harbour Facilities in Japan” (2007). OCDE.
3. ROM (Puerto Del Estado) (2007): „Recommendations for Designing the Maritime Configuration of Ports, Approach Channels and Harbour Basins”. ROM 3.1-99. Spain: CEDEX.
4. G.P. Tsinker, Marine Structures Engineering, Specialized Applications, Chapman & Hall, ITP An International Thomson Publishing Company, New York, 1995.

11. Optional / additional reading (at the time of proposing study programme)

1. Maimun, A., Priyanto, A., Sian, A. Y., Awal, Z. I., Celement, C. S., & Waqiyuddin, M. (2013). „A mathematical model on manoeuvrability of a LNG tanker in vicinity of bank in restricted water.” Safety Science, 53, 34-44.
2. Eloot, K., & Vantorre, M. (2011). „Ship behaviour in shallow and confined water: an overview of hydrodynamic effects through EFD”.



3. Kobylinski, L. K. (2011). „Capabilities of ship handling simulators to simulate shallow water, bank and canal effects.” *TransNav-International Journal on Marine Navigation and Safety of Sea Transportation*. 5(2), 247-252.
4. Bunnik, T., & Veldman, A. (2010, January). „Modelling the effect of sloshing on ship motions”. In *ASME 2010 29th International Conference on Ocean, Offshore and Arctic Engineering*, 279-286. American Society of Mechanical Engineers.
5. Lo, D. C., Su, D. T., & Chen, J. M. (2009). „Application of computational fluid dynamics simulations to the analysis of bank effects in restricted waters.” *Journal of Navigation*, 62(03), 477-491.
6. Kokarakis, J. E. & Taylor, R. K. (2007), „Hydrodynamic Interaction Analysis in Marine Accidents”, *Proceedings of the International Symposium on Maritime Safety, Security and Environmental Protection*, September 20th – 21st, Athens, Greece.
7. Lataire, Evert, et al. (2007). „Navigation in confined waters: influence of bank characteristics on ship-bank interaction.” *International Conference on Marine Research and Transportation, ICMRT*.
8. Briggs, Michael J., Leon E. Borgman, and Eivind Bratteland (2003): „Probability assessment for deep-draft navigation channel design”. *Coastal engineering* 48.pp. 29-50.
9. Perez, T., & Blanke, M. (2002). „Simulation of ship motion in seaway” *Department of Electrical and Computer Engineering, The University of Newcastle, Australia, Tech. Rep. EE02037*.
10. Perunovic, J. V., & Jensen, J. J. (2003): „Wave loads on ships sailing in restricted water depth.” *Marine structures*, 16(6), 469-485.
11. Sutulo, S., & Soares, C. G. (2008, January). „Simulation of the hydrodynamic interaction forces in close-proximity manoeuvring.” *ASME 2008 27th International Conference on Offshore Mechanics and Arctic Engineering* (pp. 839-848). American Society of Mechanical Engineers.
12. Mohović, Đ. (2010). „Ocjena prihvatljivosti pomorskih plovidbenih rizika” *Doktorska disertacija, Pomorski fakultet, Sveučilište u Rijeci*.
13. Mohović, R. (2002). „Model manevriranja brodom u ograničenim plovnim područjima u funkciji sigurnosti i zaštite morskog okoliša”; *Doktorska disertacija, Pomorski fakultet, Sveučilište u Rijeci*.
14. P. Bruun, *Mooring and Fendering Rational Principles in Design*, The International Harbour Congress, Antwerp, 1983.
15. M. Chernjowski, *Mooring of Surface Vessels to Piers*, *Marine Technology*, Vol. 17., 1980.
16. I. Senjanović - V. Čorić, *Analiza čvrstoće priveznog sistema broda u plitkim lukama*, *Brodogradnja*, 35., 36., Zagreb, 1987., 4-5, 6., str. 203 – 211., 271.-284.
17. I.W. Dand - P.R. Lyon, *The Element of Risk in Approach Channel Design*, *International Conference on Maritime Technology, Challenges in Safety and Environmental Protection*, Singapore, 1993.
18. R. R. Solem, *Probability Models of Grounding and Collision*, *Proceedings of Automation of Safety in Shipping and Offshore Petroleum Operations*, 1980.

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students
Marine Structures Engineering, Specialized Applications	1	2
Other	Available on the website	2

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Damir Zec, PhD Associate professor Vlado Frančić, PhD	
Course title	International Maritime Safety and Environment Protection System	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> The main objective of the course is to familiarize students with the organization, legal framework and principles, the way how actors operate at the international level in order to improve the safety of navigation and environmental protection. More specific, students will be familiar with: - the establishment of the International Maritime Organization (IMO), the way of working and the way of adopting internationally acceptable regulations and the relationship with other international organizations, - Establish the European Maritime Safety Agency (EMSA), the way of working and carrying out activities from the defined scope of work, - Methodological procedures used to ensure technological consistency or to assess the adequacy of regulations in the field of maritime safety and environmental protection, - Possibilities of application of procedures at regional or national level, i.e. in the field of safety and environmental protection, which are not carried out within the authority of the State. Finally, the students will be presented with the current state of development of maritime safety and environmental protection system in the EU and in the Adriatic Sea, with a breakdown of the possibilities for further improvement.
<i>2. Course enrolment requirements</i> N/A
<i>3. Expected course learning outcomes</i> It is expected that PhD students after passing the exam are able to: 1. Explain the role and activities of the International Maritime Organization in improving the safety of navigation and the protection of the marine environment, 2. To describe the features and specifics and the role of the European Maritime Safety Agency, 3. Explain the implementation of international regulations in the domain of safety of navigation within the framework of national maritime administrations, 4. To present the role and importance of recognized organizations in the development of the safety of navigation and the protection of the marine environment 5. To illustrate the way in which inspections are carried out to improve navigation safety.
<i>4. Course content</i> - International Maritime Organization - Organization, Legal Basis, Proposing and Decision Making, Obligation to Implement, Relationship with Other Subjects of International Maritime Affairs,



- The European Maritime Safety Agency - organization, scope of work and activities aimed at improving the safety of navigation and the protection of the marine environment,
- the procedure for adopting regulations in the area of maritime safety and pollution protection,
- Hazard Identification, Risk Assessment, Analysis of Management Options, Cost and Benefit Estimation, Decision Making
- application of other related methods of risk assessment and their application in drafting regulations and their application (FTA, ETA, HAZOP, etc.)
- the application of international regulations in the field of safety and their implementation in national maritime legislation, the obligations of states and their maritime administrations,
- the role of Recognized Organizations in maintaining targeted marine safety standards and their relationship with maritime administrations,
- inspection system as a means of maintenance, improvement and harmonization of established safety standards.

5. Teaching methods	☒ lectures ☐ seminars and workshops ☐ exercises ☒ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____
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6. Comments	If necessary, the lessons can be consultative or performed as long-distance education.
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7. Student's obligations

Active participation in the teaching process and independent research work.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation	2	Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	3,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

- Application of research work, presentation of independent work.
- Solving Problem Tasks.
- Checking the integrity of the adopted knowledge.

10. Assigned reading (at the time of the submission of study programme proposal)

1. SOLAS 1974 Convention as amended.
2. IMO Conventions as amended
3. Resolutions and circular letters adopted by IMO.

11. Optional / additional reading (at the time of proposing study programme)

- 1) Penny, J., Eaton, A., Bishop, P., Bloomfield, R., "The Practicalities of Goal Based Safety Regulation", 9th Safety critical Systems Symposium, Bristol, UK, 2001
- 2) Ruxton, T., Formal Safety Assessment of ships, Transactions, ImarE, vol. 108, 1996

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students
All titles	1	1



13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

The quality of the study is monitored in accordance with the ISO 9001 system and in accordance with the European standards and quality assurance guidelines implemented at the Faculty of Maritime Studies in Rijeka. Once a year, the results of the transient are analyzed, and appropriate measures are taken. Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator(s)	Assistant professor Sandra Tominac Coslovich, PhD	
Course title	Research in international maritime education and training (MET)	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> • Understanding basic concepts in MET • Evaluation of MET programmes of study in international education and training systems • Role of MET in meeting stakeholders' requirements (shipping industry, maritime administration, educational authorities) • Understanding of key principles, methods and elements of research in international MET projects • Developing critical thinking in the evaluation of international MET systems • Comparison of Croatian and international MET systems.
<i>2. Course enrolment requirements</i> Completing first year postgraduate study exams
<i>3. Expected course learning outcomes</i> Upon completing the course the students will be able: - to determine elements of research in MET - to plan and execute MET research projects - to apply key principles and methods of research in international MET projects on the MET system in Croatia
<i>4. Course content</i> • Basic notions: education, training, instruction, MET institution, principal stakeholders (shipping industry, maritime administration, educational authorities), MET, VET, CBT, • International organisations (IMO, IAMU, IMLA, AMRI, EU, ILO) and MET • Systems of MET in the world, • International MET projects (DG TREN, METHAR, EASTMET, METNET, GLOMET) • Research methodology in MET • Evaluation of the role of MET systems in the world and international education and training processes and trends (Bologna, ECTS, VECTS) • New learning technologies, long-distance and life-long learning • Comparison of Croatian and international MET systems.



5. Teaching methods		☒ lectures ☐ seminars and workshops ☐ exercises ☒ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____			
6. Comments							
7. Student's obligations							
- Active participation in the learning process, discussions, presentation of individual assignment results - Independent research and assembly of a written report (written exam) - Presentation of research (oral exam)							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam		Essay		Research	4,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							
9. Assessment and evaluation of student's work during classes and on final exam							
- Analysis of research elements in MET projects (discussion) - Developing concepts of one's own projects and being evaluated by peers - Evaluating and discussing elements of students' reports and presentations of results							
10. Assigned reading (at the time of the submission of study programme proposal)							
1. Nakazawa. T, Pritchard. B., Zec.D., Frančić, V. (2011) <i>ACCREDIMET (A feasibility study on the establishment of an IAMU accreditation scheme – Final report)</i>, IAMU & WMU, 2011, Nippon Foundation 2. <i>METNET</i> (Thematic Network on Maritime Education, Training and Mobility of Seafarers), Final Report for Publication, World Maritime University, WMU, Malmö, 2003 <i>METHAR</i> (Harmonization of European Maritime Education and Training Schemes), Final report for publication 3. <i>Proceedings of WMU Conference</i>, Myanmar, 2015 (relevant topics) 4. Relevant articles on MET in <i>Proceedings of IAMU AGA 2014, 2115, 2016</i>; http://iamu-edu.org/ - Ongoing Projects (http://iamu-edu.org/?page_id=2997); IAMU MARD; IAMU e-Learning 5. Relevant articles on MET in <i>Proceedings of IMLA Conferences</i>; 2011-2016							
11. Optional / additional reading (at the time of proposing study programme)							
1. PAES – Peer-assited evaluation form, PAES Project, IAMU 2014 2. <i>International Convention on Standards of Training, Certification and Watchkeeping of Seafarers</i>, IMO, London, 1995/2010, as amended 3. <i>The Seafarers International Research Centre (SIRC) Symposium Proceedings</i>, 2011 4. <i>METHAR</i> (Harmonization of European Maritime Education and Training Schemes), Final report for Publication, WMU 1999-2002 5. <i>Proceedings of WMU Conference</i>, Myanmar, 2015							



12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students
1. Nakazawa. T, Pritchard. B., Zec.D., Frančić, V. (2011) <i>ACCREDIMET (A feasibility study on the establishment of an IAMU accreditation scheme – Final report)</i> , IAMU & WMU, 2011, Nippon Foundation	The title is available on course coordinator's website and on the following platform: https://mudri.uniri.hr/course/category.php?id=11	
2. <i>METNET</i> (Thematic Network on Maritime Education, Training and Mobility of Seafarers), Final Report for Publication, World Maritime University, WMU, Malmö, 2003 <i>METHAR</i> (Harmonization of European Maritime Education and Training Schemes), Final report for publication	The title is available on course coordinator's website and on the following platform: https://mudri.uniri.hr/course/category.php?id=11	
3. Proceedings of <i>WMU Conference</i> , Myanmar, 2015 (relevant topics)	The title is available on course coordinator's website and on the following platform: https://mudri.uniri.hr/course/category.php?id=11	
4. <i>METHAR</i> (Harmonization of European Maritime Education and Training Schemes), Final report for Publication, WMU 1999-2002	The title is available on course coordinator's website and on the following platform: https://mudri.uniri.hr/course/category.php?id=11	
5. Proceedings of <i>WMU Conference</i> , Myanmar, 2015	The title is available on course coordinator's website and on the following platform: https://mudri.uniri.hr/course/category.php?id=11	

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Associate professor Vlado Frančić, PhD Full professor Damir Zec, PhD	
Course title	Modelling and analysis of maritime traffic flow	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION

1. Course objectives

The main goal is to introduce the student with the purpose, the ways, the limitations and possibilities in description and exploration of sea-traffic flows as a prerequisite for increasing the safety of navigation and its optimization. In addition, PhD students will be introduced to using discrete simulation models in describing sea-traffic flows.

More specific, students will be familiar with:

- theory of maritime traffic flows,
- the characteristics of maritime traffic flows in different traffic conditions, in unlimited and limited waterways,
- ways of collecting, processing and evaluating data describing traffic flows in order to quantify navigation safety,
- discrete simulation models with application in analysis and definition of maritime traffic,
- ways of exploiting and applying the results of simulation modelling maritime traffic flows in order to optimize maritime traffic and increase the safety of navigation and environmental protection.

2. Course enrolment requirements

N/A

3. Expected course learning outcomes

It is expected that PhD students after passing the exam are able to:

1. Explain the concept of maritime-traffic flow.
2. Describe the characteristics and specifics of the Maritime Organization.
3. Explain the criteria for maritime traffic optimization from the standpoint of navigation safety,
4. Apply a discrete simulation model in the examination of the characteristics of the maritime-traffic flow,
5. Outline the maritime-traffic flow model in relation to the different navigable areas and characteristics of selected vessels.

4. Course content

Traffic flows:

- definition, types, characteristics from the point of view of maritime safety and pollution protection,
- a description of the structure of Maritime Traffic Flows,
- optimization of maritime traffic from the point of view of safety of navigation,
- dynamic characteristics of ships, manoeuvring, mutual influence, domain theory, impact on maritime traffic,



The basics of discrete simulation models:

- basic features, program conditions, advantages and disadvantages in relation to other continuous and quasi-continuous simulation models, display and verification of stochastic processes; mixed approaches;
- familiarization with the appropriate program package,

Discrete simulation models of maritime traffic:

- Goals, scope of application, features
- Modelling and testing the characteristics of maritime traffic flows,
- Determining the characteristics of ships and determining dynamic parameters,
- Modelling of the traffic flow in relation to restricted waters,
- Verification of the maritime-traffic flow model.

5. Teaching methods	☒ lectures	☐ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☐ exercises	☐ laboratories
	☒ long distance education	☐ mentorship
	☐ fieldwork	☐ other _____

6. Comments	If necessary, the lessons can be consultative or performed as long-distance education.
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7. Student's obligations

Active participation in the teaching process and independent research work.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation	1	Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	4,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

- Application of research work, presentation of independent work.
- Solving Problem Tasks.
- Checking the integrity of the adopted knowledge.

10. Assigned reading (at the time of the submission of study programme proposal)

1. Ortuzar, Juan de Dios, Luis G. Willumsen, Modelling Transport, 4th ed., West Sussex, John Wiley and Sons, 2011.
2. Law, A. Kelton, W., Simulation Modelling and Analysis, McGraw Hill, 2000

11. Optional / additional reading (at the time of proposing study programme)

1. Karaynakis, N. M, Advanced System Modelling and Simulation with Block Diagram Languages, CRC 1995.
2. Woolfson, M. M, Pert, G. J, An Introduction to Computer Simulation, Oxford University Press, 1999
3. Harrell, R, Simulation Using Promodel, McGraw-Hill Science/Engineering/Math; 2000.
4. Henscher, David A., Kenneth J. Button, Handbook of Transport Modelling, Oxford, Pergamon, An Imprint of Elsevier Science, 2000. Bianco L., Modelling and Simulation in Air Traffic Management, pringer-Verlag Telos, 1997
5. Bucklew J. A. Introduction to Rare Event Simulation, Springer; 2004
6. Drew, J, Traffic Flow Theory and Control, McGraw Hill, 1968
7. Leutzbach, W, Introduction to the Theory of Traffic Flow, Springer, 1988



12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
All titles	1	1

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

The quality of the study is monitored in accordance with the ISO 9001 system and in accordance with the European standards and quality assurance guidelines implemented at the Faculty of Maritime Studies in Rijeka. Once a year, the results of the transient are analyzed, and appropriate measures are taken. Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Mirano Hess, PhD	
Course title	Sea Shipping Optimization	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> The basic aim of the chapter is to familiarize students with the research of operations' optimization in the maritime shipping market with the purpose of the proper interpretation and prediction of interaction of shipping business and technological-market influences. Students will be familiarized with the use and development of optimization methods in the process of making business decisions and setting the strategy of fleet management in the shipping market. Another aim is to present the methodology for undertaking the analysis of fleet management starting from ship's technological parameters and existing or anticipated future movements in the shipping industry.
<i>2. Course enrolment requirements</i> /
<i>3. Expected course learning outcomes</i> Understanding of items listed in the course content. Understanding the correlation of theory and practical application. Understanding and the ability of practical application of theoretical settings. The ability of writing a scientific paper on the subject of this course.
<i>4. Course content</i> Sea shipping market • segmentation, correlation and balance of maritime market • factors affecting the movement of maritime market Freight cycles • ship chartering • analysis of freight cycles and shipping market trends • correlation of dynamics of freight and economic indices Overseas trade • world trade and its cycles, the correlation of trade and GDP index • world's overseas trade and its future • ship chartering and broking Segmentation of merchant fleet • world fleet - segmentation, development and future • shipping cycles, comparison with freight and economic cycles



Delivery of new vessels

- world's shipbuilding industry, its cycles, competition, the development and forecasting
- investment in new ships

The next phase of the market

- Offshore oil, the present and the future
- comparison of offshore ships and other fleet
- different fleets, comparison and their share, ordered value

The optimization process

- the collection and evaluation of data
- market and technological parameters, evaluation of ships
- forecasting, analysis and optimization of business policy
- test of the prediction models, comparison of chartering optimal policies
- evaluation of results
- selection of the optimal chartering policy, selection of the optimal route and most profitable cargo in transit
- correlation of costs and earnings in shipping
- the method of making optimal business decisions in shipping
- management of a fleet of ships at the expert level

5. Teaching methods	☒ lectures	☒ individual assignment
	☐ seminars and workshops	☒ multimedia and network
	☒ exercises	☐ laboratories
	☐ long distance education	☐ mentorship
	☐ fieldwork	☐ other _____

6. Comments

7. Student's obligations

Course attendance and activity.

Creating a scientific paper to be published in the base A journal.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation	0,5	Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio				Scientific paper	5		

9. Assessment and evaluation of student's work during classes and on final exam

Demonstration of understanding the items listed in the course content, a maximum of 1 ECTS.

The evaluation of the written scientific article, a maximum of 5 ECTS.

10. Assigned reading (at the time of the submission of study programme proposal)

1. Ship Operations and Management, Institute of Chartered Shipbrokers, London, 2013
2. Packard, William V, Voyage Estimating, Fairplay publications, London, 2012
3. Collins, N., The Essential Guide to Chartering and the Dry Freight Market, Wiley, New York, 2012
4. Oldrein, Turner and Hannaford, Ship Sale and Purchase, Informa, New York, 2012

11. Optional / additional reading (at the time of proposing study programme)

1. Formisano, R.A., Managers Guide to Strategy, McGraw-Hill, London, 2013
2. Bacal, R., Manager's Guide to Performance Reviews, McGraw-Hill, London, 2013
3. Geman, H., Risk Management in Commodity Markets, Wiley, New York, 2012



4. Dykstra D., Commercial Management in Shipping, The Nautical Institute, London, 2009
5. Wilford, Michael and Coghlin, Terence and Kimball, J D, Time Charters, Informa, New York, 2008
6. Cooke, J and Taylor, A and Young, T and Kimball, J D, Voyage Charters, Informa, New York, 2007
7. Kavussanos, M, Visvikis, G., Derivatives and Risk Management in Shipping, Witherbys, 2006
8. Grammenos Th. C. – The handbook of maritime economics and bussines, LLP, London, 2002.

12. *Number of assigned reading copies with regard to the number of students currently attending the course*

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
1. Ship Operations and Management, Institute of Chartered Shipbrokers, London, 2013	3	1
2. Packard, William V, Voyage Estimating, Fairplay publications, London, 2012	3	1
3. Collins, N., The Essential Guide to Chartering and the Dry Freight Market, Wiley, New York, 2012	3	1
4. Oldrein, Turner and Hannaford, Ship Sale and Purchase, Informa, New York, 2012	3	1

13. *Quality monitoring methods which ensure acquirement of output knowledge, skills and competences*

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Associate professor Đani Mohović, PhD	
Course title	Assessment and management of maritime navigational risks	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i>
The aim of the course is to give students a structured training in matters of maritime navigational risk so they gain sufficient scientific background to be engaged in research work. Students become familiar with current research of risks in shipping and international and national regulations relating to the risks in shipping. Through the presentation of existing models of maritime traffic the student become ready to develop the ability to critically evaluate research work of others. By introducing students to the existing methods of risk assessment they become competent to conduct research using the scientific methodology. In the end, students are given the opportunity to conduct research on the specific problem and to determining the acceptable maritime navigational risks, where he to achieve the goal should include interdisciplinary work.
<i>2. Course enrolment requirements</i>
No special requirements
<i>3. Expected course learning outcomes</i>
1. To demonstrate a systematic understanding of the field of course and mastery of the skills and methods related to marine navigation risks. 2. To demonstrate the ability to understand, design, implementation and customization of serious research process, thereby contributing to spreading the knowledge of maritime navigational risks what students confirms by publishing their original results in recognized publications. 3. Acquire a capacity for critical analysis, evaluation and synthesis of existing and new ideas on marine navigational risks. 4. Be able to peers, throughout the scientific community and the broader community to communicate on their area of expertise. 5. Be capable in academic and professional contexts promote technological, social and cultural progress in the knowledge society through proposals for reduce the maritime navigational risk as a benefits to the whole society.
<i>4. Course content</i>
General about the risks in shipping. The application of the theory of risk in the maritime industry. Rating previous research risks in shipping. Legal foundations of risk assessment in the shipping (International Maritime Organization, the European Union, the Republic of Croatia). Defining maritime risk. Distribution of maritime accidents. Analysis of accident statistics. Display and evaluation of current methods of risk assessment. Analysis model of maritime transport. Modelling of maritime navigational accidents. The



probability of maritime navigational accidents. The methodology for determining the consequences of maritime navigational accidents. The methodology of determining the acceptability of maritime navigational risks. Risk management measures in the maritime industry. Long-term monitoring of the level of risk. Application of the theory of risk in order to increase the safety of maritime navigation.

5. Teaching methods	☒ lectures	☒ individual assignment
	☒ seminars and workshops	☒ multimedia and network
	☐ exercises	☒ laboratories
	☐ long distance education	☒ mentorship
	☒ fieldwork	☒ other
		simulators_____

6. Comments	It is expected that students who enrol in this course are experts from particular areas of navigational safety at sea.
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7. Student's obligations

Obligations of students along attendance, seminars and workshops are based on their research of maritime navigational risks in the field of nautical science and publication or presentation of their research in front the scientific and professional community.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam	1	Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio		Publication or presentation of research	2				

9. Assessment and evaluation of student's work during classes and on final exam

The learning outcomes are checked and evaluated through the monitoring of student research, the research results, and the manner and quality of the publication and presentation of research.

10. Assigned reading (at the time of the submission of study programme proposal)

1. "Managing risk in shipping" - The Nautical Institute, London, 1999.
2. "Safety Management and Risk Analysis" – Svein Kristiansen, Butterworth-Heinemann, 2005.

