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Trg braće Mažuranića 10 • 51 000 Rijeka • Croatia
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3.2. Course description

Generic information			
Head of Course	Prof. dr. sc. Vinko Tomas		
Course	Controlling of Technical Systems		
Study Programme	Marine engineering and maritime transport technology		
Level	Graduate degree programme		
Type of Course	Elective		
Year of Study	2nd	3rd	
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		5
	Number of Hours (L+E+S)		30+15+0 (2+1+0)

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The aim of this course is to provide appropriate knowledge of technical systems management. The principles of connecting different maritime technical systems into a hierarchically organized management system are considered. Providing theoretical knowledge for defining requirements in the design of management systems, methods for measuring their effects and procedures for their evaluation.

1.2. Prerequisites for Course Registration

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1.3. Expected Learning Outcomes

After passing the exam, students will be able to do the following:

1. *present and explain the features of the principles of management and control of technical systems*
2. *define requirements for the management of technical systems*
3. *apply system structural classification techniques*
4. *show the ways of connecting the technical process and the computer*
5. *show and explain redundancy management*
6. *apply methods of evaluating the technical process management system*
7. *present and explain the application of fault-tolerant control systems*

1.4. Course Outline

Definitions, basic features and principles of management and administration of technical systems. Hardware elements of a computer process control system. An example of an intelligent online system. Complex process management system. Interfaces for connecting to outdoor units, programmable logic controllers, architecture, control programming. Methods of leading and managing technical systems (optimal, adaptive, etc.). Basic procedures in building a process management system. New techniques in sensor signal processing. Hierarchical architecture of a distributed computer system. Function and organization of hierarchical levels of management system. Examples of computer management systems in maritime. Fault-resistant control systems.

1.5. Modes of Instruction	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ E-learning ☐ Field work	☒ Practical work ☐ Multimedia and Network ☒ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		

1.7. Student Obligations

Regular attendance at classes and solving tasks assigned to work at home.
1st colloquium, 2nd colloquium, preparation and presentation of a research task in an exercise class, final exam

1.8. Assessment[1] of Learning Outcomes

Course attendance	1,5	Class participation		Seminar paper	0,5	Experiment	
Written exam		Oral exam	1	Essay		Research	
Project		Continuous Assessment	2	Presentation		Practical work	
Portfolio							

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The procedure for evaluating the acquired learning outcomes takes place according to the Ordinance on Studies of the University of Rijeka and the Ordinance on Studying at the Faculty of Maritime Studies in Rijeka as follows:

- *through continuous testing of knowledge during classes, 70% of acquired learning outcomes are evaluated through the 1st colloquium - learning outcomes 1-4 (25%), 2nd colloquium - learning outcomes 5-7 (25%), presentation of the research task (seminar) - learning outcomes 1-7 (20%); the student must achieve a minimum of 50% of points for each colloquium, while the presentation of the research task is evaluated on the basis of elaborated assessment criteria;*
- *at the final part of the exam, 30% of the acquired learning outcomes are evaluated (1-7), whereby a student must pass a minimum of 50% of points in order to pass the final exam.*

Examples of evaluating learning outcomes in relation to set learning outcomes are:

1. *State and explain the features and principles of technical systems management*
2. *Defining requirements for individual parts of technical systems*
3. *Mathematical model of a multivariable dynamical system*
4. *Function and organization of hierarchical levels of management system*
5. *Explain for the system shown in the figure the handling of the error in a redundant pair*
6. *Evaluation of solutions from the framework of adaptive control systems and related technologies*
7. *Draw and explain for different