11. Optional / additional reading (at the time of proposing study programme)

1. Risk and reliability in marine technology - COMETT Programme, Wegemt, 1993.
2. Good practice in risk assessment and risk management 1- Hazel Kemshall and Jacki Pritchard, Bristol, Jessica Kingsley Publ., 1996.
2. Acceptable risk- Baruch Fischhoff, Cambridge, Cambridge University Press, 1981.
3. Procjena opasnosti za opasne stvari - Janeš V., Čavrak B., ZIRS, Intergrafika, Zagreb 1999.
4. Risk analysis and its applications - David B. Hertz and Howard Thomas, Chichester: Wiley, 1983.
5. Quantitative risk analysis: a guide to Monte Carlo simulation modeling – David Vose, Chichester: John Wiley, 1996.
6. The risk ranking technique in decision making - John. C. Chicken and Michael R. Hayns, Oxford: Pergamon Press, 1989.
7. Reliability, maintainability and risk - Smith J. David, 2001.
8. Offshore Risk Assessment - Vinnem J. Erik, Trondheim, Kluwer Academic Publisher, 1999.
9. Risk and reliability in marine technology - COMETT Programme, Wegemt, 1993.
10. Metode procjene i upravljanja rizikom u procesnoj industriji, Enconet International, Zagreb, 1999.



12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
"Managing risk in shipping"	1	2
"Safety Management and Risk Analysis"	1	2

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Professor emeritus Josip Brnić, PhD	
Course title	Analysis of mechanical behavior of engineering elements subjected to creep and relaxation	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
1. Course objectives		
Student training for independent analysis of responses of structural / engineering elements in the elastic, plastic and elasto - viscoplastic areas.No		
2. Course enrolment requirements		
There is n Possibility of conducting analysis and modeling of strain and deformation of the mechanical response of engineering elements in the area of elevated temperature-area of creep and in the area of relaxation-constant deformation and stress reduction.o specified requirements.		
3. Expected course learning outcomes		
Possibility to perform the analysis and modeling of stress and deformation of the mechanical responses of engineering elements in the area of elevated temperature (area of creep), and in the area of relaxation (constant deformation but stress reduction).		
4. Course content		
Basic knowledge in the area of stress and deformation. Stress tensor, mean and deviatoric stress tensor. Strain tensor , mean and deviatoric strain tensor. Mechanical responses of elements in the area of elevated temperature, the phenomenon of creep. Reological models and analytical formulas in modeling the actual behavior of elements at elevated temperatures: Maxwell, Voigt-Kelvin, Standard Linear Solid, Burgers model. Uniaxial and multiaxial creep. Basics of final element analysis of structural elements.		
5. Teaching methods	☒ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____
6. Comments	-	
7. Student's obligations		
Lectures and seminar.		



8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	3	Experimental work	
Written exam		Oral exam		Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Teaching/lectures, seminar

10. Assigned reading (at the time of the submission of study programme proposal)

Brnić, J.: Analysis of Engineering Structures and Material Behavior, Wiley & Sons, Chichester, 2018.
Brnić, J.: Elastomechanics and plastomechanics (in Croatian), Školska knjiga, Zagreb, 1996.

11. Optional / additional reading (at the time of proposing study programme)

Alfirević, I.: Advanced strength of materials (in Croatian), Faculty of Mechanical Engineering and Naval Architecture, Zagreb, 1975

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Brnić, J.: Analysis of Engineering Structures and Material Behavior, Wiley & Sons, Chichester, 2018.	1	1

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Assistant professor Radoslav Radonja, PhD	
Course title	Alternative fuels and emissions of harmful substances from marine energy systems	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i>
Knowledge and understanding: systematic approach to emission of harmful substances from marine energy systems (causes of their occurrence and consequences on the environment), legislative regulations, available technological and technical solutions for emission reductions, current tendencies and alternative fuels, and possible limitations in application.
<i>2. Course enrolment requirements</i>
Graduate studies in "Marine Engineering and Maritime Transport Technology" completed.
<i>3. Expected course learning outcomes</i>
After a period of study, students will be able to: - Interpret global trends and possibilities of using alternative fuels in shipping - Explain the emission criteria for harmful substances of the ship's energy systems and interpret international regulations in that context - Compare and differentiate the eligibility criteria for the energy systems of the ship by: energy, safety, ecological and economic efficiency - Structure and characterize emissions of harmful substances when applying classical and alternative fuels - Determine and evaluate development strategies for energy systems with regard to emissions of harmful substances - Plan and form models for electing the ship's energy system with regard to eligibility criteria - Set up and verify the scientific hypothesis and present research results in the form of a scientific article.
<i>4. Course content</i>
Course content: - world trends in the application of alternative fuels and new concepts of ship's energy systems - definition of alternative fuels and criteria for emission of harmful substances from energy systems on board - defining criteria for the eligibility of energy systems for energy, safety and environmental protection - selection of criteria and characteristics of the ship's energy system when applying alternative fuels and permitted emissions of pollutants - achieving safety, profitability, ecological acceptability, exploitation manageability and ship's readiness for different alternative fuels and energy systems - the emission of harmful substances from the ship's energy systems when applying classical and alternative fuels



- measures and procedures for reducing emissions of harmful substances when applying classical and alternative fuels
- forming a model for selection of the ship's energy system with regard to the eligibility criteria.

5. Teaching methods	☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____
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6. Comments

7. Student's obligations

Students are expected to master the subject content, carry out research and seminar paper on a given topic from the course content (presentation of research results in the form of scientific articles).

8. Evaluation of student's work

Course attendance	0.5	Activity/Participation		Seminar paper	1.5	Experimental work	
Written exam		Oral exam	1	Essay		Research	3
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Knowledge of terminology and facts: 20% (What are harmful emissions? What are alternative fuels? What are the tendencies? ...)

Independence in research and processing of data and information from various sources: 20% (Reference data sources?)

Ability to set criterion and critical selection: 40% (The analysis of research content with oral exam?)

Ability to present results and make an appropriate conclusion: 20% (Synthesis of research results?)

10. Assigned reading (at the time of the submission of study programme proposal)

1. Peyton, K., Fuel field manual-success and solutions to performance problems, McGraw-Hill, New York, 1997.
2. Van Erp, Richman, M.H., Technical Challenges Associated with the Development of Advanced Combustion Systems, paper 3 in RTO-MP-14, New York, 1999.
3. Kuiken, K. Diesel Engines I and II, target Global Training, Onnen, 2008.

11. Optional / additional reading (at the time of proposing study programme)

1. MARPOL 73/78, consolidated edition 2013.
2. Revised MARPOL annex VI, NOx Technical Code 2008, IMO, London 2009
3. Eyring, V., Corbett, J.J., Lee, D.S., Winebrake, J.J., Brief summary of the impact of ship emissions on atmospheric composition, climate, and human health, Document submitted to the Health and Environment sub-group of the International Maritime Organization on 6 November 2007.
4. EMEP/EEA, Trozzi, C. and De Lauretis, Air pollutant emission inventory guidebook 2009 - Technical guidance to prepare national emission inventories; EEA Technical Report No. 9/2009, Copenhagen, updated 2011.

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Associate professor Goran Vukelić, PhD Lech Murawski, PhD	
Course title	Strength, Fatigue and Fracture of Marine Structures	
Study program	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
1. Course objectives		
Adoption of theoretical knowledge and developing skills necessary for solving practical problems of construction modelling, strength analysis, dimensioning and fracture and fatigue analysis.		
2. Course enrolment requirements		
Previous knowledge of basic strength of materials.		
3. Expected course learning outcomes		
To determine stress and strain of structures made of materials that exhibit linear or nonlinear material behavior. To determine stress and strain of linear, planar and axially symmetric engineering problems. To successfully describe fracture mechanics categories and modes of fracture propagation. To determine service life of a structure. To successfully interpret analysis results.		
4. Course content		
Introduction. Stress theories. Strain theories. Stress and strain dependence. Numerical solving of elasticity problems. Elasticity and plasticity theories. Fracture mechanics fundamentals: crack occurrence and propagation, linear elastic and elastic-plastic fracture mechanics. Fracture initiated by stress corrosion, high-cycle and low-cycle fatigue, thermally induced stress. Experimental and numerical fracture analysis. Examples of construction strength analysis.		
5. Teaching methods	X lectures ☐ seminars and workshops X exercises X long distance education ☐ fieldwork	X individual assignment ☐ multimedia and network ☐ laboratories X mentorship ☐ other _____
6. Comments	-	
7. Student's obligations		
Attending lectures, solving assignments and reporting results.		



8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	3	Experimental work	
Written exam		Oral exam		Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

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10. Assigned reading (at the time of the submission of study programme proposal)

1. I. Alfiredić: Linearna analiza konstrukcija, Sveučilište u Zagrebu, Fakultet strojarstva i brodogradnje, Zagreb, 1999.
2. J. Brnić, G. Turkalj: Nauka o čvrstoći II, Zigo, Sveučilište u Rijeci, Rijeka, 2006.
3. J. Brnić: Elastomehanika i plastomehanika, Školska knjiga, Zagreb, 1996.
4. T.L. Anderson: Fracture Mechanics, Fundamentals and Applications, CRC Press, Boca Raton, USA, 1995.

11. Optional / additional reading (at the time of proposing study programme)

1. S. Suresh: Fatigue of Materials, Cambridge University Press, Cambridge, UK, 2001.
2. L.S. Etube: Fatigue and Fracture of Offshore Structures, Wiley&Sons, New Jersey, USA, 2001.
3. G. Vukelić, G. Vizentin. Damage-Induced Stresses and Remaining Service Life Predictions of Wire Ropes. Applied Sciences. 7 (2017), 1; 107-113.
4. G. Vukelić, J. Brnić, Josip. Predicted Fracture Behavior of Shaft Steels with Improved Corrosion Resistance. Metals. 6 (2016), 2; 40-1-40-9.
5. G. Vukelić, M. Brčić. Failure analysis of a motor vehicle coil spring. Procedia Structural Integrity. 2 (2016), 2944-2950.

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students
I. Alfiredić: Linearna analiza konstrukcija	1	3
J. Brnić, G. Turkalj: Nauka o čvrstoći II	1	3
J. Brnić: Elastomehanika i plastomehanika	1	3
T.L. Anderson: Fracture Mechanics, Fundamentals and Applications	1	3

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Assistant professor Anton Turk, PhD	
Course title	Dynamic effects on the stability of the ship	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
1. Course objectives		
Getting to know the problem areas of ship's stability in the intact and damaged condition with a focus on the dynamic effects on stability. Mathematical formulation of the problem related to the stability of floating objects and solving those using appropriate methods and software. Fundamental knowledge related to the specifics of the dynamic effects and the definition and / or implementation of specific technical requirements.		
2. Course enrolment requirements		
None.		
3. Expected course learning outcomes		
Formulate the problem related to dynamic loading of vessels and the impact on the stability of the ship. Analyse possibilities of application of numerical methods on applicable example, compare and select numerical method. Investigate the possibility of solving the problem by applying the existing software and / or to write his own program. Investigate and analyse the given project assignment related to specific case of stability of ship.		
4. Course content		
The stability of the motion. Structure interaction with the waves. Parametric rolling. The effects of bifurcation. Broaching. Excessive acceleration. Pure loss of stability. Dead ship stability. Control systems. Criteria. The impact of the application of classification rules. Numerical methods. Time domain calculation.		
5. Teaching methods	☒ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____
6. Comments		
7. Student's obligations		
The students are required to attend the classes (consultations), do their project, prepare and present the seminar.		



8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	2,5	Experimental work	
Written exam		Oral exam		Essay		Research	3
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Assessment and evaluation of students' work will be based on the results they achieve in their project and the seminar work.

10. Assigned reading (at the time of the submission of study programme proposal)

Vassalos D , Hamamoto M., Molyneux D., Papanikolaou A.: Contemporary Ideas on Ship Stability, Elsevier Science 2000

Clayton B. R., Bishop R.E.D.:(Mechanics of Marine Vehicles, Gulf Publishing Company, 1982

Faltinsen, O. M.: Sea Loads on Ships and Offshore Structures, University Press, Cambridge, 1998.

11. Optional / additional reading (at the time of proposing study programme)

Jensen, J. J.: Load and Global Response of Ships, Elsevier Ocean Eng. Book Series, Oxford, 2001.

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students
Vassalos D , Hamamoto M., Molyneux D., Papanikolaou A.: Contemporary Ideas on Ship Stability, Elsevier Science 2000.	1	1
Clayton B. R., Bishop R.E.D.:(Mechanics of Marine Vehicles, Gulf Publishing Company, 1982	1	1
Faltinsen, O. M.: Sea Loads on Ships and Offshore Structures, University Press, Cambridge, 1998.	1	1

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Associate professor Predrag Kralj, PhD	
Course title	Selected chapters of the marine microclimate systems	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
1. Course objectives		
Aim of course is to provide the students additional knowledge on the marine microclimate systems related to the changes in the sea environment protection regulations and the technological changes, based on the recent scientific and technological findings. Furthermore, the elaborated themes will enable students to define the scientifically based modeling procedure concept of the marine microclimate systems optimization.		
2. Course enrolment requirements		
As determined by a Faculty's Rule of Enrolment.		
3. Expected course learning outcomes		
Student would be able to evaluate existing microclimate systems, to recognize faults in the system's operation and methods to resolve or to improve it, to accept modern regulation techniques, and other directions of development, to apply knowledge in a way to protect the environment and to develop new, more efficient or more environmentally friendly systems.		
4. Course content		
1. The marine microclimate systems management approach, its influence on the overall expenses, and the possibilities of improvement 2. The working fluid changes, reload of additional fluid and the thermo dynamical properties of the fluids in the compressor systems 3. Fault diagnostics, the procedure of reparation and the redundant systems 4. The marine microclimate systems optimization		
5. Teaching methods	X lectures X seminars and workshops X exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network X laboratories X mentorship ☐ other _____
6. Comments		
7. Student's obligations		
To attend the lectures and exercises, to perform a laboratory work which would result with the essay and scientific paper published with the mentor		



8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	1	Experimental work	
Written exam		Oral exam	2	Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

10. Assigned reading (at the time of the submission of study programme proposal)

1. Martinović, D., *Brodski rashladni uređaji*, Školska knjiga, Zagreb, 1994.
2. Knak, Ch., *Diesel Motor Ships – Engines and Machinery*, GEC-GAD Publishers, Copenhagen, 1979.

11. Optional / additional reading (at the time of proposing study programme)

1. Kralj, P., *Prilog raspravi o zaštiti morskog okoliša*, Zbornik radova Pomorskog fakulteta, Rijeka, Godina 11 (1997), pp. 119-128,
2. Kralj, P., *Brodski sustavi mikrokline – automatizacija i optimizacija*, Zbornik Pomorskog fakulteta u Rijeci, Rijeka, god. 12 (1998), pp. 197-203,
3. Kralj, P. - Bukša, A. - Martinović, D., *Razvoj brodskih rashladnih sustava - utjecaj propisa o zaštiti okoliša*, Pomorstvo, Rijeka, god. 13 (1999), pp. 211-222,
4. Schafär, M., *Computational Engineering*, Springer, Berlin, 2006.
5. Turk, S., Budin, L., *Analiza i projektiranje računalom*, Školska knjiga, Zagreb, 1989.
6. Kreyszig, E., *Advanced Engineering Mathematics*, John Wiley and sons, New York, 1993.
7. Lalić, D., Kolombo, M., *Upravljanje projektima u procesnoj industriji*, Zagreb, NIP Privredni vjesnik, 1990.
8. Lalić, D., Kolombo, M., *Produktivnost u procesnoj industriji*, Zagreb, NIRO Privredni vjesnik, 1987.

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students
Martinović, D., <i>Brodski rashladni uređaji</i> , Školska knjiga, Zagreb, 1994.	5	1
Knak, Ch., <i>Diesel Motor Ships – Engines and Machinery</i> , GEC-GAD Publishers, Copenhagen, 1979.	1	1

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Associate professor Tomislav Senčić, PhD Associate professor Dean Bernečić, PhD	
Course title	Marine diesel engines selected chapters	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION							
1. Course objectives							
Introduce students to the problems of injection and combustion in marine diesel engines and introduce them to the ways of the simulation using specific software tools and existing marine engineering simulator.							
2. Course enrolment requirements							
Completed undergraduate and graduate marine engineering at the Faculty of Maritime Studies or Marine Engineering or Process and Energy Engineering module at the graduate level at Faculty of engineering.							
3. Expected course learning outcomes							
A better understanding of the basic processes in marine diesel engines. Using and adapting simulation models for processes in diesel engines. The right choice of models and interpretation of results.							
4. Course content							
The injection and combustion theory. Fuel properties significant for processes in the diesel engine. Modern construction of marine diesel engines. Different categories of engine process models: 0D, QD and 3D models. Harmful products formation modeling.							
5. Teaching methods		☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____		
6. Comments							
7. Student's obligations							
Attendance (consultation), studying and solving project tasks under the direction of Professor							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation		Seminar paper	1	Experimental work	
Written exam		Oral exam		Essay		Research	0,5
Project	4	Sustained knowledge check		Report		Practice	
Portfolio							



9. Assessment and evaluation of student's work during classes and on final exam

Discussion on consultation, presentation of the project in the seminar.

10. Assigned reading (at the time of the submission of study programme proposal)

Heywood, J.B.: Internal Combustion Engine Fundamentals, McGraw Hill Book Co., New York, 1998

Stiesch, G.: Modeling Engine Spray and Combustion Processes, Springer, Berlin, 2003

11. Optional / additional reading (at the time of proposing study programme)

Baumgarten, C.: Mixture Formation in Internal Combustion Engines, Springer, Berlin. Heidelberg, 2006

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Ivica Šegulja, PhD	
Course title	Modeling maintenance of ship's propulsion system	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
1. Course objectives		
The main objective of this chapter is to give the students of doctoral study themat serve as the initial material for defining jednostavanog and scientifically based process modeling concepts maintenance of ship operation, which would be no difficulties could be applied in practice (shipping companies, shipyards).		
2. Course enrolment requirements		
3. Expected course learning outcomes		
The the students would be capable of defining simple and scientifically based process modeling concepts maintenance of ship operation, which could be applied in practice (shipping companies, shipyards)		
4. Course content		
1 The maintenance of the ship's propulsion, approaches to maintenance, maintenance of ship life cycle and structure maintenance costs. 2. Research Methods reliability, the reliability of the ship's systems and analysis of failures. 3. Method for setting and shaping the concept of maintenance. 4. Modeling maintenance: modeling ship's propulsion system, the definition of significant components, functional dismantling the basic functions and components, the type of actuator components, analysis of failure modes, modeling maintenance intervals, risk analysis and planning of spare parts.		
5. Teaching methods	☐ lectures X seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____
6. Comments		
7. Student's obligations		



8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	5,5	Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

10. Assigned reading (at the time of the submission of study programme proposal)

1. Vučinić, B., MA – CAD, Maintenance Concept Adjustment and Design, Delft, Faculty of Mechanical Engineering and Marine Technology, 1994.
2. Majdandžić N., Strategija održavanja i informacijski sustavi održavanja, Slavonski Brod, Strojarski fakultet, 1999.
3. Šegulja I., Bukša A., Tomas V., Održavanje brodskih sustava, Udžbenik Sveučilišta u Rijeci, Rijeka 2009.

11. Optional / additional reading (at the time of proposing study programme)

1. A. Bukša, Modeliranje održavanja brodskog porivnog sustava, Sveučilište u Rijeci, Pomorski fakultet u Rijeci, Rijeka 2005.
1. Tireli E., Bukša A., Miculinić R., Method for Adjustment and Design of the Shi'p Propulsion Maintenance Concept, The 7th International Conference on Engine Room Simulators, 14.-15. november 2005, Portorož, Slovenija.
2. Bukša A., Tudor M., Martinović D., Research of the Failure Incidences in the Diesel-engine Propulsion System, The 7th International Conference on Engine Room Simulators, 14.-15. november 2005, Portorož, Sloveni
3. Bukša A., Tudor M., Kralj P., Analiza kvarova brodskih redundantnih sustava, Pomorstvo, God. 18(2004).
4. Tudor, M., Bukša, A., Kralj, P., Održavanje brodskih sustava, Pomorstvo, god. 18(2004).
3. Šegulja, I., Tomas, V., Improvement of ship maintenance by applying the RCM method, ICTS 97, Portorož, 20. -21. November, 1997.
5. Pederson Sun, P., Development Towards the Intelligent Engine, 16th International Marine Propulsion Conference, London, 1994.
6. August, J., Applied Reliability-Centered Maintenance, PennWell, Oklahoma, 1999.
7. Pukite, J., Pukite, P., Modeling for Reliability Analysis, New York, Institute of Electronics Engineers, 1998.
8. Yoski Ozaki, An introduction to the ABS Guide for Propulsion Redundancy, Guide for Propulsion Redundancy, The Motor Ship, June 1997, pp. 101-112.
9. Chi – Chao Liu, A Comparison Between the Weibull and Lognormal Used to Analyze Reliability Data, Department of Manufacturing engineering and Operations, University of Nottingham, 1997.

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Assistant professor Josip Orović, PhD	
Course title	Ship's propulsion plants optimisation	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
The aim of this course is that doctoral students acquire the necessary knowledge for scientific and technical research in the field of ship's propulsion plants optimisation with emphasis on marine propulsion machinery, equipment and their systems. The course focuses on the application of theoretical methods, numerical solution of practical problems, simulation of various conditions in the marine engine room simulators, data analysis, mathematical modeling and practical application of the results obtained in the field of marine engineering.		
<i>2. Course enrolment requirements</i>		
<i>3. Expected course learning outcomes</i>		
- Define and analyse the parameters that affect the efficiency of each propulsion plant. - Simulate different conditions on engine room simulators and analyse the impact on efficiency and total cost of the plant. - Optimise the parameters of marine propulsion machinery, equipment and their systems. - Develop mathematical models for optimisation of ship's propulsion plants.		
<i>4. Course content</i>		
Energy balance of operating plants. Efficiency of marine propulsion machinery, equipment and their systems. Analysis of the interrelation of certain parameters on the efficiency and the total cost of the plant. Ship Energy Efficiency Management Plan (SEEMP). Simulation of different states on diesel engine, steam turbine and diesel-electric propulsion plant simulators. Optimisation of operating plants and individual processes within the plant. Mathematical models for optimisation of ship's propulsion plants.		
<i>5. Teaching methods</i>	☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____
<i>6. Comments</i>		



7. Student's obligations

Course attendance, research and experimental work, oral exam

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper		Experimental work	2
Written exam		Oral exam	1	Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

- Research and experimental work
- Oral exam

10. Assigned reading (at the time of the submission of study programme proposal)

- S.S. Rao: Engineering Optimization: Theory and Practice; John Wiley & Sons, Inc., 1996

11. Optional / additional reading (at the time of proposing study programme)

- A. Ravindran; K.M. Ragsdell; G.V. Reklaitis: Engineering optimization, Methods and Application; ; John Wiley & Sons, Inc., 2006
- Matlab: Optimization toolbox, User's Guide
- Instruction books

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Assistant professor Aleksandar Cuculić, PhD	
Course title	Battery and hybrid power plants on marine vessels	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
- Getting required knowledge for research in the field of battery and hybrid propulsion system on board marine vessels, as well as other systems with a significant share of fuel cells, batteries, super capacitors and energy storage technologies. - Introduction to the methods of battery and hybrid drives modelling and optimization with a focus on fuel saving, reduction of greenhouse gas emissions and increasing the power plant availability. - The final goal of the chapter is to enable doctoral students to contribute to the scientific component of the battery and hybrid vessels power system design.		
<i>2. Course enrolment requirements</i>		
<i>3. Expected course learning outcomes</i>		
- Familiarizing with basic concepts of battery and hybrid power plants on board marine vessels and theoretical basics of technologies used in above mentioned systems. - Learn the techniques of battery and hybrid system modelling and optimization by using appropriate software (Matlab/Simulink). - Applying of acquired knowledge for the purpose pre project defining of electrical power plant on board battery and hybrid powered vessels.		
<i>4. Course content</i>		
Theoretical concepts of the electrical power system on board battery and hybrid driven vessels. Types, characteristics and theoretical basis of electrochemical batteries, fuel cells, supercapacitors, and energy storage technologies. Optimizing of vessels power management system in order to increase the economic and environmental efficiency of the vessel and to maximize the utilization of electrical energy available from the battery and other sources. Modelling battery and hybrid propulsion systems using the Matlab and Simulink software. Project defining of electrical power systems on board vessels with battery and hybrid drives.		
<i>5. Teaching methods</i>	+ lectures + seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	+ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____



6. Comments							
7. Student's obligations							
Attendance (lectures or consultations), to conduct research and write a seminar paper, oral exam.							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation		Seminar paper	1	Experimental work	
Written exam		Oral exam	2	Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							
9. Assessment and evaluation of student's work during classes and on final exam							
- Attendance (lectures or consultations) - learning outcomes 1-5; 0,5 ECTS - Research and study work - learning outcomes 4:05; 2,5 ECTS - Oral examination - learning outcomes 1-5; 2 ECTS							
10. Assigned reading (at the time of the submission of study programme proposal)							
- Agrawal, A., Wies, R., Johnson, R.: Hybrid Electric Power Systems: Modelling, Optimization and Control, Akademiker Verlag, 2012. - Rahn, C.D., Wang, C.Y.: Battery systems engineering, Wiley, 2013. - O'Hayre, R., Cha, S. W., Collela, W., Prinz, F.B.: Fuel Cell Fundamentals 3rd Edition, Wiley, 2016 - Teaching materials and lecturer's published papers							
11. Optional / additional reading (at the time of proposing study programme)							
- Linden, D., Reddy, T.: Handbook of batteries third edition, McGraw Hill, 2002 - Gonzales, F. D., Sumper, A., Gomis-Bellmunt, O.: Energy storage in power systems, Wiley, 2016 - Papers published in relevant journals							
12. Number of assigned reading copies with regard to the number of students currently attending the course							
Title				Number of copies		Number of students	
13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences							
Student's feedback by means of survey organized by the University.							



Basic description		
Course coordinator	Full professor Boris Sviličić, PhD	
Course title	Maritime Electronics Micro- and Nano-Technologies	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
1. Course objectives		
The objective of this course is to familiarize students with advanced transistor and MEMS architectures and with their applications in maritime electronic navigational systems (ARPA/radar, GPS, ECDIS, AIS). The course is focused on the analysis of contemporary electronics micro- and nano-technologies and the knowledge development required to design novel electronic and MEMS devices, integrated circuits and system-on-chip for maritime applications.		
2. Course enrolment requirements		
-		
3. Expected course learning outcomes		
General knowledge acquisition in the domain of advanced transistor and MEMS technologies, architectures and applications in maritime navigation systems. Specific knowledge and skills acquisition for design and development of novel electronic devices for maritime applications.		
4. Course content		
Scaling of microelectronic devices. Power, voltage and current limitation for VLSI and ULSI circuits integration. Advanced transistor micro and nano technologies (SOI, Tri-Gate, DG, SON, FinFet). MEMS technology and integration in system-on-chip. Reliability analysis. Electronic devices and circuits characterisation using analytical modelling and computer simulations.		
5. Teaching methods	☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other _____
6. Comments	-	
7. Student's obligations		



8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	1,5	Experimental work	1
Written exam		Oral exam	1	Essay		Research	1
Project		Sustained knowledge check		Report		Practice	1
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Assesment on the final exam.

10. Assigned reading (at the time of the submission of study programme proposal)

1. P. Biljanović. "Poluvodički elektronički elementi", Školska knjiga, Zagreb 2001.
2. Y. Taur, T. Ning, "Fundamentals of Modern VLSI Devices", Cambridge University Press, 1998.
3. J-P. Colinge. "Silicon on Insulator Technology: Materials to VLSI", 2nd ed. Kluwer Academic Publishers, 1997.

11. Optional / additional reading (at the time of proposing study programme)

- Digital Integrated Circuits - A Design Perspective, 2nd ed. J.M. Rabaey, A. Chandrakasan, B. Nikolić Prentice Hall 2003.
- S. M. Sze. "Physics of Semiconductors", J. Wiley, New York, 1981.
- Publications of the course coordinator.

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
1.	1	-
2.	1	-
3.	1	-

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Associate professor Dubravko Vučetić, PhD	
Course title	Electric propulsion	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12+0+0

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
The Aim of course is the acquisition of relevant knowledge required for scientific research on the field of vessel electric propulsion systems and electric power systems with dominant or significant share of power electronic devices in total consumption in general, with the special interest on the analyses and measures for the improvement of the electric energy quality. Final aim of course is qualifying the doctoral candidate for his active contribution in scientific component of vessel electric power and electric propulsion systems preliminary design		
<i>2. Course enrolment requirements</i>		
<i>3. Expected course learning outcomes</i>		
Understand and use exploitation advantages of ship electric propulsion. Analyse, evaluate and optimize integrated electric propulsion system and subsystems. Knowledge of relevant rules and regulations. Understand electric energy quality influence on ship's electrical devices. Analyse voltage harmonic distortion in high voltage, low voltage and lighting electric power networks. Understand causes of distortions and electric energy quality indicators. Identify sources of non-sinusoidal currents on board a ship.		
<i>4. Course content</i>		
Exploitation advantages of electric propulsion. Analysis and evaluation of electric propulsion system subsystems. Meaning, causes of distortions and electric energy quality indicators. Sources of non-sinusoidal currents on board a ship. Influence of the electric energy quality on ship's electrical devices. Relevant rules and regulations. Analysis of voltage harmonic distortion in high voltage and low voltage electric power network. Analysis of non-linear loads in ship's lighting network. Analysis of voltage harmonic distortion in lighting network. Electric power system optimization.		
<i>5. Teaching methods</i>	☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____



6. Comments							
7. Student's obligations							
Seminar paper, oral exam							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation		Seminar paper	1,5	Experimental work	
Written exam		Oral exam	4	Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio							
9. Assessment and evaluation of student's work during classes and on final exam							
Course attendance (10%) Seminar paper 25%, Final exam 65%							
10. Assigned reading (at the time of the submission of study programme proposal)							
1. Vučetić D.; Električna propulzija, predavanja 2. Vučetić, D., Model optimizacije elektroenergetskog sustava trgovačkog broda s električnom propulzijom, doktorska disertacija, Pomorski fakultet u Rijeci, Sveučilište u Rijeci, Rijeka, 2006. 3. Vučetić, D., Tomas, V., Cuculić A., Electric Propulsion Optimization Model Based On Exploitation Profile and Energy Price, Brodogradnja, 62(2011)2, pp 130-135. 4. Vučetić D., Čekada I.; Eksploatacijske prednosti električne propulzije, Pomorstvo, 20, str. 129-145, Rijeka 2006.							
11. Optional / additional reading (at the time of proposing study programme)							
1. Vlahinić, I., Električni sistemi plovniha objekata, Sveučilište u Rijeci, Pomorski fakultet, Rijeka 2004. 2. Skalicki B., Grilec J., Brodski električni uređaji, Sveučilište u Zagrebu, FSB, Zagreb 2000. 3. J.Arrillaga et al, Power System Harmonic Analysis, John Willey&Sons Ltd, Chichester, 1998. 4. G.J.Wakileh, Power Systems Harmonics - Fundamentals, Analysis and Filter Design, Springer, Berlin, 2001. 5. W.E.Kazibwe, M.H.Sendaula, Electrical Power Quality Control Techniques, Springer, Berlin,1993.							
12. Number of assigned reading copies with regard to the number of students currently attending the course							
Title				Number of copies		Number of students	
1. Vučetić D.; Električna propulzija, predavanja				1			
2. Vučetić, D., Model optimizacije elektroenergetskog sustava trgovačkog broda s električnom propulzijom, doktorska disertacija, Pomorski fakultet u Rijeci, Sveučilište u Rijeci, Rijeka, 2006.				1			
3. Vučetić, D., Tomas, V., Cuculić A., Electric Propulsion Optimization Model Based On Exploitation Profile and Energy Price, Brodogradnja, 62(2011)2, pp 130-135.				1			
4. Vučetić D., Čekada I.; Eksploatacijske prednosti električne propulzije, Pomorstvo, 20, str. 129-145, Rijeka 2006.				1			
13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences							
Student's feedback by means of survey organized by the University.							



Basic description		
Course coordinator	Assistant professor Jasmin Ćelić, PhD	
Course title	Cooperative Intelligent Transport Systems	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> - to understand the intelligent transportation systems, analysing their advantages and disadvantages; describing systems for data processing, types and applications, the architecture and concept of the systems; analysing intelligent transportation systems' technologies; - to provide an understanding of the basic building blocks and techniques used in the delivery of cooperative ITS systems and services including the main communications and information backbones; - to provide an understanding of the building blocks of ITS systems and services and, through examples, critically examine a range of ITS deployments and the policies they are designed to support; - to understand autonomous and connected vehicle technology in vehicles and between infrastructure and vehicles, real-time sensing of infrastructure, artificial intelligence for data analysis and information dissemination; - to understand various applications/systems of ITS on the local, state, national and international levels like advanced traffic control system, automatic road enforcement (variable speed limits, electric toll collection), cooperative public transportation system, transportation demand management, cooperative parking management system, multi-modal traveler information systems, etc; - to synthesize and analyse ITS policy and understand the technology challenges; - to develop hands on experience of ITS concepts by applying them to local and global scenarios. - to understand and interpret information presented in verbal, numerical and graphical form, and also to do the information transfer; - to provide material for doctoral students to revise, consolidate and extend their skills in solving numerical and practical tasks in development of intelligent transportation systems; - to develop doctoral students' reading skills to enable them to scan the text for the specific information, to interpret the text and to deduce the meaning from the context.
<i>2. Course enrolment requirements</i>
<i>3. Expected course learning outcomes</i> - define basic principles of ITS; - explain and point principles of network management; - describe cooperative ITS development; - explain and present procedures of implementing cooperative ITS in traffic infrastructure;



- explain reasons for and benefit of implementing cooperative ITS;
- describe and present working principles of vehicle electronic systems;
- present navigation usage in ITS and monitoring of traffic using GNSS;
- describe telematic solution of cooperative traffic systems;
- present principles of automatic monitoring for the purpose of road safety;
- define conditions for development and implementation of cooperative ITS services.

4. Course content

Fundamentals of intelligent transportation systems; ITS standards; System theory and cybernetics basics; Physical and logical ITS architecture; development of ITS and related technologies; Implementation of intelligent transportation systems in traffic infrastructure; Reasons for and benefit of implementing C-ITS; C-ITS communication technologies; Modelling and simulation of traffic; Expert systems and artificial intelligence in transportation systems; C-ITS and control systems; Vehicle electronic systems; Creating environment for C-ITS implementation; Navigational systems; Vehicle monitoring and diagnostics; Maintenance expert systems; Advanced C-ITS.

5. Teaching methods	☒ lectures	☒ individual assignment
	☒ seminars and workshops	☐ multimedia and network
	☐ exercises	☐ laboratories
	☐ long distance education	☐ mentorship
	☐ fieldwork	☐ other _____

6. Comments

7. Student's obligations

Attendance (lectures or consultations), to conduct research and write a seminar paper, oral exam.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	1	Experimental work	
Written exam		Oral exam	2	Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

- Attendance (lectures or consultations) - learning outcomes 1-5; 1 ECTS
- Research and study work - learning outcomes 4:05; 3 ECTS
- Oral examination - learning outcomes 1-5; 2 ECTS

10. Assigned reading (at the time of the submission of study programme proposal)

1. "Intelligent Transportation Primer", Institute of Transportation Engineers, 2000.,
2. Bob Williams: "Intelligent Transport Systems Standards", Artech House, 2008.

11. Optional / additional reading (at the time of proposing study programme)

1. A. Zilouchian, M. Jamshidi: "Intelligent Control Systems Using Soft Computing Methodologies", CRC Press, London, 2001.,
2. Ronald K. Jurgen, "Navigation and Intelligent Transportation Systems", str 211-290, Society of Automotive Engineers, Inc. 1998.,
3. M. Gupta, N. K. Sinha: "Intelligent Control Systems - Concept and Applications", IEEE Press, 1995.



4. Journals:

- a) Traffic Technology International, Transportation research (part A and B);
- b) IEEE Vehicular Technology Magazine;
- c) IEEE Intelligent Transportation Systems Magazine;
- d) IEEE Transactions On Intelligent Transportation Systems;
- e) Journal of Intelligent Transportation Systems

5. Internet:

- a) <https://www.pcb.its.dot.gov/eprimer.aspx>
- b) <http://www.iteris.com/itsarch/index.htm>
- c) <http://www.itsoverview.its.dot.gov/>
- d) <http://www.fhwa.dot.gov/publications/publicroads/14marapr/index.cfm>
- e) http://www.ornl.gov/ORNLReview/v33_3_00/smart.htm
- f) <http://www.etsi.org/technologies-clusters/technologies/intelligent-transport>

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Mato Tudor, PhD	
Course title	Modelling the Integrated Ship's Information System	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
1. Course objectives		
Defining and modelling the integrated ship's processes information monitor system. Acquiring knowledge on how to integrate applications into the information system, and the method of analysis system to the basic functions. Designing a computer system tolerant to faults. The inclusion of computers in various technological processes of the ship and their integration into a unique information system of the ship.		
2. Course enrolment requirements		
No		
3. Expected course learning outcomes		
– Explain levels of information system – Describe the flow of information – Describe the concept of function blocks – Explain the design of a computer system tolerant to faults – Describe the process of developing an integrated information system		
4. Course content		
The process of development of an integrated information system. The flow of information. Modelling of the Information System. Levels of the information system. Applications of the information system of the ship. Services of the Information System. Functional description of the application. The concept of a functional block. Improving the security of the use of the concept of function blocks. Designing a computer system tolerant to faults. Techniques for validation and accuracy		
5. Teaching methods	x lectures x seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____
6. Comments		
7. Student’s obligations		



8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	3,5	Experimental work	
Written exam		Oral exam	2	Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

10. Assigned reading (at the time of the submission of study programme proposal)

Tudor, Mato, Modeliranje integriranog informacijskog sustava nadzora brodskih procesa s gledišta održavanje, Doktorska disertacija, Sveučilište u Rijeci, Pomorski fakultet u Rijeci, Rijeka 2006.
Wixom, Dennis, Wixom Roth, System Analysis and Design, Third Edition; Wiley, 2006.

11. Optional / additional reading (at the time of proposing study programme)

Ralph Stair; George Reynolds, Principles of Information Systems, Course technology, Eleven Edition, 2013.
Rainer, R. Kelly; Cegielski, Casey G. Introduction to Information Systems: Enabling and Transforming Business, Third Edition, 2009.

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students
Tudor, Mato, Modeliranje integriranog informacijskog sustava nadzora brodskih procesa s gledišta održavanje, Doktorska disertacija, Sveučilište u Rijeci, Pomorski fakultet u Rijeci, Rijeka 2006.	1	-
Wixom, Dennis, Wixom Roth, System Analysis and Design, Third Edition; Wiley, 2006.	1	-

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Vinko Tomas, PhD	
Course title	New Technologies in Diagnostics and Control Systems	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
1. Course objectives		
This course is intended to provide the students with knowledge in design and implementation of new technologies and techniques in diagnostics and automatic process control and also its application on ships.		
2. Course enrolment requirements		
None		
3. Expected course learning outcomes		
A student completing this course unit should have an understanding of how new technologies and techniques in diagnostics and automatic process control are designed, built and implemented. Also, a student should be able to work effectively as a member of a group. A student completing this course unit should have developed an knowledge of implementation modes and methodologies of application of new technologies and techniques of diagnostics and control.		
4. Course content		
Introductions in diagnostics and automatic process control with fault tolerance. Dynamic system models, identification. Structural system analysis. Diagnosis and control of linear continuous and discrete systems on examples from maritime affairs. Hardware (HW) and analytical (SW) redundancy in control and diagnostics. Sensor Fusion and networking. Implementation of new technologies and techniques in diagnostics and automatic process control (fuzzy logic, expert systems, neural networks, genetic programming, object-oriented programming, pattern recognition, etc). Examples of application of new technologies on ship systems and processes, as well as wider in maritime affairs.		
5. Teaching methods	☒ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____
6. Comments	-	
7. Student's obligations		
Course attendance (consultations), solving project assignment, preparing and presenting the seminar.		



8. Evaluation of student's work

Course attendance	0.5	Activity/Participation		Seminar paper	1,5	Experimental work	
Written exam		Oral exam		Essay		Research	1
Project	3	Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Course attendance (consultations), solving project assignment, preparing and presenting the seminar.

10. Assigned reading (at the time of the submission of study programme proposal)

1. Vinko Tomas; Napredne tehnologije u dijagnostici i upravljanju - primjena u pomorstvu, Lecture Notes, Faculty of Maritime Studies Rijeka, University of Rijeka, Rijeka, Croatia.
2. Jian-Qiao Sun, Qian Ding; Advances in Analysis and Control of Time-Delayed Dynamical Systems, 2013. World Scientific Publishing Co Pte Ltd.
3. Blanke, M., Kinnaert, M., Lunze, J., & Staroswiecki, M.; (2015). *Diagnosis and Fault-tolerant Control*, 3rd Edition. (3. edition ed.)

11. Optional / additional reading (at the time of proposing study programme)

1. Dingyü Xue, Yang Quan Chen; Modeling, Analysis and Design of Control Systems in MATLAB and Simulink, 580pp Nov 2014, World Scientific Publishing Co Pte Ltd.
2. Tao, G.; Adaptive Control Design and Analysis, John Wiley and Sons, New York, 2003.
3. Bartłomiej Dyniewicz, Robert Konowrocki, Czesław I. Bajer; Intelligent adaptive control of the vehicle-span/track system, <http://dx.doi.org/10.1016/j.ymssp.2014.12.007>

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students
Vinko Tomas; Napredne tehnologije u dijagnostici i upravljanju - primjena u pomorstvu, Lecture Notes, Faculty of Maritime Studies Rijeka, University of Rijeka, Rijeka, Croatia.	e-learning	1-3
Jian-Qiao Sun, Qian Ding; Advances in Analysis and Control of Time-Delayed Dynamical Systems, 2013. World Scientific Publishing Co Pte Ltd.	Available online	1-3
Blanke, M., Kinnaert, M., Lunze, J., & Staroswiecki, M.; (2015). <i>Diagnosis and Fault-tolerant Control</i> , 3rd Edition. (3. edition ed.)	2	1-3

1.1. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Boris Sviličić, PhD	
Course title	Maritime Cyber Risk Management	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
The objective of this course is to familiarize students with cyber risks related to maritime systems on the basis of the guidelines of the <i>International Maritime Organisation (IMO MSC Guidelines on Maritime Cyber Risk Management)</i>. The term maritime systems includes: ship bridge navigation and communications systems (ECDIS, ARPA, AIS...), propulsion and machineries (control, monitoring and alarm systems for the driver, shaft, gear, propeller...), power generation and distribution (control, monitoring and alarm systems for the engine, turbine, generator...), cargo management systems (control, monitoring and alarm systems for the cargo pumps, valve...), access control systems (surveillance systems, CCTV systems, electronic personnel-on-board systems, shipboard security alarm systems...), passenger servicing and management systems (boarding and access control, property management, electronic health records, flooding detection systems...), vessel traffic management and information system (VTMIS)... The course is focused on the detection and prevention of potential cyber risks that are specific to the cyber maritime systems, in order to develop new systems with higher cyber security level.		
<i>2. Course enrolment requirements</i>		
-		
<i>3. Expected course learning outcomes</i>		
General knowledge acquisition in the multidisciplinary domain of recognition and management of cyber risks that are specific for the maritime systems. Specific knowledge and skills acquisition for cyber security improvement and enhancement of the maritime systems.		
<i>4. Course content</i>		
IMO MSC guidelines on maritime cyber risk management. Cyber risks of the maritime systems. Analysis and classification of cyber threats and vulnerabilities. Mechanism and measures for cyber risks management. Security policies. Identification and authorization. Physical security. Fail-over systems and redundant architectures. Data encryption. Privacy protection. Malicious code detection. Intrusion detection system. Procedure for recognizing the signs of cyber risks exploitation. Cyber risk assessment of the maritime systems.		
<i>5. Teaching methods</i>	☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other _____



6. Comments							
7. Student's obligations							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation		Seminar paper	1,5	Experimental work	1
Written exam		Oral exam	1	Essay		Research	1
Project		Sustained knowledge check		Report		Practice	1
Portfolio							
9. Assessment and evaluation of student's work during classes and on final exam							
Assesment on the final exam.							
10. Assigned reading (at the time of the submission of study programme proposal)							
1. M. Egan, T. Mather. "The Executive Guide to Information Security: Threats, Challenges, and Solutions", Addison – Wesly, 2004. 2. R. Anderson. "Security Engineering", J. Wiley & Sons, 2001. 3. ISO 27002 (ISO 17799), "Information Technology - Security Techniques - Code of Practice for Information Security Management", Standards Direct - International Standards and Documentation, 2007.							
11. Optional / additional reading (at the time of proposing study programme)							
• H. Tipton, M. Krause. "Information security Management", Auerbach, 1998. • J. Crume. "Inside Internet Security", Addison – Wesly, 2000. • Publications of the cours coordinator.							
12. Number of assigned reading copies with regard to the number of students currently attending the course							
Title			Number of copies		Number of students		
1.			1		-		
2.			1		-		
3.			1		-		
13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences							
Student's feedback by means of survey organized by the University.							



Basic description		
Course coordinator	Associate professor Irena Jurdana, PhD	
Course title	Optical technologies in maritime industry	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
The course aims to enable students to become qualified for understanding developments and application of optical technology in maritime industry. The course presents selected topics in the field of optical communication and optical sensor networks. The course is focused on training students for independent analysis, design, modelling and constructing data transmission systems, measurement systems and submarine communications networks based on fiber optic technology. This course builds on previously acquired basic knowledge of fiber-optic communications, principles of propagation of light, optical passive and active components and measuring methods and devices used in optical communication and sensor networks.		
<i>2. Course enrolment requirements</i>		
-		
<i>3. Expected course learning outcomes</i>		
Understanding the elements, structure, operation of optical communication and sensor system in maritime industry. To recognise, define and give examples of new trends in technology & recent developments in optical technology. Ability of working on development and implementation of different applications of optical technology in maritime industry. Ability of using computer programs for modelling optical systems, analysing the results and applying such models in real systems.		
<i>4. Course content</i>		
Communication networks in the ship's systems by using optical technology: the application of a mathematical model, reliability. Optical sensor systems for measuring electrical and non-electrical values: components, measurement methods and devices. Electronic navigation devices based on fiber optic technology. Wireless fiber optic systems (Free Space Optics). Transmission of radio-signal over optical fiber (Radio-over-Fiber). Submarine optical networks: construction, safety and protection, the impact on the marine environment, technical and legal aspects.		
<i>5. Teaching methods</i>	☒ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____
<i>6. Comments</i>		



7. Student's obligations

The presence at lectures (consultations), working on the individual assignment, preparation and presentation of seminar paper. Publication of the results of research in the international scientific conference or journal.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	2,5	Experimental work	
Written exam		Oral exam		Essay		Research	1
Project	2	Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Supervising attendance at classes (consultation), supervising continuity of the work on individual assignment, research and seminars. Presentation of seminar paper to committee whose members are teachers at the doctoral study. Positively evaluated reviewed published work on international scientific conference or journal.

10. Assigned reading (at the time of the submission of study programme proposal)

- [1] G.P. Agrawal: Fiber-Optic Communication Systems, John Wiley, 2010.
- [2] J.M. Lopez-Higuera (editor): Optical Fibre Sensing Technology, John Wiley & Sons, 2002.
- [3] R. Ramaswami, K.N. Sivarajan, G.H. Sasaki: Optical Networks: A Practical Perspective, 3rd ed., Elsevier, 2010.
- [4] J. Chesnoy: Undersea Fiber Communication Systems, Academic Press, 2002.
- [5] J.P.Dakin, Handbook of Optoelectronics, Taylor&Francis Group, 2006.

11. Optional / additional reading (at the time of proposing study programme)

- [1] W.D. Grover, Mesh-based Survivable Networks: Options and strategies for Optical, MPLS, SONET and ATM networking, Prentice Hall PTR, 2004.
- [2] J.P. Vasseur, M. Pickavet, P. Demeester, Network recovery: Protection and Restoration of Optical, SONET-SDH, IP, and MPLS, Elsevier, 2004.
- [3] K. van Dokkum, Ship Knowledge: A Modern Encyclopedia, Dokmar, Netherland, 2003.
- [4] A. Selvarajan, S. Kar, T. Srinivas: Optical Fiber Communications: Principles and Systems, McGraw-Hill, 2006.
- [5] M.Ilyas, H.Mouftah, Optical communication Networks, CRC Press, 2003.

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students
G.P. Agrawal: Fiber-Optic Communication Systems, John Wiley, 2010.	1	1
J.M. Lopez-Higuera (editor): Optical Fibre Sensing Technology, John Wiley & Sons, 2002.	1	1
R. Ramaswami, K.N. Sivarajan, G.H. Sasaki: Optical Networks: A Practical Perspective, 3rd ed., Elsevier, 2010.	1	1
J. Chesnoy: Undersea Fiber Communication Systems, Academic Press, 2002.	1	1
J.P.Dakin, Handbook of Optoelectronics, Taylor&Francis Group, 2006.	1	1

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Vinko Tomas, PhD Assistant professor Marko Valčić, PhD	
Course title	Guidance and motion control of marine vehicles	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i>
Acquiring general and advanced knowledge and skills that are required to carry out mathematical modelling and simulations related to guidance, navigation, and motion control of marine vehicles.
<i>2. Course enrolment requirements</i>
None.
<i>3. Expected course learning outcomes</i>
Ability to set a mathematical formulation of the vessel kinematics and dynamics coupled with environmental loads. To create specific models for autopilots and dynamic positioning. To be able to model guidance systems for target and trajectory tracking, as well as path following systems. Ability to design various vessel observers and to analyse their performance. To couple vessel observers with usual control strategies. To design sensor fusion algorithms. To model actuators and to perform constrained optimal thrust allocation. To analyse and to evaluate thrust loss effects. To be able to understand and implement selected adaptive and intelligent control strategies for weather optimal positioning and route planning. To understand modern concepts of autonomous navigation. To analyse and compare different strategies related to guidance and motion control of marine vehicles. To perform risk assessment for different guidance and motion control strategies.
<i>4. Course content</i>
Reference frames and kinematics of marine vehicles. Dynamics of marine vehicles. Manoeuvring theory and standard manoeuvring tests. Models for ships, offshore structures and underwater vehicles: autopilot models for heading control, dynamic positioning models, manoeuvring models, equations of motion. Environmental models: wind, waves and ocean current models. Motion control: autopilots, dynamic positioning and position mooring systems, waypoint tracking and path-following control systems. Guidance systems: target and trajectory tracking, path following systems. Sensor and navigation systems: testing of signals and handling of redundant measurements, low-pass and notch filtering, state estimation, discrete-time Kalman filter, extended Kalman filter, intelligent identification and estimation, sensor fusion. Motion control systems: PID control, linear quadratic optimal control (LQR), nonlinear control. Propulsion systems: power systems, power and energy management, propellers and thrusters, control problem formulation, optimal thrust allocation, thrust loss effects. Adaptive and intelligent control of marine vehicles. Weather optimal positioning and optimal weather route planning. Decision support systems in guidance and navigation of marine vehicles. Autonomous marine vehicles, subsystems and control: autonomous navigation and risk assessment. Intelligent collision avoidance for autonomous marine vehicles.



5. Teaching methods	☒ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____					
6. Comments	-						
7. Student's obligations							
Course attendance (consultations), solving project assignment, preparing and presenting the seminar.							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation		Seminar paper	1,5	Experimental work	
Written exam		Oral exam		Essay		Research	1
Project	3	Sustained knowledge check		Report		Practice	
Portfolio							
9. Assessment and evaluation of student's work during classes and on final exam							
Course attendance (consultations), project research work, preparation and presentation of assigned seminar.							
10. Assigned reading (at the time of the submission of study programme proposal)							
Valčić, M., Tomas, V., 2017. Guidance and Motion Control of Marine Vehicles. Lecture Notes, Faculty of Maritime Studies Rijeka, University of Rijeka, Rijeka, Croatia. Fossen, T.I., 2011. Handbook of Marine Craft Hydrodynamics and Motion Control. John Wiley & Sons Ltd, Chichester, UK. Sørensen, A.J., 2013. Marine Control Systems: Propulsion and Motion Control of Ships and Ocean Structures. Lecture Notes, Department of Marine Technology, NTNU, Trondheim, Norway. Available online: http://folk.ntnu.no/assor/publications/marcyby.pdf Triantafyllou, M.S., Hover, F.S., 2003. Maneuvering and Control of Marine Vehicles. Lecture notes, Department of Ocean Engineering, MIT, Cambridge, Massachusetts, USA. Available online: https://ocw.mit.edu/courses/mechanical-engineering/2-154-maneuvering-and-control-of-surface-and-underwater-vehicles-13-49-fall-2004/lecture-notes/1349_notes.pdf							
11. Optional / additional reading (at the time of proposing study programme)							
Fossen, T.I., 2002. Marine Control Systems: Guidance, Navigation, and Control of Ships, Rigs and Underwater Vehicles. Marine Cybernetics, Trondheim, Norway. Do, K.D., Pan, J., 2009. Control of Ships and Underwater Vehicles: Design for Underactuated and Nonlinear Marine Systems. Springer, London, UK. Wadoo, S., Kachroo, P., 2010. Autonomous Underwater Vehicles: Modeling, Control Design and Simulation. CRC Press, Taylor and Francis Group, Boca Raton, FL, USA. El-Hawary, F. (Ed.), 2001. The Ocean Engineering Handbook. CRC Press LLC, Boca Raton, FL, USA. Dhanak, M.R., Xiros, N.I. (Eds.), 2016. Springer Handbook of Ocean Engineering. Springer, Heidelberg, Germany.							



12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Valčić, M., Tomas, V., 2017. Guidance and Navigation of Marine Vehicles. Lecture Notes, Faculty of Maritime Studies Rijeka, University of Rijeka, Rijeka, Croatia.	e-learning	1-3
Fossen, T.I., 2011. Handbook of Marine Craft Hydrodynamics and Motion Control. John Wiley & Sons Ltd, Chichester, UK.	2	1-3
Sørensen, A.J., 2013. Marine Control Systems: Propulsion and Motion Control of Ships and Ocean Structures. Lecture Notes, Department of Marine Technology, NTNU, Trondheim, Norway. http://folk.ntnu.no/assor/publications/marcyb.pdf	Available online	1-3
Triantafyllou, M.S., Hover, F.S., 2003. Maneuvering and Control of Marine Vehicles. Lecture notes, Department of Ocean Engineering, MIT, Cambridge, Massachusetts, USA. https://ocw.mit.edu/courses/mechanical-engineering/2-154-maneuvering-and-control-of-surface-and-underwater-vehicles-13-49-fall-2004/lecture-notes/1349_notes.pdf	Available online	1-3

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Assistant professor Borna Debelić, PhD	
Course title	Maritime Domain Allocation and Coastal Zone Management	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> The basic objective is to familiarize students with actual scientific knowledge about the characteristics of coastal zone management and the issues of the allocation of the maritime domain in the context of recent research and with the link to the real practice. To provide an overview of current issues that arise in the practice of integrated coastal zone management and maritime domain management with the elaboration of selected case studies, in terms of theoretical concepts that modern science offers as a potential for overcoming the detected problems.
<i>2. Course enrolment requirements</i> No additional requirements
<i>3. Expected course learning outcomes</i> It is expected that students after passing the exam for the course Maritime Domain Allocation and Coastal Zone Management can: – Correctly interpret theoretical framework and the characteristics of allocation issues and the actions of the institutions – Describe different features and scope of economic governance and interpret allocation of resources activities and the underlying mechanisms – Describe and interpret the application of game theory to the allocative processes – Correctly interpret categories of goods and allocative specificities, as well as the issue of collective action and economic governance – Perform and analyse different possibilities of application of the theory of public and social choice on explanations of allocative function – Interpret fundamental economic determinants of maritime domain and interpret collective action characteristics of the allocative problems of the maritime domain – Correctly interpret allocation mechanisms of the maritime domain and the role of institutions in the allocation of the maritime domain – Describe economic significance of the allocation of the maritime domain and coastal zone management, and apply techniques of assessing and evaluating empirical conditions – Conduct and interpret research tasks in the field of coastal zone management



4. Course content

The theoretical framework and the characteristics of allocation issues and the actions of the institutions. The theory of institutions in terms of allocative function. Features and scope of economic governance. The allocation of resources and the underlying mechanisms. The application of game theory to the allocative processes. Possibilities of application of the theory of public and social choice on explanations of allocative function. Categories of goods and allocative specificities. The issue of collective action and economic governance. The fundamental economic determinants of maritime domain. Collective action characteristic of the allocative problems of the maritime domain. Allocation mechanisms of the maritime domain. The role of institutions in the allocation of the maritime domain. The economic significance of the allocation of the maritime domain and coastal zone management. Important international experiences in the field of coastal zone management and maritime domain management. Options for improving the allocation of the maritime domain and coastal zone management.

5. Teaching methods	☒ lectures	☒ individual assignment
	☒ seminars and workshops	☐ multimedia and network
	☐ exercises	☒ laboratories
	☐ long distance education	☒ mentorship
	☐ fieldwork	☐ other _____

6. Comments

7. Student's obligations

1. Actively participate in class
2. Development of project task
3. Implementation of evaluation research for the project task
4. Preparing paper that presents the research results of the project task
5. Laying of written and oral final exam

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation	0,5	Seminar paper	1	Experimental work	1
Written exam		Oral exam	1	Essay		Research	1
Project	1	Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

The work of students in the course will be evaluated and assessed during classes. The total number of points a student can achieve is 100 (assessed activities are indicated in the table).

10. Assigned reading (at the time of the submission of study programme proposal)

1. Debelić, B.: Racionalizacija mehanizma alokacije pomorskog dobra Republike Hrvatske: doktorska disertacija, Rijeka, 2013.
2. Ostrom, E.: Upravljanje zajedničkim dobrima: Evolucija institucija za kolektivno djelovanje, Naklada Jesenski i Turk, Zagreb, 2006.
3. Vojković, G.: Pomorsko dobro i koncesije. Hrvatski hidrografski institut., Split, 2003.
4. Bolanča, D. et al.: Pomorsko dobro, Inženjerski biro, Zagreb, 2005.



11. Optional / additional reading (at the time of proposing study programme)

1. Debelić, B.: Agency Theory and a Concession Relation in Ports Open to Public Traffic in the Function of Empowerment of Entrepreneurial Initiatives, *Pomorstvo: Scientific Journal of Maritime Research*, 27 (1), 2013., p. 225-246
2. Ostrom, E.: Beyond Markets and States: Polycentric Governance of Complex Economic Systems. *American Economic Review*, 100 (3), 2010., p. 641–672.
3. Petak, Z.: Politička ekonomija kolektivnog odlučivanja: doprinos Buchanana i Tullocka. *Politička misao*, 36 (3), 1999., p. 71–88.
4. Williamson, O. E.: The Economics of Governance. *American Economic Review*, 95 (2), 2005., p. 1–18.

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Debelić, B.: Racionalizacija mehanizma alokacije pomorskog dobra Republike Hrvatske: doktorska disertacija, Rijeka, 2013.	5	
Ostrom, E.: Upravljanje zajedničkim dobrima: Evolucija institucija za kolektivno djelovanje, Naklada Jesenski i Turk, Zagreb, 2006.	5	
Vojković, G.: Pomorsko dobro i koncesije. Hrvatski hidrografski institut., Split, 2003.	5	
Bolanča, D. et al.: Pomorsko dobro, Inženjerski biro, Zagreb, 2005.	5	

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Alen Jugović, PhD	
Course title	Economics of Infrastructure projects in port system	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> The study of the theory and practice of managing infrastructure projects in our country and the world with special emphasis on the infrastructure of port projects financed by international institutions (World Bank, European Bank for Reconstruction and Development, the EU funds, etc.), Domestic institutions (from the budget, the Croatian National Bank and others.) and private entities. At the same time, particular emphasis placed on the effects that such projects, but also the ports themselves, create on the local, county and state level.
<i>2. Course enrolment requirements</i>
<i>3. Expected course learning outcomes</i> 1. Connect the financing of port infrastructure and the functionality of the port system in view of the limitations of technical resources and port infrastructure 2. Stand out and describe the types and models of financing port infrastructure 3rd Measure the effectiveness of a particular model of financing 4. Identify the importance of budgetary funds in the total revenues of port authorities to prove whether he is related to the effectiveness of operations of port authorities. 5th compare the models of governance with the removal of shortcomings to each function of the port authority as a manager seaports achieve maximum social and economic benefit.
<i>4. Course content</i> - The importance of port infrastructure in the port, the city, the region and the entire economy - Planning the development of port infrastructure: short, medium and long-term plans - Preparation of infrastructure projects - Market Analysis - Financing infrastructure: international, national and private sources of capital - specificity / advantages and disadvantages (Identification of required capital. The determination of liabilities to sources of capital. Budgeting as an instrument of project management.) - Examples of financing port infrastructure projects in Croatia in the ports of particular importance, in the ports of county and local importance - Economic impacts of port investments: micro and macro effects. - The role of management in the implementation of port investment.



5. Teaching methods		☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☒ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____	
6. Comments					
7. Student's obligations					
Attending lectures and field work. Examination through activities in class and final oral exam.					
8. Evaluation of student's work					
Course attendance	0,5	Activity/Participation		Seminar paper	Experimental work
Written exam		Oral exam	1	Essay	Research
Project		Sustained knowledge check		Report	Practice
Portfolio		Article	3,5		
9. Assessment and evaluation of student's work during classes and on final exam					
The student is evaluated through activities in lectures, research and dedicated article (essay) and final oral exam.					
10. Assigned reading (at the time of the submission of study programme proposal)					
1.) Jugović, Alen: Upravljanje morskom lukom, Rijeka : Pomorski fakultet; 2012. (sveučilišni udžbenik) 2.) Wayne-K-Talley: Port Economics, Routledge, Taylor and Francis Group, London & New York, 2009. 3.) Cullinane, Wayne & Talley, Kevin: Port Economics, Jai Press (elsevier), 2006.					
11. Optional / additional reading (at the time of proposing study programme)					
1.) Coto-Millán, Pablo, Pesquera, Miguel Angel, Castanedo, Juan: Essays on Port Economics, 2010, XVIII. 2.) Stampford, M: Maritime Economics – third edition, Routledge, Taylor and Francis Group, London & New York, 2009.					
12. Number of assigned reading copies with regard to the number of students currently attending the course					
Title		Number of copies		Number of students	
Jugović, Alen: <u>Upravljanje morskom lukom</u> , Rijeka, Pomorski fakultet, 2012.		50		20	
Stampford, M: Maritime Economics – third edition, Routledge, Taylor and Francis Group, London & New York, 2009.		5		20	
13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences					
Student's feedback by means of survey organized by the University.					



Basic description		
Course coordinator	Associate professor Ana Perić Hadžić, PhD	
Course title	Economy of Public Private Partnerships	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION

1. Course objectives

The basic goal of the course is transmitted to doctoral students the latest knowledge and insights regarding the features of public-private partnerships as a model of financing the public sector that is in the world emerged as a new and specific way of economic development. The partnership includes agreements between government, private sector, NGOs and other actors of civil society and with him regarding the application of the institution of good governance that contain recognizable (transparent) processes in terms of sustainable development. In addition to the primary objective, the other objectives of the course are to enable doctoral students understanding and reflection:

- way of economic - development of solving those problems in society that the public sector alone do not have possibility (financial), the private sector has no interest in self-invest (lack of return on invested funds), and must be respected the interests of the civil sector
- theoretical - political links, motives and objectives, risk, and interest in connecting partners in public-private partnerships
- modern trends of development of the port sector through the model of public-private partnerships such as concessions, greenfield investments and contracts on the operational management of the project
- concrete examples that have emerged from recent research doctoral enable to present conclusions regarding the advantages and disadvantages of the application of public private partnership in the world and especially in the Republic of Croatia.

2. Course enrolment requirements

No special requirements

3. Expected course learning outcomes

After finishing the course students will be able:

- To interpret new knowledge through research and demonstrate a systematic understanding of areas of the college, and conduct research skills and methods related to area of research cooperation between public and private sectors.
- To demonstrate the ability to understand, design, implementation and customization of serious research process, thus the fond of knowledge about the specific consideration of economic development based on partnership of public and private sector, the student confirms publishing their results in recognized publications.
- Acquire a capacity for critical analysis, evaluation, assessment and synthesis of existing and new ideas



on ways of linking public and private sectors.

- To peers, throughout the scientific community and the wider community to discuss their area of expertise.
- In academic and professional contexts promote technological, social and cultural progress in the knowledge society through the motions of public-private partnerships that are beneficial to the whole society.

4. Course content

Important characteristics of the partnership of public and private sector. Theoretical, economic and political links between PPPs. Areas of classic application of public-private partnership models. Advantages and disadvantages of financing through public private partnerships. Economic motives and participants of connecting public and private sectors. Models and forms of cooperation between public and private sector. The risks of linking public and private sectors. The role of the European Union and other international organizations in projects of public-private partnerships. Analysis and evaluation of the development of public-private partnerships in the world's seaports. World practice in the application of the public-private partnership in the systems of sea ports. Public-private partnership in the system of sea ports of the Republic of Croatia. The legal framework applying public-private partnership in the port system of the Republic Croatia. Luka Rijeka - example (not) successful projects. Criteria decision making to help in decision-making on public private partnerships.

5. Teaching methods	☒ lectures	☒ individual assignment
	☒ seminars and workshops	☐ multimedia and network
	☐ exercises	☐ laboratories
	☐ long distance education	☒ mentorship
	☐ fieldwork	☐ other
		simulators_____

6. Comments	It is expected that students who enrol in this course are experts from
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7. Student's obligations

Student requirements along attendance, seminars and workshops are based on independent tasks related to research current topics in the field of public-private partnerships and the publication or presentation of his research before the scientific and professional community.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	2	Experimental work	
Written exam		Oral exam	1	Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio		Publication or presentation of research					

9. Assessment and evaluation of student's work during classes and on final exam

The learning outcomes are validated and evaluated through the monitoring of students' work on the study, the results of research and the manner and quality of the publication or presentation of research.

10. Assigned reading (at the time of the submission of study programme proposal)

1. Yescombe E.R.: Javno-privatno partnerstva, Načela politike i financiranje, MATE d.o.o., Zagreb, 2010.
2. Perić Hadžić, A., Jugović, A., Perić, M.: Criteria for the management partnership model in Croatian seaports, Economic Research-Ekonomska Istraživanja Vol. 28 , Iss. 1,2015, 226-242, DOI: 10.1080/1331677X.2015.1041775, 2015 Impact Factor: 0.466,



<http://dx.doi.org/10.1080/1331677X.2015.1041775>

3. Perić Hadžić, A.: Javno-privatno partnerstvo u hrvatskim morskim lukama, Pomorstvo: Scientific Journal of Maritime Research, Vol.26 No.1 Lipanj 2012., str. 113-137.
4. Nikšić, M, Perić Hadžić, A.: Uloga Europske investicijske banke u javno-privatno partnerstvo, grupa autora, Javno-privatno partnerstvo; turizam, europska i svjetska iskustva, FINTRADE & TOURS d.o.o., Rijeka, 2007.
5. Čišić, D., Perić, A.: Primjena modela javno-privatnog partnerstva na razvoj luka, Pomorstvo, Pomorski fakultet u Rijeci, 2005., prethodno priopćenje, p. 101-113.

11. Optional / additional reading (at the time of proposing study programme)

1. Developing Best Practice for Promoting Private Sector Investment in Infrastructure, Ports, Asian Development Bank, 2000., www.adb.org
2. On Public Financing and Charging Practices in the Community Sea Port Sector, Commission staff Working document, Commission of the European Communities, Brussels, 2001.
3. Haarmeyer D., Yorke, P.: Port Privatization: An International Perspective, Policy study No. 156, April, 1993.
4. Green Paper on Public – Private Partnership and Community Law on Public Contracts and Concessions, Commission of the European Communities, Brussels, 30.4.2004. COM (2004) 327 final
5. Juričić, D., Veljković, D.: Financiranje kapitalnih projekata lokalnog javnog sektora, Ekonomski fakultet Rijeka, Vitagraf d.o.o., Rijeka 2001.

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

The quality of studies is evaluated in accordance with the ISO 9001 system and in accordance with European standards and guidelines for quality assurance which is carried out at the Faculty of Maritime Studies. Once a year, analyses the results of transience and make appropriate measures.



Basic description		
Course coordinator	Pietro Evangelista, PhD	
Course title	Green transport and logistics services: initiatives, influencing factors and impact on performance	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> In the 21st century, the greening of supply chains has become an increasing concern for many businesses and a major challenge for their logistics management. As a result, environmental sustainability has become a critical issue for the third-party logistics service providers (3PLs) to whom they outsource their logistics. The supply chain role of 3PL firms evolved has substantially over the last few decades shifting from executing operational and repetitive activities toward a more complex supply chain orchestration model. Over the last few years, this evolving process has included the provision of more environmentally sustainable services. An increasing number of 3PLs have started to transform their operations and strategies to be more effective from an environmental sustainability perspective. In addition, environmental aspects of the transport and logistics have become a more serious concern because products are being moved over greater distances and this trend is forecast to continue. Accordingly, 3PLs are increasingly being requested to drastically reduce their externalities. From the research point of view, most studies of environmental issues have focused on manufacturing sectors and relatively little attention has been paid to the service sectors, such as the logistics service industry. There is a paucity of research on the sustainability strategies and actions adopted in the 3PL industry. In addition, there is a great deal of uncertainty about the deployment of green strategies by 3PLs especially with respect to their justification and implementation. <i>The main aim of this course is to contributing to fill this gap through exploring the green initiatives implemented by these companies, the main influencing factors affecting the adoption of such initiatives and the impact of such actions on company performance. The research design will be based on a combination of quantitative and qualitative methods allowing a more in-depth knowledge on this research topic.</i>
<i>2. Course enrolment requirements</i> - Basic knowledge of transport economics and mangement - Satisfactory level of knowledge of English language
<i>3. Expected course learning outcomes</i> By the end of the course, the students will be achieve the following knowledge: - recognise different type of logistics service providers; - assess the development stage of logistics service providers; - evaluate the benefits and challenges in implementing the principles of green logistics in the logistics service industry - design and conduct a systematic literature review;



- analyse the role of environmental sustainability in the strategy of logistics service providers
- define and implement a green logistics auditing plan
- identify a decarbonization strategy for logistics.

4. Course content

Two are the objectives of the two days allocated to this topic. The first objective is to provide the students a clear picture on the state of the extant literature on environmental sustainability in the 3PL industry. The second objective relates to the description of the main findings achieved in recent empirical investigations. The first day will be devoted to the critical assessment of the existing body of knowledge on the this topic based on a systematic literature review. This will allow to identify research gaps and formulate appropriate research questions. During the second day it will be described a number of empirical investigations in different EU countries I conducted in collaboration with other colleagues. This will give the opportunity to illustrate and discuss the main findings achieved and derive research and managerial implications. A more detailed scheduling of activities that will be carried out along the two days may be as follows:

➤ Day 1 (four hours)

- The changing supply chain role of 3PL and the importance of environmental sustainability dimension
- The environmental impact of transport and logistics: an assessment based on secondary data
- The results of a systematic literature review on environmental sustainability in the 3PL industry

➤ Day 2 (four hours)

- Emerging research gaps and research questions
- Environmental sustainability practices in 3PLs: actions, factors and impact on performance
- The role of customer in greening transport and logistics services
- De-carbonization auditing plan for logistics service companies

➤ Day 3 (four hours)

- Green transport and logistics: a focus on the Italian 3PL market
- Discussion of results achieved from different studies and conclusion
- Research implications
- Managerial implications

5. Teaching methods	☒ lectures	☒ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☒ exercises	☐ laboratories
	☐ long distance education	☐ mentorship
	☒ fieldwork	☐ other _____

6. Comments

7. Student's obligations

- Follow the course
- Carry out exercises and assignments

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper		Experimental work	
Written exam	1,5	Oral exam		Essay	2	Research	
Project		Sustained knowledge check	1	Report	1	Practice	
Portfolio							



9. Assessment and evaluation of student's work during classes and on final exam

Written exam

10. Assigned reading (at the time of the submission of study programme proposal)

- Christopher M. (2005), *Logistics and Supply Chain Management. Creating value-adding networks*, Englewood Cliffs, Prentice Hall, Financial Times.
- Bryman, A. and Bell, E. (2003), *Business Research Methods*, Oxford University Press, New York.
- McKinnon, Browne, M., Piecyk M., and Whiteing, A. (eds) (2015), *Green Logistics: Improving the Environmental Sustainability of Logistics*, 3rd edition, Kogan Page, London.
- IPCC - Intergovernmental Panel on Climate Change (2014), *Mitigation of Climate Change*, WG III Assessment report 5 [available at: <http://www.ipcc.ch>]
- Capgemini/PennState University (2017) Third party logistics study. The state of Logistics Outsourcing [disponibile a: <http://www.3plstudy.com/>]
- Evangelista, P. (2014) "Environmental sustainability practices in the transport and logistics service industry: an exploratory case study investigation", *Research in Transportation Business & Management*, 12, 63-72.
- Palsson, H., Kovács, G. (2014), Reducing transportation emissions: A reaction to stakeholder pressure or a strategy to increase competitive advantage, *International Journal of Physical Distribution & Logistics Management*, 4(4), pp. 283-304.

11. Optional / additional reading (at the time of proposing study programme)

- Mangan, J., Lalwani, C., Butcher, T., Javadpour, R. (2012) *Global Logistics and Supply Chain Management*, 2nd edition, John Wiley & Sons Inc, UK.
- WEF - World Economic Forum (2009), *Supply chain decarbonisation. The role of logistics and transport in reducing supply chain carbon emissions*.
- Lieb, K.J., Lieb, R.C. (2010), Environmental sustainability in the third-party logistics (3PL) industry. *International Journal of Physical Distribution and Logistics Management*, 40(7), 524-533.
- Evangelista P., Brodin M., Isaksson K., Sweeney E. (2012) "The environmental sustainability attitude of 3PLs. Implications for purchasing transport and logistics services" in Folinas D. (ed.) *Outsourcing Management for Supply Chain Operations and Logistics Services*, IGI Global, (USA), pp. 449-465.
- Evangelista P., Colicchia C., Creazza A., (2017). "Is environmental sustainability a strategic priority for logistics service providers?", *Journal of Environmental Management* (in printing).

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students

13 Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Natalija Kavran, PhD	
Course title	Intelligent transport systems in maritime transport	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> Research of theoretical assumptions of development of intelligent transport systems and their implementation into maritime system. Integration of system characteristics with other national systems. Research of adaptive, flexible system with the aim of accelerating the flow of goods, increasing the effectiveness and safety of maritime traffic. Advisability research of development and application of intelligent transport systems in maritime transport, methods and methodology development of intelligent transport systems with the goal of dynamic optimization of maritime system and its subsystems, research of potential integration with other parts of national ITS architecture. Consideration of ITS benefits in ports: reducing congestion, reducing capital and operating costs, improving safety, increasing productivity of transport infrastructure, reducing energy consumption and knowledge acquisition of the functionality of ITS in the ports
<i>2. Course enrolment requirements</i>
<i>3. Expected course learning outcomes</i> After completing the course, students will be able to: - Assess the needs of the development of intelligent transport systems in the maritime transport - Evaluate the benefits and necessity of application of ITS applications in the maritime transport - Define the architecture level of national ITS system - Create and define a proposal for a functional level of ITS - Conceptualize the use of new technologies in order to establish intelligent transportation solutions in the maritime transport
<i>4. Course content</i> Introduction (concept, application and development of intelligent transport systems). Methods and methodology for intelligent transportation systems (systems approach and methodology, system specifications of user requirements, the elements of ITS methodology). Architecture of intelligent transportation systems (concept and development of ITS architecture, ITS types of architecture, objective-oriented approach, levels of ITS architecture). Improving safety and security in transport using ITS (safety effects of ITS applications, national security and safety as functional area of ITS, security analysis in maritime transport). Intelligent transport systems in maritime transport (specific characteristics and functions of intelligent transportation



systems in maritime industry, structures of states and transitions of the system, education, e-learning and development of adaptive national system). Intelligent transport systems in ports (automatic identification of cargo systems, systems of tracking and monitoring of cargo, automated transshipment systems, robotization).

5. Teaching methods	☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____
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6. Comments

7. Student's obligations

A seminar, in which: analyzes, conceptualize and propose use of new technologies in the functional, physical, information and communication architecture of ITS in the maritime transport.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	3,5	Experimental work	
Written exam		Oral exam	1	Essay		Research	1
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Oral presentation of seminar paper using PowerPoint presentation and demonstration of the solution of proposed development/application of ITS applications in the maritime transport.

10. Assigned reading (at the time of the submission of study programme proposal)

- [1] Jolić, N: Luke i ITS, Fakultet prometnih znanosti, Zagreb, 2008.
- [2] Intelligent transport systems in action: Action plan and legal framework for the deployment of intelligent transport systems (ITS) in Europe, European Commission, 2011.
- [3] Bošnjak, I: Inteligentni transportni sustavi I, Fakultet prometnih znanosti, Zagreb, 2006.
- [4] Kavran, Z., Jolić, N., Čavar, I.: Proposal of Intelligent Transport Systems Development in Marinas, 19th Central European Conference on Information and Intelligent Systems: conference proceedings, Varaždin, Faculty of Organization and Informatics, 2008.
- [5] Jolić, N., Božičević, D., Brnjac, N.: Defining Functional Areas – keystone in the Development of Functional Architecture of the Port System, Proceedings of the 10th International Congress on Intelligent Transport Systems, Madrid, Španjolska, 2003.

11. Optional / additional reading (at the time of proposing study programme)

- [1] Sussman, J. S: Perspectives on Intelligent Transportation Systems, Springer, 2005.
- [2] Ghosh, S., Lee, T.J.: Intelligent Transportation Systems: Smart and Green Infrastructure Design, CRC Press, 2010.
- [3] Models and technologies for Intelligent Transportation Systems, ARACNE, Rim, 2009.



12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Dragan Čišić, PhD	
Course title	Research directions in supply chain management	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
1. Course objectives		
The aim of the course is a strategic approach to the supply chain. Understanding : • All of the components of the logistics system, such as the delivery system, procurement, handling of the raw materials, production, inventory, ordering and transportation. • The interaction between the components logistics system • The method and technique of analysis logistics systems		
2. Course enrolment requirements		
No		
3. Expected course learning outcomes		
Understanding the new future trends in logistics and supply chain management. Making models of logistics systems and analysis of individual development directions and technologies that are used in logistics.		
4. Course content		
Strategic logistics planning: Logistical Strategies, Performance measurement of logistics processes, integration of logistics strategy in the financial The development of supply chain management. The new developments in logistics. Future trends. Agile logistics. Compression time in logistics. Systematic exposure logistics strategy. Managing the supply chain. Organization of supply chain management and information technology. Coordination of supply chain. Models and applications.		
5. Teaching methods	☒ lectures ☒ seminars and workshops ☐ exercises ☒ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____
6. Comments		
7. Student’s obligations		
Project, research , seminar		



8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	1	Experimental work	1
Written exam		Oral exam		Essay		Research	2,5
Project	1	Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Project, research , seminar

10. Assigned reading (at the time of the submission of study programme proposal)

Herbert Kotzab Stefan A. Seuring Martin Muller: Research Methodologies in Supply Chain Management

11. Optional / additional reading (at the time of proposing study programme)

Hau L. Lee, Seungjin Whang (auth.), Joseph Geunes, Panos M. Pardalos, H. Edwin Romeijn (eds.)
Supply Chain Management: Models, Applications, and Research Directions

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students
Herbert Kotzab Stefan A. Seuring Martin Muller: Research Methodologies in Supply Chain Management	1	5

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Associate professor Edvard Tijan, PhD	
Course title	Information management in seaport clusters	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION

1. Course objectives

- Identify all relevant theoretical and practical features of seaports, seaport clusters and electronic business.
- Analyze the commercial and administrative processes taking place in the seaport clusters.
- Prove that the application of integral information systems for electronic business / electronic data exchange and messaging can rationalize the business of stakeholders involved in port operations as well as seaports as a whole.
- Review existing approaches to electronic business in seaports and propose a more appropriate solution - an integral model of electronic business / electronic data and messages exchange that maximizes the rationalization of business in seaport clusters.

PhD students will be offered answers to several questions on different levels:

- at a strategic level: How to improve the competitiveness of the seaport?
- at operational level: How to ensure harmonized port operations and high quality port services?
- at a tactical level: How to optimize and efficiently use resources in the seaport cluster?

2. Course enrolment requirements

According the the Study Rules.

3. Expected course learning outcomes

Identify the stakeholders who work in the seaport clusters based on their roles and divide them into groups. Graphically display business processes, subprocesses, and activities. Investigate the mutual influence of the aforementioned stakeholders and evaluate their role. Justify the rationality of the introduction of integral information systems in port operations. Design, create and recommend the introduction of transformed business processes (reengineering). Predict the bottlenecks that may occur during reengineering. Suggest improvements in information and business systems of stakeholders in seaport clusters. Improve information visibility and accuracy of information in seaport clusters.



4. Course content

- Flows of information in seaport clusters.
- Electronic business and electronic exchange of data and messages in seaport clusters.
- Main commercial and administrative processes taking place in seaport clusters.
- Data in administrative documents and forms exchanged in seaport clusters.
- Transformation of business processes in seaport clusters using electronic business.
- Rationalization and optimization of business through increased synergies among the stakeholders in the seaport cluster.
- The justification for introducing integrated systems for electronic data exchange and messages in seaport clusters.

5. Teaching methods

- | | |
|--|---|
| ☐ lectures | ☐ individual assignment |
| ☐ seminars and workshops | ☐ multimedia and network |
| ☐ exercises | ☐ laboratories |
| ☐ long distance education | ☒ mentorship |
| ☐ fieldwork | ☐ other _____ |

6. Comments

7. Student's obligations

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	5,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

On this level of the doctoral studies there are no classes or final exams anticipated.

10. Assigned reading (at the time of the submission of study programme proposal)

1. Tijan, E, Agatić, A., Hlača, B.: Port Community System Implementation in Croatian Seaports, Promet-Traffic & Transportation. Vol 24, No 4 (2012); 305-315
2. Tijan, E., Agatić, A., Hlača, B.: Evolucija informacijsko-komunikacijskih tehnologija na kontejnerskim terminalima, Pomorstvo, 24/1 (2010)
3. Agatić, A., Čišić, D., Tijan, E.: Information Management in Seaport Clusters, Pomorstvo-Journal of maritime studies, 25 (2011), 2; 371-386
4. Čišić, D.; Perić Hadžić, A.; Tijan, E.: The economic impact of e-Business in seaport systems, MIPRO: 32nd International Convention on information and communication technology, electronics and microelectronics, Proceeding; Vol. V., Opatija, 2009.



11. Optional / additional reading (at the time of proposing study programme)

1. Tijan, E., Kos, S., Ogrizović, D.: Disaster recovery and business continuity in port community systems, Pomorstvo - Journal of Maritime Studies, 23 (2009) , 1; 243-260
2. Tijan, E.: Data Classification and Information Lifecycle Management in Port Community Systems, Pomorstvo - Journal of Maritime Studies, 2/2009 (2009) ; 557-568.
3. CrimsonLogic Pte Ltd.: Study of System requirements specification for Port Community System, Release No 3.0, June 2007, 55-64
4. Jolić, N: Luke i ITS, Fakultet prometnih znanosti, Zagreb, 2008.
5. Perić Hadžić, A., Tijan, E., Jugović, A.: Regional Research-driven Marine Clusters. // Journal of China-USA Business Review. 10 (2011) , 11; 1115-1125

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Daniela Gračan, PhD	
Course title	Management of sustainable development of nautical tourism	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION

1. Course objectives

The aim of this course is to study the basic principles of sustainable development of nautical tourism, based on a study of the development of nautical tourism with the existing legislation. In line with the strategy of development of nautical tourism, there is a priority in the proper, sustainable management of resources and in improving and maintaining the competitive position of Croatian nautical tourism in the long term.

The course is insisting on presenting practical procedures in order to manage the sustainable development of all segments of nautical tourism: nautical tourism, cruising and charter companies.

PhD students are expected to acquire theoretical and applied knowledge on the management of sustainable development of nautical tourism, in particular, procedural functions of marinas and the emphasis on presenting practical procedures in all areas of operations of ports of nautical tourism in accordance with the principles of sustainable development. PhD students will develop an awareness of the strategic management of nautical tourism in order to create a nautical tourism product that suits the preferences of tourists, thus creating the prerequisites for achieving competitiveness on the nautical tourism market.

2. Course enrolment requirements

-

3. Expected course learning outcomes

After a certain period of study / learning, students will be able to do the following:

- Correctly explain and interpret basic concepts of sustainable development of nautical tourism, by studying the basic principles of sustainable development of nautical tourism through all management functions;
 - Explain and interpret the specifics of different forms of nautical tourism, especially of procedural function of ports of nautical tourism in terms of sustainable management;
 - Conduct and analyze the different decisions in practical situations in the management process:
- develop and analyze measures which are focused on determining the upper limit of development of tourism,
 - use and explain prescribing and control of environmental impact,
 - develop and implement guidelines for the disposal of waste and waste water and quality assurance
 - analyze and apply the defined measures in the field of protection and conservation of sea and coastal zone respecting environmental and developmental characteristics of individual parts and all by different forms of nautical tourism;



- Carry out and interpret simple research tasks in the field of nautical tourism in accordance with the principles of sustainable development.

4. Course content

Based on a wide range of primary economic and social motives that determine its content, nautical tourism is the tourism of balance, experience, polycentric selection, originality, development of personality, the new spiritual atmosphere or the optimal economic objective and results, which enables the successful realization of its primary functions and meeting the increasingly complex motives and needs of tourist visitors.

The course defines the area of nautical tourism through the concept and importance of nautical tourism and the factors of its development. Special focus is put on basic principles of sustainable development of nautical tourism through all management functions. Distinguished and detailed analyzed are the three main forms of nautical tourism turnover: nautical tourism ports, charter and cruising. Analysis is made on complexity of nautical tourism market and its components that requires the centralization of supply and effective marketing. The capacities for providing services of nautical tourism are analyzed as well as typology of nautical ports. It is necessary to analyze the nautical offer and optimally arrange the work for the effective performance on the European market. Course also examines the trends and global performance in the global nautical tourism market and by the quantitative and qualitative indicators the status of nautical tourism and are guidelines and perspectives of development of nautical tourism in Croatia are showed.

5. Teaching methods	X lectures	X individual assignment
	X seminars and workshops	☐ multimedia and network
	☐ exercises	☐ laboratories
	☐ long distance education	X mentorship
	☐ fieldwork	☐ other _____

6. Comments	-
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7. Student's obligations

Attendance and class participation, seminar work and implementation of research, exam.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation	0,5	Seminar paper	1,5	Experimental work	
Written exam		Oral exam	2	Essay		Research	1,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

It is evaluated:

- Presence in classes and preparation of students in classes,
- Independent student work on the basis of theoretical knowledge through seminar work and contribution to the application based on completion of the research
- Knowledge on oral exam.

10. Assigned reading (at the time of the submission of study programme proposal)

1. Gračan, D., Alkier Radnić, R., Uran, M., *Strateška usmjerenja nautičkog turizma u Europskoj uniji*, Sveučilište u Rijeci, Fakultet za menadžment u turizmu i ugostiteljstvu u Opatiji, Opatija, 2011.
2. Luković, T., *NAUTICAL TOURISM*, CABI / OXFORD, 2013.
3. Luković, T., *Nautički turizam Hrvatske*, Lučka uprava Dubrovnik, 2015.



11. *Optional / additional reading (at the time of proposing study programme)*

1. Luković, T., Gržetić, Z., Nautičko turističko tržište u teoriji i praksi Hrvatske i europskog dijela Mediterana, Hrvatski hidrografski institut, Split, 2007.
2. Luković, T., Šamanović, J., Menadžment i ekonomika nautičkog turizma, Hrvatski hidrografski institut, Split, 2007.
3. *Pravilnik o razvrstavanju i kategorizaciji luka nautičkog turizma*, NN 24/90, promijenjen NN 142/99, te dopunjen u NN 47/00, 121/00, 45/01, 108/01.
4. Strategija razvoja nautičkog turizma Republike Hrvatske za razdoblje 2009.-2019., Zagreb, 2008.
5. Stavovi i potrošnja nautičara u Hrvatskoj - NAUTIKA Jahting 2012, ZOMAS NAUTIKA, Institut za turizam Zagreb, 2013.

12. *Number of assigned reading copies with regard to the number of students currently attending the course*

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Gračan, D., Alkier Radnić, R., Uran, M., <i>Strateška usmjerenja nautičkog turizma u Europskoj uniji</i> , Sveučilište u Rijeci, Fakultet za menadžment u turizmu i ugostiteljstvu u Opatiji, Opatija, 2011.	1	0
Luković, T., <i>NAUTICAL TOURISM</i> , CABI / OXFORD, 2013.	1	0
Luković, T., <i>Nautički turizam Hrvatske</i> , Lučka uprava Dubrovnik, 2015.	1	0

13. *Quality monitoring methods which ensure acquirement of output knowledge, skills and competences*

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Associate professor Marija Ham, PhD	
Course title	Sustainability marketing in transportation	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
The main objectives of the course are the following: • teach students about the importance and potentials of application of sustainable marketing in business • acquire the knowledge necessary to understand the concept of sustainability in general and sustainable marketing • acquire a comprehensive knowledge of the possibilities and ways of implementation of sustainable marketing in order to achieve competitive advantage and sustainable development at the macro and micro levels		
<i>2. Course enrolment requirements</i>		
Enrolled postgraduate study and this course.		
<i>3. Expected course learning outcomes</i>		
After passing the examination in this course, it is expected that students will be able to: • argue the importance of sustainability in today's business environment • explain the concept and elements of sustainable marketing • discuss the implementation of sustainable marketing in traffic • suggest ways of implementing sustainable marketing in specific marketing strategies		
<i>4. Course content</i>		
The social focus of marketing. Sustainable development and corporate social responsibility. The role of marketing in sustainable development. Ecology and marketing. Green marketing. Peculiarities of green consumers. Definition and objectives of sustainable marketing. Stakeholders in sustainable marketing. Planning for sustainable marketing. Segmentation of the market for the purpose of sustainable marketing. Sustainable marketing strategies. The instruments of sustainable marketing - product, price, distribution and promotion. Profiling of new consumers in terms of sustainable marketing. Macromarketing in the function of sustainable development. Sustainable marketing in transportation.		
<i>5. Teaching methods</i>	☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____



6. Comments							
7. Student's obligations							
Class attendance and completion of teaching tasks.							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation	0,5	Seminar paper	2,5	Experimental work	
Written exam		Oral exam	1,0	Essay	1,5	Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio							
9. Assessment and evaluation of student's work during classes and on final exam							
- argue the importance of sustainability in today's business environment – essay, seminar paper, class activity - explain the concept and elements of sustainable marketing – oral exam, seminar paper, essay - discuss the implementation of sustainable marketing in traffic – seminar paper - suggest ways of implementing sustainable marketing in specific marketing strategies – seminar paper							
10. Assigned reading (at the time of the submission of study programme proposal)							
- Čutura, M.: "Poslovna etika i društvena odgovornost u području marketinga" Ekonomski fakultet Sveučilišta u Mostaru, Mostar, BiH, 2017. - Nefat, A. Zeleni marketing, Sveučilište Jurja Dobrile, Pula, 2015.							
11. Optional / additional reading (at the time of proposing study programme)							
- Kotler, Ph., Lee, N.: DOP-Društveno odgovorno poslovanje: Suvremena teorija i najbolja praksa, M.E.P. d.o.o., Zagreb, 2009. - Belz, F-M. – Peattie, K.: Sustainability Marketing: A Global Perspective, John Wiley & Sons Ltd., Chichester, 2009. - Fuller, D.: Sustainable marketing – Managerial-ecological issues, SAGE Publications, Inc., London 1999. - Dahlstrom, R.: Green Marketing Management, South Western Educational Publishing, Cincinnati 2010. - Ottman, J. A.: Green marketing, Ottman Consulting Inc., New York 1998.							
12. Number of assigned reading copies with regard to the number of students currently attending the course							
Title				Number of copies		Number of students	
13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences							
Student's feedback by means of survey organized by the University.							



Basic description		
Course coordinator	Assistant professor Marinko Maslarić, PhD	
Course title	Supply Chain Analytics	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
This course will provide the students with an understanding of areas of business analytics, modelling and optimization and their applications within supply chain management context. The approach will focus on quantitative methods and techniques in supply chain management problems solving, thus providing an understanding of the role and applicability of several techniques and methods of descriptive, predictive and prescriptive supply chain analytics. Additionally, the course will provide for an understanding of the basic types of data and information which are necessary for quality implementation of certain analytics techniques and the succesful problem solving.		
<i>2. Course enrolment requirements</i>		
Basic pre-knowledge of logistics and supply chain management.		
<i>3. Expected course learning outcomes</i>		
At the end of this course, studen will be able to understand the key analytics skills that enable a holistic approach to mapping and structural decomposition of complex logistics systems, and after that the evaluation and analysis of potential solutions of the supply chain management problems. The course form is particularly focused on practical students training for mastering the skills of quantitative approach to solving logistic problems. However, it will also contribute to the development of capability of group decision making and efficient communication.		
<i>4. Course content</i>		
Introduction to the supply chain. Understanding and defining the supply chain analytics from the aspects of application of quantitative methods and techniques. The concept of the models and quantification. Logistics decision-making models. Logistics decision support systems. Methods and techniques of descriptive analytics: supply chain mapping, SCOR model, suply chain visualization. Methods and techniques of predictive analytics: time-series methods, linear regression. Methods and techniques of prescriptive analytics: optimization (linear programming), game theory, modelling and simulation. Supply chain risk management.		
<i>5. Teaching methods</i>	☒ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____



6. Comments							
7. Student's obligations							
Course attendane, seminars and workshops, seminar paper							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation		Seminar paper	1,5	Experimental work	
Written exam	2	Oral exam	2	Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio							
9. Assessment and evaluation of student's work during classes and on final exam							
Evaluation of student's work will be assessed through seminar paper and exams (written and oral). The seminar paper as a student's obligation during the course is a prerequisite for taking the written exam. In the written part of the exam student solves the practical problem in order for evaluation of the level of its knowledge about quantitative methods and techniques. In the oral part of the exam, the student defends its work from written part of the exam and after that the final evaluation of student's understanding of theoretical principles and their capability for critical analysis and creation of new knowledge is performed.							
10. Assigned reading (at the time of the submission of study programme proposal)							
1. Brandon-Jones, A., Slack, N. Quantitative Analysis in Operations Management, Prentice Hall, USA, 2008. 2. Liu, J.J. Supply Chain Management and Transport Logistics, Routledge, Taylor and Francis Group, USA, 2012. 3. Ballou, R. Business Logistics / Supply Chain Management, Pearson Prentice Hall, USA, 2004. 4. Waters, D. Quantitative Methods for Business, Prentice Hall, USA, 2011. 5. Simchi-Levi, D., Kaminsky P., Simchi-levi E. Designing and Managing the Supply Chain, Concepts, Strategies and Case Studies, Third Edition, McGraw Hill, USA, 2008.							
11. Optional / additional reading (at the time of proposing study programme)							
1. Waters, D. Supply Chain Risk Management-Vulnerability and Resilience in Logistics, Second Edition, Kogan Page, 2011. 2. Christopher, M. Logistics and Supply Chain Management - Creating Value-Adding Networks, Third Edition, Prentice Hall, USA, 2005. 3. Pengzhong L. Supply Chain Management, InTech, Rijeka, Croatia, 2011. 4. Kersten W., Blecker, T., Ringle, C.M. Managing the Future Supply Chain - Current Concepts and Solutions for Reliability and Robustness, EUL Verlag, Hamburg, Germany, 2012. 5. Russel, R.S., Taylor, B.W. Operations Management-Creating Value Along the Supply Chain, Sevent Edition, John Wiley and Sons, USA, 2011.							
12. Number of assigned reading copies with regard to the number of students currently attending the course							
Title				Number of copies		Number of students	
13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences							
Student's feedback by means of survey organized by the University.							



Basic description		
Course coordinator	Assistant professor Saša Aksentijević, PhD	
Course title	Information security and business continuity in logistics	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> Goal of the course is transfer of the latest knowledge related to corporative information security, business continuity and disaster recovery with emphasis on specific requirements related to logistics. Relations between corporate ICT management, integral and ICT security will be studied along with legal requirements for information security and data privacy, with final goal being complete topic coverage and candidate awareness of acute issues in the field. One of goals is also provision of detailed answers to all candidates' questions related to integral and information security and raising awareness of all stakeholders on importance of evaluation of corporate ICT security in logistics within framework of economic outcomes, while maintaining the latest technological trends like cloud computing and IoT. PhD candidates will be furnished with answers to the following questions: 1. On the level of logistic stakeholder: What are the main criteria for decision-making about investments in the area of information security and business continuity? 2. On the level of ICT management within logistic stakeholder: What are the most important challenges in the area of ICT security and specific challenges posed by introduction of new technologies? 3. On the level of execution and efficacy measurement of information security and business continuity: How to quantify and measure effectiveness of investments in logistic stakeholders' information security management systems and business continuity? Newly acquired knowledge and competences the candidates will gain are aimed towards closing the gap between theoretical and practical models of ICT security management deployed in ICT systems of logistic stakeholder, and between operative and strategic overview of that function. In dynamic exchange of theoretical and practical examples, the candidates will receive complete overview of all information security and business continuity domains with emphasis on strategic orientation of corporate management („top down“) whose orientation is predominantly dictated by market forces, and not only technical context.
<i>2. Course enrolment requirements</i> According the the Statute.



3. Expected course learning outcomes

The course methodology will use the following certification and best practice systems, with the following learning outcomes:

1. ISACA – Control Objectives for Information and Related Technology (COBIT) framework will be used to explain control measures used to address business ICT risks and manage technical issues in ICT management, with final outcome being that candidates will be able to evaluate the impact of this framework on ICT management and security of the logistics,
2. ISO 27001:2005 and ISO 27001:2013 standards will be used to explain requirements of setting up an effective ISMS (Information Security Management System), with outcome being that candidates will study impact of the formal risk assessment and security management system set up on confidentiality, integrity and availability of information maintained by the logistic stakeholders,
3. ITIL 4 Edition model will be used for best practices in ICT information security service delivery, with the outcome being that candidates will be able to predict changes in ICT service delivery system as a consequence of Information Security Management System Introduction in logistics, and
4. The best practice of risk assessment and treatment in logistics will be evaluated and outlined, using the latest risk management methods, based on quantitative principles, with final goal being that candidates acquire new competences in risk evaluation and deployment of organizational and technical mitigation measures, depending on the level of the calculated risk.

4. Course content

INFORMATION SECURITY MANAGEMENT IN LOGISTICS – MANAGEMENT OVERVIEW

- Integral corporate security management
- Information security position within logistics
- Information capital and knowledge management inside logistics

FINANCIAL ASPECT OF INFORMATION SECURITY AND BUSINESS CONTINUITY

- Characteristics of investments in information security
- Description or running costs of information security
- Modern trends: outsourcing, cloud computing, everything as a service
- Usage of quantitative methods in decision making in information security investing

MANAGEMENT OF INFORMATION SECURITY IN LOGISTICS

- Information security management in logistics
- Information security technologies
- Basic glossary of information security
- Information security and privacy legal requirements
- Organization of information security in logistics
- Basic information security measures
- Investments and running costs of information security
- Portfolio approach in information security
- Intellectual capital security



INTEGRATION OF INFORMATION SECURITY AND BUSINESS CONTINUITY IN LOGISTICS

- Relations between corporate and information security
- Disaster recovery planning
- Creation and execution of business continuity plans

5. Teaching methods	☐ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other _____
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6. Comments	not applicable
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7. Student's obligations

Research under mentorship and publication of research results.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	5,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

On this level of the doctoral studies there are no classes or final exams anticipated.

10. Assigned reading (at the time of the submission of study programme proposal)

1. Elaborat o jedinstvenom sučelju za formalnosti u pomorskom prometu i Kataloga isprava, dokumenata i podataka, Ministarstvo mora, prometa i infrastrukture
2. Tehnička specifikacija PCS ICT sustava – Tehnička specifikacija zahtjeva informacijske sigurnosti, sukladnosti i intelektualnog vlasništva, naručitelj Lučka uprava Rijeka
3. The journal of maritime studies, year 22, number 2/2008, pages 245-258, "Influence of ISO 27001:2005 on Port of Rijeka security"

11. Optional / additional reading (at the time of proposing study programme)

1. Aksentijević, S., Tijan, E., Hlača, B. , "Importance of organizational information security in port community systems", MIPRO 2009, 25-29 svibanj 2009, 32-gi međunarodni skup, sekcija ISS (Information Systems Security),
2. Aksentijević, S., Tijan, E., Hlača, "Investment Analysis of Information Security Management in Croatian Seaports" , MIPRO 2012., 21-25. svibanj 2012., 35-ti međunarodni skup, sekcija DE – Digitalna ekonomija
3. Čapko, Z., Aksentijević, S., Tijan, "Economic and financial analysis of investments in information security", E., MIPRO 2014., 26-30. svibanj 2014., 37-mi međunarodni skup, sekcija DE – Digitalna ekonomija
4. Tijan, E., Kos, S., Ogrizović, D.: Disaster recovery and business continuity in port community systems, Pomorstvo - Journal of Maritime Studies, 23 (2009) , 1; 243-260
5. Tijan, E.: Data Classification and Information Lifecycle Management in Port Community Systems, Pomorstvo - Journal of Maritime Studies, 2/2009 (2009) ; 557-568.



12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Tanja Poletan Jugović, PhD	
Course title	Planning of Cargo Flows and Transport Route Valorisation	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i>
• Analysis of rules and factors that determine the formation, spatial distribution, consolidation of cargo flows and transport route valorisation on transport market • Exploring the basic rules and specifics of the analysis and evaluation of transport supply, demand and the environment (as the main factors of competitiveness and transport route valorisation on the transport services market) • Developing conclusions on the general assumptions for maritime and land transport route valorisation and for cargo flows attracting (for concrete examples of transport routes); • Dating analysts and specificity tracking of cargo flows on the world, regional, national level (according to different criteria) as a function of planning cargo flows and defining activities for their intensification • Introduction the methodology and multicriterial analysis model of cargo flow planning and transport route valorisation
<i>2. Course enrolment requirements</i>
<i>3. Expected course learning outcomes</i>
1. Analyse and interpret (in theoretical and practical sense) geo-traffic, socio-economic factors and patterns of formation, spatial distribution and consolidation of cargo flows on the transport route 2. Systematize and argue the general and specific factors of competitiveness of the route (corridor) on the transport market (in theory and in practical terms to a specific example of the route) 3. Argue the importance of the relevant phenomena for evaluation (competitiveness) transport route (corridor) on the transport market 4. Analyse, plan and optimize the relevant indicators for cargo flows on the transport route (corridor) 5. Plan and optimize the factors of route (corridor) valorisation on the transport market
<i>4. Course content</i>
• The basic principles and factors of formation, distribution and consolidation of cargo flows. • Indicators of the structure and dynamics of cargo flows - geographic analysis of international cargo flows, Croatia in international trade flows. • Valuation of traffic direction in the market of transport services - aspect offers (competitiveness of



transport services), the aspect of demand (comprehensiveness requirements, needs and preferences of service users), the aspect of the environment (the presence of competition from alternative transport routes).

- Multi-criteria simulation models and optimization of transport route valorisation (the specific example).

5. Teaching methods

- | | |
|--|---|
| ☒ lectures | ☒ individual assignment |
| ☐ seminars and workshops | ☐ multimedia and network |
| ☐ exercises | ☐ laboratories |
| ☐ long distance education | ☐ mentorship |
| ☐ fieldwork | ☐ other _____ |

6. Comments

7. Student's obligations

Course attendance (lectures or consultations), research and study work (seminar), presentation of research, oral exam

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	1	Experimental work	
Written exam		Oral exam	2	Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

- Course attendance (lectures or consultations) - learning outcomes 1-5; 0,5 ECTS = 10 height of assessment points
- Research and study work (seminar)- learning outcomes 4-5; 2,5 ECTS = 30 height of assessment points
- Presentation of research - learning outcomes 4-5; 1 ECTS = 20 height of assessment points
- Oral exam - learning outcomes 1-5; 2 ECTS; 40 of height of assessment points

10. Assigned reading (at the time of the submission of study programme proposal)

- Poletan, T., Robni tokovi, Faculty of Maritime Studies, University in Rijeka, 2014.
- teaching materials and published research papers of lecturer (course coordinator)

11. Optional / additional reading (at the time of proposing study programme)

- Rodrigue, J-P., Comtois, C., Slack, B., The Geography of Transport Systems, Routledge-Taylor-Francis Group, London and New York, 2006
- Shipping Statistics and Market Review, ISL (Institute of Shipping Economics and Logistics), Bremen (the latest numbers with actual data)
- Statistical Yearbook of the Republic of Croatia Central Bureau of Statistics, Croatia, Zagreb (the latest numbers with actual data)
- other statistical sources and databases (Eurostat, Intrastat etc.) for the purpose of obtaining current data related to the problem of research



12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Poletan, T., Robni tokovi, Faculty of Maritime Studies, University in Rijeka, 2014.	5	1
teaching materials and published research papers of lecturer (course coordinator)	available on web	1

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Sönke Reise, PhD	
Course title	Container Terminal Operations	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION

1. Course objectives

Deep knowledge about the elements of a container terminal which form several types of container terminals. Based on this, operational processes like load and discharge will be discussed. Also several administrative processes must be considered like yard planning and resource allocation and also the requirements of special container like reefer.

2. Course enrolment requirements

none

3. Expected course learning outcomes

The outcome of this lecture is a broad and deep knowledge how a container terminal operate

4. Course content

Categories and functions of ports
Container handling technology
Types of Container terminals
Processes and operations (load, discharge, yard- and landside processes)
Requirements of special container
Administrative processes (yard control, resource allocation, ...)

5. Teaching methods

- | | |
|---|---|
| ☒ lectures
☐ seminars and workshops
☐ exercises
☐ long distance education
☐ fieldwork | ☐ individual assignment
☐ multimedia and network
☐ laboratories
☐ mentorship
☐ other _____ |
|---|---|

6. Comments

7. Student's obligations

Course attendance, written exam



8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper		Experimental work	
Written exam	5,5	Oral exam		Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

10. Assigned reading (at the time of the submission of study programme proposal)

M. Burns: „Port Management and Operations“, CRC Press
K. Kim and H. Otto: „Container Terminal and Cargo Systems: Design, Operations Management and Logistic Control“, Springer

11. Optional / additional reading (at the time of proposing study programme)

Watanabe: Container Terminal Planning – A Theoretical Approach, WCN Publishing Ltd

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Zvonko Kavran, PhD	
Course title	Expert system in maritime transport	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
To enable students for understanding the structure of expert systems. Based on the search of knowledge, on findings of certain facts and relations capacity for knowledge presentation. Understanding processes of inference and individual phases of the development of expert systems. Ability to apply expert system in the field of traffic technology and transportation		
<i>2. Course enrolment requirements</i>		
<i>3. Expected course learning outcomes</i>		
After completing the course, students will be able to: Distinguish ways of presenting knowledge and inference mechanisms Analyze the need and propose solutions for the introduction of an expert system in the transport environment Define the content of the knowledge base Create user requirement for expert systems Build a simple model of an expert system		
<i>4. Course content</i>		
Introduction. Structure of expert systems (knowledge bases, inference mechanism). Knowledge presentation (rules, inference tree, frames, semantic networks). Conclusion process. Development process of expert systems: collection, verification and validation of knowledge). Application of expert systems in maritime transport.		
<i>5. Teaching methods</i>	☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____
<i>6. Comments</i>		



7. Student's obligations

In seminar paper students:

Analyze of knowledge base development and application of methods of inference in decision-making processes in the traffic and transport environment

Present components of expert systems, and in particular the knowledge base and user interface

Develop of model components or entire expert system

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	3,5	Experimental work	
Written exam		Oral exam	1	Essay		Research	1
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Presentation of seminar paper using PowerPoint presentation and demonstration of the model.

10. Assigned reading (at the time of the submission of study programme proposal)

- [1] Giarratano, J.C., Riley, G.D.: Expert Systems, Principles and Programming, Thomson Learning, Inc., USA, 2005
- [2] Krishnamoorthy, C.S., Rajeev, S.: Artificial Intelligence and Expert Systems for Engineers, CRC Press, 1996.
- [3] Medsker, L., Liebowitz, J.: Design and Development of Expert Systems and Neural Networks, Prentice Hall, 1994.
- [4] Negnevitsky, M.: Artificial Intelligence: A Guide to Intelligent Systems, Addison Wesley, 2005.
- [5] Russell, S., Norvig, P.: Artificial Intelligence: A Modern Approach, Prentice Hall, 2003.

11. Optional / additional reading (at the time of proposing study programme)

- [1] Akerkar, R., Sajja, P.: Knowledge-Based Systems, Jones & Bartlett Publishers, 2009.
- [2] Jones, M.T.: Artificial Intelligence: A Systems Approach, Infinity Science Press, 2008.
- [3] Luger, G. F.: Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Addison Wesley, 2009.

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Associate professor Ines Kolanović, PhD	
Course title	Methodology of shipping service quality measurement	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
- determine the importance of systematic approach to the problem and to the shipping service quality evaluation process - explore major determinants of service quality and form conclusion about assumptions in the shipping service quality evaluation process - set up the quality concept and carry out the service quality measurement in shipping industry - define methodological approach for empirical research of the service quality, to formulate guidelines and quality solutions for their improvement, using appropriate methods		
<i>2. Course enrolment requirements</i>		
<i>3. Expected course learning outcomes</i>		
- Identify determinants of service quality - Explain quality concept and apply it on the concrete example - Analyze and investigate standards in the function of service quality - Suggest service quality measuring models - Argue and evaluate methodological approach to the shipping service quality measurement		
<i>4. Course content</i>		
Theoretical determinants and service quality concept. Basic features and assumptions in establishing the service quality concept. Dimensions and attributes of service quality in shipping industry. Standards and guidelines for quality assurance. Standardization as a function of service quality. Measuring service quality in terms of user expectations and perceptions. Service quality measuring models. Quality index. Service quality management. Methodological approach to the shipping service quality measurement		
<i>5. Teaching methods</i>	+ lectures + seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	+ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____



6. Comments							
7. Student's obligations							
Course attendance (lectures or consultations), research and seminar paper, oral exam							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation		Seminar paper	1	Experimental work	
Written exam		Oral exam	2	Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							
9. Assessment and evaluation of student's work during classes and on final exam							
- Course attendance – learning outcomes 1 – 5; 0,5 ECTS - Research and seminar – learning outcomes 4 and 5; 3,5 ECTS - Oral exam – learning outcomes 1 – 5; 2 ECTS							
10. Assigned reading (at the time of the submission of study programme proposal)							
- Lazibat, T.: Upravljanje kvalitetom, Znanstvena knjiga d.o.o., Zagreb, 2009. - Kondić, Ž.: Kvaliteta i ISO 9000, Tiva, Varaždin, 2002. - Teaching materials and published papers of course coordinator							
11. Optional / additional reading (at the time of proposing study programme)							
- Juran, J.M.; Gryna, M.F.: Planiranje i analiza kvalitete, treće izdanje, MATE d.o.o., Zagreb, 1999. - Kanji, K.; Asher, M.: 100 Methods for total Quality management, Sage publications, London, 1996. - Stamatis, D.H. Total quality service, Principles, Practices and Implementation, St. Lucie Press, Florida, 1996. - Scientific researches published in relevant scientific journals							
12. Number of assigned reading copies with regard to the number of students currently attending the course							
Title				Number of copies		Number of students	
Lazibat, T.: Upravljanje kvalitetom, Znanstvena knjiga d.o.o., Zagreb, 2009.				2		1	
Kondić, Ž.: Kvaliteta i ISO 9000, Tiva, Varaždin, 2002.				3		1	
Teaching materials and published papers of course coordinator				available on web			
13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences							
Student's feedback by means of survey organized by the University.							



Basic description		
Course coordinator	Assistant professor Neven Grubišić, PhD	
Course title	Modelling tactical logistical problems on Container Terminals	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
To familiarize students with the types and methods of operational decision making problems solving on container terminals and internal transport		
<i>2. Course enrolment requirements</i>		
According to the Regulations on postgraduate studies "Pomorstvo"		
<i>3. Expected course learning outcomes</i>		
1. Link together the main operational decision making problems on container terminals 2. Examine existing mathematical models and determine the value of decision variables 3. Revise existing models depending on the technical and technological characteristics and criteria of decision-making 4. Formulate individual problem depending on the selected criteria for optimization 5. Evaluate and justify the results 6. Demonstrate the application of software tools for optimization and modeling		
<i>4. Course content</i>		
Tactical-logistical problems in sea-side transshipment system on container terminals: Berth allocation problem, Crane allocation problem, Quay Crane scheduling problem. Optimization criteria. Operational decision making problems on storage area of CT: Job scheduling of RTG and RMG cranes, Post-stacking problems, premarshalling, remmarshalling and relocation problems. Transport network problems and route optimization, shortest path, maximum flow and resource allocation optimization. Modification of existing models depending of criteria for optimization. Post-opt analysis and interpretation of results. Usage of optimization software tools: LINGO, AIMMS.		
<i>5. Teaching methods</i>	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____
<i>6. Comments</i>	Computer tools for optimization and modeling are used in teaching process	



7. Student's obligations

Students are required to make programming task (practical optimization model) using software-computing tools, after previously conducted scientific research

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation	1	Seminar paper		Experimental work	
Written exam		Oral exam	1	Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	1
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Evaluation of outcomes is carried out through activities in the classroom (method of computer modeling default problems), the quality of research and practical work - a programming task that the student has to make and the presentation of the exam.

Examples of evaluating the individual learning outcome:

1. Explain conditioning solutions results of individual tactical logistical problems in sea-side transshipment process at the operation of the ship and the planning of ship arrivals
2. Create an existing mathematical model and determine the value of the main variables
3. For the selected model redefine inputs and change the criteria of decision-making
4. Create a program basis for custom problem according to the own choice
5. Make post-optimum analysis and explain the obtained solution
6. Demonstrate how to use the software tools and explain their limitations

10. Assigned reading (at the time of the submission of study programme proposal)

1. Mattfeld, D.C.: The Management of Transshipment Terminals, Springer, New York, 2006.
2. Meisel, F.: Seaside Operations Planning in Container Terminals, Physica-Verlag, Berlin Heidelberg, 2009.
3. Grubisic, N., Maglic, L. (2016). Optimization Process of Berth and Quay-Crane Assignment in Container Terminals with Separate Piers. Conference Proceedings - ATINER - 2nd Annual International Conference on Transportation, Athens, Greece.
4. Grubisic, N., Dundovic, C. (2014). A Solution for Container Terminal QC Scheduling Considering Grouped Tasks and Operative Zone Limits. Conference Proceedings - International Conference on Industrial Logistics, ICIL. Bol, Croatia.

11. Optional / additional reading (at the time of proposing study programme)

1. Grubisic, N. (2013). Optimizacija raspodjele vezova i obalnih dizalica na lučkim kontejnerskim terminalima. Doktorski rad. Sveučilište u Rijeci, Pomorski fakultet, Rijeka.
2. Grubisic, N., Dundovic, C., Zuskin, S. (2016). A split task solution for quay crane scheduling problem in mid-size container terminals. Tehnički vjesnik - Technical Gazette, Vol.23, No.6. pp 1723-1730
3. Grubisic, N., Hess, S., Hess, M. (2014). A Solution of Berth Allocation Problem in Inland Waterway Ports. Tehnički vjesnik - Technical Gazette, Vol. 21, No. 5. pp 1135-1141.
4. Grubisic, N., Vilke, S., Baric, M. (2015). A Contribution to Berth Allocation Problem Solution with Draft Restrictions. Pomorski zbornik, 49, 1, Rijeka, pp. 127-142.
5. Bohrer, P.: Crane Scheduling in Container Terminals, VDM Verlag Dr. Müller, Saarbrücken, 2010.
6. Gen M., Cheng, R., Lin L.: Network Models and Optimization, Springer-Verlag, London, 2008.
7. Zuskin, S., Grubisic, N., Sumner, M (2015). Shipowner management in accordance with mutual agreement. Pomorstvo: Scientific Journal of Maritime Research, 29, 1, Rijeka, pp.69-74.



12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
The Management of Transshipment Terminals, Springer, New York, 2006	1	
Seaside Operations Planning in Container Terminals, Physica-Verlag, Berlin Heidelberg, 2009.	1	
Optimization Process ofr Berth and Quay-Crane Assignment in Container Terminals with Separate Piers	online	
A Solution for Container Terminal QC Scheduling Considering Grouped Tasks and Operative Zone Limits	online	

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Ljudevit Krpan, PhD	
Course title	Land use – Transport Planning	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> The aim of the course is to acquire the necessary knowledge of the basic elements of spatial and traffic planning and multi-criteria analysis. Furthermore, the aim is for students to independently assess and identify the objective spatial planning and accommodation options of the transport infrastructure, with particular emphasis on the accommodation of logistic zones. Accepted knowledge will enable students a rational judgment of project ideas related to the planning of the traffic system as well as the possibility of a critical review of the proposed design solutions.
<i>2. Course enrolment requirements</i> None
<i>3. Expected course learning outcomes</i> After completing the course and passing the exam, the student will be able to: 1. Valorize individual land use-transport solutions 2. Re-examine individual traffic solutions using multi-criteria analysis 3. Justify individual solutions for the accommodation of transport infrastructure 4. Critically evaluate the interface between spatial and traffic solutions, especially in urban environments 5. Assess the objective spatial planning and accommodation facilities of the transport infrastructure 6. Design high-quality transport solutions compatible with spatial capabilities 7. Review the existing transport network solutions 8. Create traffic solutions that are compatible with traffic needs and space requirements
<i>4. Course content</i> 1. Basic traffic planning and design settings 2. Types of Transport Planning 3. Transport offer and demand 4. Planning of urban structures from the point of transport view 5. Ensuring accessibility as a response to increased mobility needs 6. The role of transport in the development of urban environments 7. Correlation of spatial content and transport 8. Land use-transport models levels 9. The basics of spatial planning 10. Physical planning documents from the point of view of transport and transport infrastructure



11. Land use-transport models: Spatial differentiation
12. Land use-transport models: Defining transport zones
13. Land use-transport models: Defining the poles and connections system (functional-nodal method)
14. Land use-transport models: defining transport directions
15. Evaluating land use-transport solutions

5. Teaching methods	☒ lectures	☐ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☐ exercises	☒ laboratories
	☐ long distance education	☐ mentorship
	☐ fieldwork	☐ other _____

6. Comments	In the course of the lecture, students will visit the Institute for Physical Planning of the PGŽ and get a concrete insight into the models of spatial-traffic planning implemented for the needs of the PGŽ Spatial Plan
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7. Student's obligations

Attending classes
Passing an exam

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation	2,5	Seminar paper		Experimental work	
Written exam		Oral exam	3	Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

10. Assigned reading (at the time of the submission of study programme proposal)

Krpan, Lj.: Modeli prostorno-prometnog planiranja, Sveučilište Sjever, Varaždin, 2015. (selected chapters)

11. Optional / additional reading (at the time of proposing study programme)

1. Baričević, H.: Tehnologija kopnenog prometa, Pomorski fakultet u Rijeci, Rijeka, 2001.
2. Hess, S.: Planiranje prometne potražnje, Pomorski fakultet u Rijeci, Rijeka, 2010.
3. Maletin, M.: Planiranje i projektovanje saobraćajnica u gradovima, Orion art, Beograd, 2005.
4. Štimac, M.: Prostorno planiranje u praksi, Glosa, Rijeka, 2010.
5. Rodrigue, J-P., et. all: The Geography of Transport Systems, Taylor&Francis Group, New York, 2006.

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Associate professor Biserka Rukavina, PhD	
Course title	Legal framework for maritime domain and sea ports management	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
The aim of this course is to enable students to acquire knowledge of the legal aspect of maritime domain and seaports management. The aim is also to encourage students to study maritime legal and administrative regulations on maritime domain and seaports. By acquiring new knowledge, students should be able to apply the theoretical characteristics of concessions and concessionary approval to concrete cases, recognize the shortcomings of positive legal regulations and actively contribute to the effectiveness of managing these institutes.		
<i>2. Course enrolment requirements</i>		
<i>3. Expected course learning outcomes</i>		
1. Define and interpret basic legal principles and norms relating to maritime domain and seaports. 2. Explain the procedure for determining the borders of the maritime domain. 3. Explain the procedure for granting concessions of maritime domain. 3. Recognize and explain the differences between concessions and concessionary approval. 5. Apply theoretical characteristics of concessions and concessionary approval to concrete cases. 6. Analyze the shortcomings of positive legal regulations and explain possible future solutions.		
<i>4. Course content</i>		
1. The legal status of maritime domain and sea ports in the Republic of Croatia. 2. Legal framework for concessions in the Republic of Croatia. 3. Concession grant procedure. 4. Concessionary approval grant procedure. 5. Maritime domain and sea ports - future solutions.		
<i>5. Teaching methods</i>	X lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	X individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____



6. Comments							
7. Student's obligations							
Course attendance. Seminar paper. Oral exam.							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation		Seminar paper	2	Experimental work	
Written exam		Oral exam	3,5	Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio							
9. Assessment and evaluation of student's work during classes and on final exam							
10. Assigned reading (at the time of the submission of study programme proposal)							
- Maritime Domain and the Sea Ports Act, Official Gazette of the Republic of Croatia, No. 158/03., 100/04, 141/06, 38/09, 123/11 and 56/16. - The Concession Act, Official Gazette of the Republic of Croatia, No. 69/17. - Bolanča, Dragan, Pomorsko dobro i koncesije, Pomorsko dobro – problemi i perspektive, Inženjerski biro d.d. Zagreb, 2005. - Seršić, Vanja, Koncesije na pomorskom dobru, Novi informator, Zagreb, 2011.							
11. Optional / additional reading (at the time of proposing study programme)							
- Bolanča, Dragan, Pomorsko dobro u svjetlu novog Zakona o pomorskom dobru i morskim lukama iz 2003., Poredbeno pomorsko pravo, god. 43., br. 158., 2004. - Kundih, Branko, Pomorsko dobro sutra - <i>de lege ferenda</i>", Nekretnine u vlasništvu Republike Hrvatske i opća dobra, Inženjerski biro d.d., Zagreb, 2007. - Rak, Loris, Rukavina, Biserka, Jelčić, Olga, Uvođenje općeg stvarnopravnog režima na objektima lučke suprastrukture izgrađenim na temelju ugovora o koncesiji, Poredbeno pomorsko pravo, Jadranski zavod HAZU, Zagreb, br. 169., 2015. - Seršić, Vanja, Institut koncesija prema novom Zakonu o koncesijama", I dio Informator, br. 5734, 18.2.2009. i II dio Informator, br. 5735, 21.2.2009.							
12. Number of assigned reading copies with regard to the number of students currently attending the course							
Title				Number of copies		Number of students	
Maritime Domain and the Sea Ports Act, Official Gazette of the Republic of Croatia, No. 158/03., 100/04, 141/06, 38/09, 123/11 and 56/16.				Text available in Official Gazette.			
The Concession Act, Official Gazette of the Republic of Croatia, No. 69/17.				Text available in Official Gazette.			
Bolanča, Dragan, Pomorsko dobro i koncesije, Pomorsko dobro – problemi i perspektive, Inženjerski biro d.d. Zagreb, 2005.				2			
Seršić, Vanja, Koncesije na pomorskom dobru, Novi informator, Zagreb, 2011.				5			
13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences							
Student's feedback by means of survey organized by the University.							



Basic description		
Course coordinator	Assistant professor Siniša Vilke, PhD	
Course title	Sustainability of Inland Transport Systems	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> To familiarize students with the types The main goal of the course is to introduce students with inland transport systems development as an integral part of sustainability policy. For this purpose the students will research improvement possibilities of inland transport systems according to modern requirements and criteria of sustainability transport and environment management. Tasks of scientific education are designed in accordance with the course goal. The tasks will qualify the students for understanding the relations between inland transport and spatial planning as well as the impact of inland transport on the community and environment. The students will be qualified to interpret the relation of inland transport systems planning and transport sustainability as well as to analyze political measures significant for sustainability.
<i>2. Course enrolment requirements</i> According to the Regulations on postgraduate studies <i>Maritime Affairs</i>
<i>3. Expected course learning outcomes</i> 1. Link together the main operational decision making problems on container terminals 2. Examine existing mathematical models and determine the value of decision variables 3. Revise existing models depending on the technical and technological characteristics and criteria of decision- making 4. Formulate individual problem depending on the selected criteria for optimization 5. Evaluate and justify the results 6. Demonstrate the application of software tools for optimization and modeling
<i>4. Course content</i> Main components and development of inland transport systems. Planning and designing of inland transport systems. The impact of inland transport on Urban Environment. Inland transport, energy and environmental pollution. Urban expansion, telecommuting and transport. Transport sustainability and environment management. Sustainability of inland transport systems in Urban Environments. Sustainable transport and spatial planning. Inland transport and green logistics. The use of geographical information system (GIS) in inland transport. The goals of sustainable transport policy.



5. Teaching methods		☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____	
6. Comments					
7. Student's obligations					
Students are required to make programming task (practical optimization model) using software-computing tools, after previously conducted scientific research					
8. Evaluation of student's work					
Course attendance	0,5	Activity/Participation	1	Seminar paper	Experimental work
Written exam		Oral exam	1	Essay	Research
Project		Sustained knowledge check		Report	Practice
Portfolio			1		
9. Assessment and evaluation of student's work during classes and on final exam					
Evaluation of outcomes is carried out through activities in the classroom (method of computer modeling default problems), the quality of research and practical work - a programming task that the student has to make and the presentation of the exam. Examples of evaluating the individual learning outcome: 1. Explain conditioning solutions results of individual tactical logistical problems in sea-side transshipment process at the operation of the ship and the planning of ship arrivals 2. Create an existing mathematical model and determine the value of the main variables 3. For the selected model redefine inputs and change the criteria of decision-making 4. Create a program basis for custom problem according to the own choice 5. Make post-optimum analysis and explain the obtained solution 6. Demonstrate how to use the software tools and explain their limitations					
10. Assigned reading (at the time of the submission of study programme proposal)					
1. Štefančić, G.: Tehnologija gradskog prometa I, Fakultet prometnih znanosti, Zagreb, 2008. 2. Črnjar, M.: Ekonomika i politika zaštite okoliša, Ekonomski fakultet, Rijeka, 2002. 3. Baričević, H., Tehnologija kopnenog prometa, Pomorski fakultet, Rijeka, 2001. 4. Golubić, J.: Promet i okoliš, Fakultet prometnih znanosti, Zagreb, 2006. 5. Štefančić, G.: Tehnologija gradskog prometa II, FPZ, Zagreb, 2011.					
11. Optional /additional reading (at the time of proposing study programme)					
1. Black, A.: Urban Mass Transportation Planning, University of Kansas, 1995. 2. Baričević, H., Poletan-Jugović, T., Vilke, S.: Tereti u prometu, Pomorski fakultet, Rijeka, 2010. 3. Hanson, S.: The Geography of Urban Transportation, Second Edition, New York, 1995. 4. V. R. Vuchic: Urban Transit, University of Pennsylvania, Philadelphia, 2005. 5. Maglić, L.; Baričević, H.; Vilke, S.: <i>Carpooling and the development of sustainable transport</i>, Proceedings – International Scientific Conference “Planning and development of sustainable transport system” – ZIRP, Zagreb 2013.					



12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
	1	
	1	
	online	
	online	

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Assistant professor Žarko Koboević, PhD	
Course title	Environmental risks in the maritime industry	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> The aim of the course is to familiarize students with the proper perception of the environmental risks in the maritime industry and with risk assessment methods. Students will use scientific methods to determine environmental risks while the ship is operating under the contract of affreightment. They will be able to analyse hazardous systems on board ship and will get acquainted with the risk assessment methods. Dominant factors will be analysed and the mosaic of elements will be elaborated through navigation and through various criteria from which a model of environmental risk management can be developed. The main objective is to identify and assess the level of harmful effects of a particular ship on the marine environment and reduce it.
<i>2. Course enrolment requirements</i> Attended A course lectures, i.e. lectures in the I semester
<i>3. Expected course learning outcomes</i> After attending lectures, writing the seminar paper, and passing the exam, students are expected to : - Identify harmful substances that the ship releases or could release, - Describe and compare potentially hazardous ship systems, - Describe and define the level of harmfulness of emitted substances, - Set up a risk matrix for specific operations on board ships, - Independently assess the level of harmfulness of a particular ship or ship system, - Define the procedures that can reduce the ship's harmful impact on the environment.
<i>4. Course content</i> Risks in the shipping industry in general. Harmful effect on the environment. Harmful substances released into the sea and air, heat, noise, harmful substances discharged ashore, the heat released from ships. Environmentally hazardous ship systems. Power plant emission factors. Accommodation, treatment and handling of harmful substances. Harmful effect of cargo on the marine environment. Harmful effect of the ballast system. Harmful effect of the hull, coatings, and noise. The analysis of factors affecting the ship's environmental risk assessment. The tendency and frequency of hazards according to the ship type. The age of specific ships tested for the cause of risk. Ship defects. Human errors. The contribution of ports and states in the hazardous events. Technical, operating, human, and standardization factors. The environmental risk assessment of the hazardous event in terms of the type of ship, ship defect, human error, the state and port where the event occurred. The environmental risk assessment of the ship on the example of water ballast management model. Elaboration of the risk matrix. Impact factors, elements of the situation, the level of



harmfulness of the elements of situation. Setting up the harmfulness model on the example of the released water ballast for the real types of ships in the operating conditions.

5. Teaching methods	☒ lectures	☒ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☒ exercises	☐ laboratories
	☐ long distance education	☐ mentorship
	☐ fieldwork	☐ other _____

6. Comments

7. Student's obligations

Attending lectures or consultative classes and writing a seminar paper corresponding to the scientific paper.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	3,5	Experimental work	
Written exam		Oral exam	2	Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

70% classes and seminar paper, 30% the final exam

Continuous assessment:

Preparation and presentation of the seminar paper on the topic chosen from the course content in agreement with the lecturer.

Final exam:

The final exam (oral) comprises the presentation of the seminar paper to assess the independence in preparing the work and integrity of theoretical knowledge. A minimum of 50% of theoretical knowledge is required.

10. Assigned reading (at the time of the submission of study programme proposal)

Safety Management and Risk Analysis, Svein Kristiansen, Elsevier Butterworth-Heinemann, Norfolk, 2005.

11. Optional / additional reading (at the time of proposing study programme)

1. P&I CLUB, Analysis of major claims (Ten year trends in maritime risks), Thomas Miller P&I Report, London, 2000.
2. Ž. Koboević: Model of Marine Pollution by Black Waters from Vessels, doctoral thesis, Rijeka, Faculty of Maritime Studies Rijeka, 2015.

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students
Safety Management and Risk Analysis	2	2

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.

The quality is monitored in line with the ISO 9001 system and the European quality benchmark implemented at the University of Rijeka. The exam pass rate is analysed once a year and suitable measures are applied.



Basic description		
Course coordinator	Full professor Goran Kniewald, PhD	
Course title	Oceanography	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
1. Course objectives		
The objective of the course is to provide students a basic introduction into the scientific aspects of physical, chemical, biological and geological oceanography, as well as issues related to pollution of the marine environment.		
2. Course enrolment requirements		
None		
3. Expected course learning outcomes		
The expected outcome is for the students to obtain a sound understanding of the basic principles of oceanography (marine physics, chemistry, biology, geology, pollution) including a treatment of contemporary and future threats to the world ocean. Sustainability of the marine environment. Specific aspects of semi-enclosed (Mediterranean) and enclosed seas (Adriatic sea).		
4. Course content		
1.The world ocean – 2. History of marine science – 3. Earth structure and plate tectonics – 4. Physical oceanography – 5. Chemical oceanography – 6. Biological oceanography – 7. Geological oceanography – 8. Atmospheric circulation and climate – 9. Coasts and coastal environments – 10. Marine pollution at local, regional and global scale – 11. Marine resources – 12. Threats to the world ocean and its sustainability		
5. Teaching methods	x lectures x seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment X multimedia and network ☐ laboratories ☐ mentorship ☐ other _____
6. Comments	Teaching methods will be commensurate with the number of auditors	
7. Student's obligations		
Regular attendance of lectures and participation in seminars.		



8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	2	Experimental work	
Written exam	3,5	Oral exam		Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Written and/or oral examination, seminar work and papers/presentations (individually or in group). One mid-term exam.

10. Assigned reading (at the time of the submission of study programme proposal)

Garrison, T. (1996) Oceanography – an invitation to marine science. Second edition. Wadsworth Publishing Company, London.

11. Optional / additional reading (at the time of proposing study programme)

Web resources (www) and additional literature assigned by the lecturer

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Axel Luttenberger, PhD	
Course title	Legal aspects of the protection of the marine environment	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
<i>1. Course objectives</i>		
The education and development of researchers capable of undertaking research in the field of protection of marine environment, in particular to conduct research on the promotion of maritime safety standards, to actively contribute to the effectiveness of management of marine environment and being trained to respect international obligations and transfer of knowledge.		
<i>2. Course enrolment requirements</i>		
<i>3. Expected course learning outcomes</i>		
Expected outcomes are the competence to perform research in protection of marine environment, i.e. legal framework for protection of marine waters, conservation and recovery of the marine and coastal ecosystems and the protection of biodiversity, conservation of protected marine areas and ecologically important areas of the European Union, the reduction of pollution in the marine and coastal environment and conservation,, improving and restoring the balance between human activities and natural resources in the sea and on the shores taking into account of ecosystems approach to management.		
<i>4. Course content</i>		
The definition of the marine environment. Safety of Maritime Navigation (International Maritime Organization, the European Maritime Safety Agency, the organization of administrative inspection and technical professional activities in the Republic of Croatia, maritime navigation). Maritime domain and ports. Maritime ship (concept and types, elements of individualization of ships, registration of ships, ship safety, calibration of ships, books and documents). Floating objects. Boat and yacht. The role of the human factor (stakeholders on land, master and crew). International, regional and national sources of law on protection of marine environment. Implementation and control of international standards of environmental protection. The requirements for maritime industry, government and non-governmental organizations, and public awareness development.		
<i>5. Teaching methods</i>	☒ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____



6. Comments							
7. Student's obligations							
lectures, seminar and workshop, research							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation	0,5	Seminar paper	1	Experimental work	
Written exam		Oral exam	2	Essay	0,5	Research	1,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							
9. Assessment and evaluation of student's work during classes and on final exam							
integrated assessment procedure, as above 8.							
10. Assigned reading (at the time of the submission of study programme proposal)							
1. Grabovac, Ivo, Pomorsko pravo Republike Hrvatske, Split, 2002. 2. Rudolf, Davorin, Međunarodno pravo mora i Hrvatska, Zagreb, 2001. 3. Luttenberger, Axel, Osnove međunarodnog prava mora, Rijeka, 2006.							
11. Optional / additional reading (at the time of proposing study programme)							
1. Luttenberger, Axel, Runko Luttenberger, Lidija, Sustainable procurement and environmental life-cycle costing in maritime transport, World Maritime University Journal of Maritime Affairs, Malmo, 2016, pp 1-13, doi:10.1007/s13437-016-0116-6 2. Runko Luttenberger, Lidija, Luttenberger, Axel, Environmental assessment of externalities associated with tourist property development projects in coastal areas, Tourism & Hospitality Industry 2016, Trends and Challenges, Faculty of Tourism and Hospitality Management, Opatija, 2016, pp. 404-417 3. Zekić, Astrid, Luttenberger, Axel, Doprinos morskog prostornog planiranja zaštiti morskog okoliša, Pomorski zbornik, Posebno izdanje, 2016., str.283-296 4. Luttenberger, Axel, Runko Luttenberger, Lidija. Environmental life-cycle costing in maritime transport, International Association of Maritime University, 16th Annual General Assembly Proceedings, University of Rijeka, Faculty of Maritime Studies, 2015, Rijeka, pp 217-223 5. Luttenberger, Axel, Runko Luttenberger Lidija, Uloga pravosuđa u suzbijanju klimatskih promjena i zaštiti morskog okoliša, Poredbeno pomorsko pravo, god.54, broj 169, Zagreb, 2015, str.515-531 6. Luttenberger, Axel, Runko Luttenberger Lidija, Environmental Aspects of Public Procurement in Transport Sector, 17th International Conference on Traffic Science, Slovenian Society of Traffic Science, University of Ljubljana, Faculty of Maritime Studies, Portorož, 2015, pp.261-274 7. Luttenberger, Axel, Izazovi zaštite morskog okoliša sudskim putem, Peti znanstveno-stručni skup In memoriam prof.dr.sc. Vjekoslav Šmid Aktualnosti hrvatskog pomorskog prava, prava mora, prava u turizmu i građanskog i upravnog prava, Pravni fakultet Sveučilišta u Splitu, Split, 2014., str.129-141 8. Luttenberger, Axel, The role of precautionary principle in environmental protection of coastal sea, Tourism & Hospitality Industry 2014, New Trends in Tourism and Hospitality Management, Faculty of Tourism and Hospitality Management, Opatija, 2014, pp. 70-78 9. Runko Luttenberger, Lidija, Luttenberger, Axel, Challenges of Marine Spatial Planning in Eastern Adriatic, 6th International Maritime Scientific Conference, Solin, Faculty of Maritime Studies Split, 2014, pp.33-40 10. Luttenberger, Axel, Kos, Serđo, Regulating the Provisions of European Marine Data and Observation, International Conference IMLA 21, Fisheries and Marine Institute of Memorial University of Newfoundland, St. John's, NL, Canada, 2013, pp.69-73							



12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Luttenberger, Axel, Osnove međunarodnog prava mora, Rijeka, 2006.	3	3

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Damir Zec, PhD Matej David, PhD	
Course title	Ballast water management and risk assessment	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i>
To explain students the principles, methods and limitations of ballast water management on ships and terminals with special emphasis on the policy management and risk assessment methods.
<i>2. Course enrolment requirements</i>
According to the Regulations on postgraduate study "Pomorstvo"
<i>3. Expected course learning outcomes</i>
- Knowing the basic principles of preventing the transport of invasive species by ballast water - Being able to develop a program of research to determine the ballast water load in terminals - Being able to develop the baseline study program for a given pair of ports - Being able to develop a risk assessment for a given port or ship
<i>4. Course content</i>
Ships and ballast water. Profile and transportation of ballast water and capacities of different types of ships. Influences and safety aspects of ballast water. Negative impacts of ballast water to the environment, economy and human health. The processes of transfer of organisms by ballast water and their negative impacts. Case studies with significant adverse effect. International Convention for Ballast Water Management. The requirements of the Convention and associated guidelines, especially in the part related to risk management. Technological requirements. National and regional requirements and approaches to the management of ballast water, particularly in terms of risk assessment. Methods and approaches to the management of ballast water. Methods of ballast water exchange and methods of treating ballast water, including possibilities and limitations. Methods and approaches to risk assessment for the purposes of Ballast Water Management. The risk assessment for the purposes of implementing the International Convention on Ballast Water Management and Sediment. The inspection control of the BWM Convention implementation. Inspection procedures and methods provided for in the Convention and guidelines, with particular emphasis on theoretical items and practical application of sampling of ballast water. Decision-making in the management of ballast water. Methods and application of the decision-making support systems and early warning system.



5. Teaching methods		☒ lectures ☐ seminars and workshops ☐ exercises ☒ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____	
6. Comments					
7. Student's obligations					
The student is required to prepare a program of the baseline study and risk assessment program for a selected pair of ports.					
8. Evaluation of student's work					
Course attendance	0,5	Activity/Participation	1	Seminar paper	Experimental work
Written exam		Oral exam		Essay	Research
Project	1	Sustained knowledge check		Report	Practice
Portfolio					3,5
9. Assessment and evaluation of student's work during classes and on final exam					
The evaluation of learning outcomes is based on verification of the suitability of programs that are given as assignment during the teaching process in particular: - The study of the ballast water load for a port is appropriate for the given conditions in the selected port. - The program of the baseline study is appropriate given the conditions in the selected port. - The development of the risk assessment program, including all sources, is appropriate to the given conditions in the chosen pair of ports.					
10. Assigned reading (at the time of the submission of study programme proposal)					
1. David, M., Gollasch, S. (Eds.) (2015) Global Maritime Transport and Ballast Water Management – Issues and Solutions. Invading Nature, Springer Series in Invasion Ecology 8, Springer Science + Business Media, Dordrecht, 2015, DOI: 10.1007/978-94-017-9367-4. 2. IMO, International Convention for the Control and Management of Ships' Ballast Water and Sediments 2004, International Maritime Organization, 13 February 2004, IMO, London, 2004., sa smjernicama G1-G15					
11. Optional / additional reading (at the time of proposing study programme)					
1. David, M., Gollasch, S., Cabrini, M., Perkovič, M., Bošnjak, D., Virgilio, D. (2007). Results from the first ballast water sampling study in the Mediterranean Sea - the Port of Koper study. Marine Pollution Bulletin 54, 53-65. 2. M. David, M. Perkovič, V. Suban, S. Gollasch, A Generic Ballast Water Discharge Assessment Model as a Decision Supporting Tool in Ballast Water Management, Dec. Supp. Syst. 53 (2012) 175-185, DOI: 10.1016/j.dss.2012.01.002. 3. David, M., Gollasch, S., Leppäkoski, E., 2013. Risk assessment for exemptions from ballast water management – The Baltic Sea case study. Marine Pollution Bulletin 75, 205–217, DOI: 10.1016/j.marpolbul.2013.07.031. 4. David, M., Gollasch, S., Pavliha, M. (2013). Global ballast water management and the same location concept – a clear term or a clear issue? Ecological Applications 23 (2), 331–338. 5. David M (2013) Ballast water sampling for compliance monitoring - Ratification of the Ballast Water Management Convention. Final report of research study for WWF International. Project number 10000675 - PO1368					



12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Global Maritime Transport and Ballast Water Management – Issues and Solutions	2	
IMO, International Convention for the Control and Management of Ships' Ballast Water and Sediments 2004, International Maritime Organization, 13 February 2004, IMO, London, 2004., sa smjernicama G1-G15		

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

The quality of studies is monitored in accordance with the ISO 9001 system and in accordance with European standards and guidelines for quality assurance carried out at the Faculty of Maritime Studies. Once a year, the results of transience are analysed, causing appropriate measures, if needed.



Basic description		
Course coordinator	Associate professor Mirjana Kovačić, PhD	
Course title	Coastal management and sustainable development	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> Introducing the previous research in the world and in Croatia. Case studies and practical examples with the aim of determining the interdependence of coastal zone management and sustainable development. Familiarization with different models coastal zone management. Maritime spatial planning and its role in the planning of coastal areas. Specific objective: Introduction to fundamental issues and problems of growth and development and issues of sustainability in order to understand the processes that occur in the coastal area and the planning of its development.
<i>2. Course enrolment requirements</i>
<i>3. Expected course learning outcomes</i> 1. Explain the need for the establishment of coastal zone management 2. Have some new knowledge of the role of public administration in the development of coastal areas 3. Define the institutional framework 4. Explain the role of maritime spatial planning as fundamental determinants of coastal zone management 5. Know and define the different models of coastal zone management 6. Explain the methods and techniques of evaluation of the coastal areas 7. Apply theoretical knowledge in the process of research to practical example
<i>4. Course content</i> • INTRODUCTION: Past researches, Role of coastal area in economic development of the countries; • THEORETICAL APPROACH TO MANAGEMENT AND PLANNING OF COASTAL AREA: Mechanisms and instruments of management of coastal area, Coordination and role of public administrations and citizens development of coastal area, Sustainable coastal development; • INTEGRAL COASTAL MANAGEMENT: Institutional framework, Maritime Spatial Planning, Methodology, EU, Regions and Regional development; • COASTAL MANAGEMENT IN CROATIA: Organization and structure of public administration, Institutional and intellectual capacities, Management of maritime domain, concept of concession; Planning as part of coastal zone management • BEACH MANAGEMENT: Theoretical approach to beaches classification, Methods of valorization, International and Croatian experiences.



5. Teaching methods		☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☒ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____			
6. Comments							
7. Student's obligations							
Conducting research on a given topic, writing a paper, go to the conference / publication in a scientific journal							
8. Evaluation of student's work							
Course attendance	0,5	Activity/Participation	1	Seminar paper	1	Experimental work	
Written exam		Oral exam	1	Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							
9. Assessment and evaluation of student's work during classes and on final exam							
Essay on a given topic, oral exam, attending a conference / announcement operation							
10. Assigned reading (at the time of the submission of study programme proposal)							
1. Kovačić, M. Komadina, P: Upravljanje obalnim područjem i održivi razvoj, Pomorski fakultet Sveučilišta u Rijeci, 2011. 2. Cičin Sain, B., Pavlin I., Belfiore S.: Sustainable Coastal Management - A Transatlantic and Euro-Mediterranean Perspective: „The role of regional economic agreements in marine resource conservation“, Gonzalo, C., Kluwer Academic Publishers, Dordrecht, 2002. 3. Črnjar K., Črnjar M.: Menadžment održivog razvoja, Fakultet za menadžment u turizmu i ugostiteljstvu u Opatiji, Sveučilište u Rijeci, 2009. 4. Filipić, P., Šimunović, I.: O ekonomiji obalnih područja, planiranje i upravljanje, Sveučilište u Splitu, Ekonomski fakultet Split, 1993. 5. Williams, A.; Micaleff, A.: Beach Management: Principle & Practice, Earthscan Publications Ltd., London, U.K., 2009. 6. Kovačić, M., Zekić, A., Rukavina, B.: Maritime Spatial Planning in Croatia – Necessity or Opportunity for Balanced Development, Pomorstvo, Journal of Maritime Studies, vol. 30, No.1 (2016), p. 82-87. 7. Kovačić, M., Schiozzi, D., Zekić, A.: The Experiences and Dilemmas in implementing the Marine Spatial Planning in Integrated Coastal Zone Management, 35 th International Conference on Organizational Science Development. „Sustainable Organization“. 35 (2016); Portorož, pp 398-404. CD Proceedings.							
11. Optional / additional reading (at the time of proposing study programme)							
1. Mrvica, A., Jugović, A., Kovačić, M: The Role and Applicability of Multi-criteria Procedures in the Function of Defining the Model for Connecting the Mainland and Islands and Islands in Between, Pomorstvo, Journal of Maritime Studies, vol. 29, No.2 (2015), p. 156-164. 2. Kovačić, M., Zekić, A., Rukavina, B.: Maritime Spatial Planning in Croatia – Necessity or Opportunity for Balanced Development, Pomorstvo, Journal of Maritime Studies, vol. 30, No.1 (2016), p. 82-87. 3. Kovačić, M., Jurić, M. Lekić, R.: Responsibility of Public Administration in the Protection of Coastal Area during the Adoption Process to EU – Case Study of Croatia, 32 nd International Conference on Organizational Science Development. „Smart Organization. High Potential. Lean Organization. Internet of							



Things." 32 (2013); Portorož, p. 432-441.

4. Kovačić, M., Favro, S., Gržetić, Z.: *Proposal of Socio-economic Model of Development of Small, Periodically Inhabited and Uninhabited Croatian Islands*, 2nd International Conference on Science Development, Conference Proceedings Wit Press, Wit Library, September 17th – 19th, 2012 Brač, Croatia, p. 143-153.
5. Kovačić, M., Saftić, D., Violić, A.: *Possibilities of Implementation of the Geographic Information System (GIS) in Coastal Area Management – the Case of Croatia*, 4th International Scientific Conference, Knowledge and Business Challenge of Globalization in 2012, Celje, Slovenia 2012., p. 823-831.
6. Kovačić, M.; Luković, T., Saftić, D.: *Geographic Information System in Coastal Area Management*, 30th International Conference on Organizational Science Development. „Future Organization“ 30 (2011); Portorož, 615-624.
7. Kovačić, M., Jurić, V.: *Evaluation of Maritime Domain for the Economic Development of the Republic of Croatia*, IMSC, Split, 2011.
8. Kovačić, M., Favro, S., Perišić, M.: *The Issue of Coastal Zone Management in Croatia - Beach Management*, Tourism&Innovation Journal, Year 3, No.1-2, July 2010, ISSN 1855-3303.

12. Number of assigned reading copies with regard to the number of students currently attending the course

Title	Number of copies	Number of students

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Serđo Kos, PhD Slavko Barić, PhD	
Course title	Geopolitics and geostrategy	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION

1. Course objectives

The aim of the course *Geostrategy* is presentation of geostrategy as a part of geopolitics which deals with research of geographic factors with impact to the political and military planning action of specific state in realization of national interests. Geopolitics is exploring geographical and political characteristics of the certain region (influence of geography on politics). Geostrategy explores military planning aspects aiming at achievement of defined national goals (application of military power on specifically critical area on Earth, directed towards the creation of political presence in international system).

Students will be learned about the term of geostrategy and its connection with geopolitics. Also, geostrategy will be presented through evolutionary phases – development of land power (Clausewitz and Jomini), naval power (Mahan, Corbett, Mackinder), aerial power (Dhouet, Mitchell, Seversky), nuclear power (Brodie, Kahn) and space power (Ober, Dolman, Klein).

2. Course enrolment requirements

Nil

3. Expected course learning outcomes

Course expected learning outcomes on the basis of which the students, after completing and passing the course will be able to:

1. Explain structural elements of geopolitics and geostrategy and their relationship,
2. Analyze and evaluate relevant factors that influence the formulation of the geostrategy,
3. Explain stages of geostrategy from the beginning of the 19th century until today,
4. Explain theories of maritime power, nuclear power and space power,
5. Analyze and evaluate naval power and correlate it with the geostrategy,
6. Analyze and evaluate geostrategical characteristics of maritime space,
7. Analyze and evaluate geopolitical and geostrategical components of the sea,
8. Analyze and evaluate maritimization and militarization at sea,
9. Analyze and evaluate the impact of maritime power on warfare,
10. Analyze and evaluate elements of terrestrial power.



4. Course content

Definition of geopolitics and geostrategy. Relation between geostrategy and geopolitics.
The impact of factors on forming geostrategy. Geographical factor. Historical factor. Demographical factor. Strategic culture. Other factors.
Development phases of geo-strategy from the beginning of the XIX. century to the present. Theories of land power of the XIX. century. Theories of naval power 1890-1919. Theories of aerial power 1918-1945. Theories of nuclear power 1945-1960. Theories of space power 1999-present.
Naval power. Connection of naval power and geostrategy. Construction of naval power. Naval power strategy. Geostrategical characteristics of maritime areas. Geopolitical and geostrategical components of the sea. Maritimisation during the world history. Militarisation at sea.
Impact of naval power on maritime warfare. Elements and classification of land power.
Theory of naval power. Mahan's theory of naval power. Corbett and naval power. Mackinder and geostrategy. Other theoreticians of the naval power.
Case studies. Geostrategical significance of the Mediterranean. Geostrategical significance of the Indian ocean. Geostrategy of the USA (expeditional warfare).

5. Teaching methods	X lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	X individual assignment ☐ multimedia and network ☐ laboratories X mentorship ☐ other _____
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6. Comments	Nil
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7. Student's obligations

Lectures, individual assignments and research.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	1	Experimental work	
Written exam		Oral exam		Essay		Research	4,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Assessment and evaluation of student's work is conducted through research of specified topic related to the course opus.

10. Assigned reading (at the time of the submission of study programme proposal)

1. Collins, J. M.: Military Geography, Washington: National Defense University Press, 1998.
2. Cvrtila, V.: Politička geografija i geopolitika, skripta, Zagreb: Fakultet političkih znanosti, 2004.
3. Jablonsky, D.: Roots of Strategy – Book 4 (Mahan, Corbett, Dhoutet, Mitchell), Mechanicsburg-Pennsylvania: Stackpoole Books, 1999.
4. Lindberg, M.; Todd, D.: Brown, Green- and Blue-Water Fleets: The Influence of Geography on Naval Warfare, 1861 to the Present, London: Praeger Publishers, 2002.
5. Till, G.: Seapower: A Guide for the Twenty-First Century, Second Edition, New York: Routledge, 2009.



11. Optional / additional reading (at the time of proposing study programme)

1. Bouchard, C.; Crumplin, W.: Neglected no longer: the Indian Ocean at the forefront of world geopolitics and global geostrategy, *Journal of the Indian Ocean Region*, 6,1, 2010., str. 26-51.
2. Diaconu, Florin: A Renewed Geopolitical and Geostrategic Role for the Mediterranean Sea, *Strategic Impact*, no.3, 2008.
3. Dodds, K.: *Geopolitics: A Very Short Introduction*, New York: Oxford University Press, 2007.
4. Hattendorf, J. B.: *Naval Strategy and Policy in the Mediterranean: Past, Present and Future*, London: Frank Cass Publishers, 2000.
5. Murray, W.; Knox, M; Bernstein, A.: *The Making of Strategy: Rulers, States, and War*, Cambridge: Cambridge University Press, 1994.

12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Collins, J. M.: <i>Military Geography</i> , Washington: National Defense University Press, 1998.	1	
Cvrtila, V.: <i>Politička geografija i geopolitika</i> , skripta, Zagreb: Fakultet političkih znanosti, 2004.	1	
Jablonsky, D.: <i>Roots of Strategy – Book 4</i> (Mahan, Corbett, Dhoutet, Mitchell), Mechanicsburg-Pennsylvania: Stackpoole Books, 1999.	1	

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Assistant professor Luka Mihanović, PhD	
Course title	Navy combat systems	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (P+V+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i> To introduce students to navy combat systems, their constructional and technological solutions. To adopt knowledge on artillery and rocket armed systems of navy's, mine warfare and submarine warfare of armed navy's with special review on their use. To conduct comprehensive analysis of today's navy weapon systems and tendencies of their future development and appliance depending on global safety movements. To explore platforms (holders) of navy weapon systems with an accent on warships. To analyze networking and interdependence of weapon systems with other ship systems and systems on mainland. To master knowledges on efficiency and tactics of applying navy weapon systems on different platforms and in different conditions of combat acts.
<i>2. Course enrolment requirements</i>
<i>3. Expected course learning outcomes</i> Upon successful completion of the course, students will be able to: 1. Understand the basics of ballistics and shooting theory. 2. Identify different types of artillery ammunition and lighters and their use 3. Know the different types of naval cannons and their tactical use. 4. Know the most significant naval artillery systems of the Navy. 5. Explain the basic principles of air defence and missile defence of naval forces. 6. Know the principles of combat use and maintenance of missile ship systems. 7. Understand the basics of mine weapons and their tactical use. 9. Know the principles of use of Navy combat carriers. 10. Explain the basic principles for the use of anti-submarine weapons systems.
<i>4. Course content</i> 1. Classification of holders of navy weapon systems. 2. Systems of warship weaponing, the division of weapon systems. 3. Ballistics foundations and shooting theories, shooting goals n sea, land and in air. 4. Ship artillery, artillery of HRM, fundamental characteristics, installation, adjusting and questioning. 5. Artillery ammunition. 6. Ship's rocket weaponing, generally on rocket weaponing. 7. Division of rocket weaponing based on its use.



8. Foundations of aerodynamics and construction of anti-ship rocket (analysis of anti-ship RBS 15B rocket)
9. Use of holders of rocket weapons and anti-missile defence of the ship and navigation structure.
10. Anti-aircraft defence of the ship.
11. Underwater weaponing, historical development and role of underwater weapon in maritime combat.
12. Division of mine weaponing, tasks and use of mine weapons.
13. Anti-mine systems and systems for compensation of ship's physical areas.
14. Torpedo weaponing.
15. Antisubmarine weaponing.
16. Electronic combat systems for electronic combat reconnaissance, distraction, counter electronic protection and reconnaissance.
17. Integrated systems for ship managing and devices for fire managing.
18. Special ship weaponing systems.
19. The most important weaponing systems of navy's of the world.

5. Teaching methods	☒ lectures	☒ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☐ exercises	☐ laboratories
	☐ long distance education	☒ mentorship
	☐ fieldwork	☐ other _____

6. Comments

7. Student's obligations

Attending class, researching, seminar papers, tests.

8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	1	Experimental work	
Written exam	1	Oral exam	1	Essay		Research	2,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Attending class, researching, seminar papers, tests.

10. Assigned reading (at the time of the submission of study programme proposal)

1. Brlić, M.: Razarači i fregate za 21. stoljeće, Zagreb, 2002.
2. Kristić, V.; Polić, I.: Naoružanje i opremanje ratnog broda, FSB, Zagreb
3. Seretinek, Ž.: Namjena zadaće i paljbene mogućnosti brodskog topništva, HRM, Split, 2006.
4. Seretinek, Ž.: Tendencija razvoja suvremenih brodskih sustava, HRM, 2006.
5. Seretinek, Ž.: Osnove balistike i teorije gađanja, HVU, Zagreb, 2011.
6. Mihanović L., Seretinek, Ž.: Topničko streljivo HRM, HVU, Zagreb, 2017.

11. Optional / additional reading (at the time of proposing study programme)

1. Newspapers: Hrvatski vojnik; Armada, Defense news, Navy, ...
2. Materials issued by professors Croatian Military Academy.
3. Different materials issued by the world's largest manufacturers of ship weapons and equipment.



12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

The studying quality is measured according to ISO 9001 system and according to European standards and guidelines for ensuring quality conducted on Faculty of Maritime Studies Rijeka. Once a year transience results are analyzed and appropriate measures brought.



Basic description		
Course coordinator	Full professor Axel Luttenberger, PhD	
Course title	Law of the Armed Conflicts at Sea	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION		
1. Course objectives		
The education and development of researchers capable of undertaking the research in the field of naval warfare law, in particular to conduct the research work in stimulating and development of humanitarian law at sea as naval activity and the activity intended for civil purposes.		
2. Course enrolment requirements		
3. Expected course learning outcomes		
Expected course include international rules contained in international treaties and case law, that are particularly designed for resolving the international humanitarian problems resulting directly from international or non-international conflicts and that for humanitarian reasons use warfare methods at own chose, or protect persons and property that are or could be hit by conflict.		
4. Course content		
The concept of naval warfare law. Ban of the use of force and peace keeping. Geneva Conventions for protection of war victims and additional protocols. Naval war (Declaration concerning the law of naval war, Hague convention on naval war, San Remo manual on international law applicable to armed conflicts at sea). The implementation of international naval law (international level of responsibility, national level of responsibility). Making the foundations for peaceful conflict resolution after its ending.		
5. Teaching methods	x ☐ lectures x ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☐ individual assigment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____
6. Comments		
7. Student's obligations		
lectures, seminar and workshop, research		



8. Evaluation of student's work

Course attendance	0,5	Activity/Participation	0,5	Seminar paper	1	Experimental work	
Written exam		Oral exam	2	Essay	0,5	Research	1,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

integrated assessment procedure, as above 8.

10. Assigned reading (at the time of the submission of study programme proposal)

1. Luttenberger Axel, Pomorsko ratno pravo, Rijeka, 2008.
2. Politakis, George, Modern Aspects of Naval Warfare and Maritime Neutrality, London-New York, 1998
3. The Handbook of Humanitarian Law in Armed Conflicts, Oxford University Press, 2000

11. Optional / additional reading (at the time of proposing study programme)

1. Luttenberger, Axel, Runko Luttenberger, Lidija, Sustainable procurement and environmental life-cycle costing in maritime transport, World Maritime University Journal of Maritime Affairs, Malmo, 2016, pp 1-13, doi:10.1007/s13437-016-0116-6
2. Runko Luttenberger, Lidija, Luttenberger, Axel, Environmental assessment of externalities associated with tourist property development projects in coastal areas, Tourism & Hospitality Industry 2016, Trends and Challenges, Faculty of Tourism and Hospitality Management, Opatija, 2016, pp. 404-417
3. Zekić, Astrid, Luttenberger, Axel, Doprinos morskog prostornog planiranja zaštiti morskog okoliša, Pomorski zbornik, Posebno izdanje, 2016., str.283-296
4. Luttenberger, Axel, Runko Luttenberger, Lidija. Environmental life-cycle costing in maritime transport, International Association of Maritime University, 16th Annual General Assembly Proceedings, University of Rijeka, Faculty of Maritime Studies, 2015, Rijeka, pp 217-223
5. Luttenberger, Axel, Runko Luttenberger Lidija, Uloga pravosuđa u suzbijanju klimatskih promjena i zaštiti morskog okoliša, Poredbeno pomorsko pravo, god.54, broj 169, Zagreb, 2015, str.515-531
6. Luttenberger, Axel, Runko Luttenberger Lidija, Environmental Aspects of Public Procurement in Transport Sector, 17th International Conference on Traffic Science, Slovenian Society of Traffic Science, University of Ljubljana, Faculty of Maritime Studies, Portorož, 2015, pp.261-274
7. Luttenberger, Axel, Izazovi zaštite morskog okoliša sudskim putem, Peti znanstveno-stručni skup In memoriam prof.dr.sc. Vjekoslav Šmid Aktualnosti hrvatskog pomorskog prava, prava mora, prava u turizmu i građanskog i upravnog prava, Pravni fakultet Sveučilišta u Splitu, Split, 2014., str.129-141
8. Luttenberger, Axel, The role of precautionary principle in environmental protection of coastal sea, Tourism & Hospitality Industry 2014, New Trends in Tourism and Hospitality Management, Faculty of Tourism and Hospitality Management, Opatija, 2014, pp. 70-78
9. Runko Luttenberger, Lidija, Luttenberger, Axel, Challenges of Marine Spatial Planning in Eastern Adriatic, 6th International Maritime Scientific Conference, Solin, Faculty of Maritime Studies Split, 2014, pp.33-40
10. Luttenberger, Axel, Kos, Serđo, Regulating the Provisions of European Marine Data and Observation, International Conference IMLA 21, Fisheries and Marine Institute of Memorial University of Newfoundland, St. John's, NL, Canada, 2013, pp.69-73



12. Number of assigned reading copies with regard to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Luttenberger Axel, Pomorsko ratno pravo, Rijeka, 2008	3	3

13. Quality monitoring methods which ensure acquirement of output knowledge, skills and competences

Student's feedback by means of survey organized by the University.



Basic description		
Course coordinator	Full professor Robert Fabac, PhD	
Course title	Strategic planning and leadership	
Study programme	Postgraduate university study <i>Maritime Affairs</i>	
Course status	Optional	
Year	1	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	12

COURSE DESCRIPTION
<i>1. Course objectives</i>
The main objectives of the course are related to the achievement of learning outcomes from several connected areas, important for the highest level of leadership and management in large organizations. These areas are: strategic management, management in the public sector, defense planning, modern leadership, (rational) decision making and decision support, interactive decision-making (game theory).
<i>2. Course enrolment requirements</i>
Knowledge of mathematics at the required level. Knowledge of the organization and management.
<i>3. Expected course learning outcomes</i>
After successful completion of the course the students will be able to: • explain the key concepts of resource-based view and the “environment models” • discuss the concept of competitive advantage and ways of its realization • apply modern techniques of planning and demonstrate an integrated system of support defense planning processes • create a design of an efficient/effective organization • distinguish the practice of adaptive and generic learning in organizations • apply tools for decision support • develop models of interactive decision-making by applying game theory • create a system for measuring organizational performance and supporting strategy implementation • analyze and experiment with different approaches to leadership • analyze and evaluate the national strategies and implementation (action) plans
<i>4. Course content</i>
Strategy and strategic management. Organization's mission and vision. Establishing organizational objectives. Strategic planning. Strategic management process modelling. Organizational resources. Organizational capabilities. Resourced based view. Core Competencies. Organizations as learning systems. Internal strengths and weaknesses. External environment analysis. Types of environment. Model of “five forces”. Dynamics of competition. Identifying opportunities and threats. Strategic management in a changing environment. SWOT analysis. The Competitive Profile Matrix. Organizational interactions- game theory models. Competitive advantage.



Creating and capturing value in the value chain. Choice and implementation of strategy. Organizational design. Organizational changes. Organizational structure. Galbraith's model. Business processes. Organizational culture. Human potentials. Projects in organization. Business decisions. Decision making process. Utility theory. Objectives and attributes. Multi-attribute evaluation problem. Uncertainty and risk. Group decisions techniques. Decision support tools. Interactive decision making- game theory. Competitive scenarios. Cooperative scenarios. Matrix and extensive games. Dynamic games. Simulations. Planning, programing and budgeting systems. Decision-making in defense systems. Responses to asymmetric threats. Decision-making in crisis. The importance of information in decision-making process. Information technology in decision making. Business Intelligence. The systems support strategic planning and management. The performance measurements systems. Balanced Scorecard (BSC). Implementation of BSC. Behavioral approach in organizational theory. Fundamentals of organizational behavior. Communication and decision-making. Leadership. The behavioral theory of leadership. Situational (contingency) approach to leadership. Modern leadership. Scenario techniques for managers and leaders. Strategic communication management. Strategic management in the public sector. Military Strategy. National Security Strategy. Cyber security strategy.

5. Teaching methods	☒ lectures ☒ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other _____
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6. Comments	
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7. Student's obligations

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8. Evaluation of student's work

Course attendance	0,5	Activity/Participation		Seminar paper	1	Experimental work	
Written exam	2	Oral exam	1	Essay		Research	1,5
Project		Sustained knowledge check		Report		Practice	
Portfolio							

9. Assessment and evaluation of student's work during classes and on final exam

Learning outcomes will be verified through the seminars and conducted research as a prerequisites for taking the final exam. In the written part of the exam certain appropriate quantitative tasks will be set.

10. Assigned reading (at the time of the submission of study programme proposal)
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- Bryson, J. M. (2011) *Strategic planning for public and nonprofit organizations: A guide to strengthening and sustaining organizational achievement* (4th ed.). San Francisco, CA: Jossey-Bass
- Johnson, S.E., Libicki, M.C., Treverton, G. F. (Eds.) (2003) *New Challenges, New Tools for Defense Decision-making*, RAND Corporation, 2003.
- Daft, R.L. (1999) *Leadership: Theory and Practice*, The Dryden Press, New York
- Hitt, Michael A., R. Duane Ireland, Robert E. Hoskisson (2014) *Strategic Management: Competitiveness and Globalization- Concepts and Cases*, 11th Edition, Cengage Learning, 2014
- Buble, Marin (Ur.) (2005) *Strateški menadžment*, Sinergija, Zagreb, 2005.



11. *Optional / additional reading (at the time of proposing study programme)*

- Bouyssou, Denis; Didier Dubois; Marc Pirlot & Henri Prade (Eds)(2009) *Decision-making Process Concepts and Methods*, Wiley, 2009
- Mun, Johnathan (2010) *Modeling Risk: Applying Monte Carlo Risk Simulation, Strategic Real Options, Stochastic Forecasting and Portfolio Optimization*; Wiley; 2nd edition 2010
- Gintis, H. (200) *Game Theory Evolving*, Princeton University Press, 2000.
- Mintzberg, H. (1983) *Structure in Fives: Designing Effective, Organizations*, Prentice Hall.
- Stacey, Ralph D. (1993) *Strategic Management and Organizational Dynamics*, Prentice Hall, 1993

12. *Number of assigned reading copies with regard to the number of students currently attending the course*

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>

13. *Quality monitoring methods which ensure acquirement of output knowledge, skills and competences*

Student's feedback by means of survey organized by the University.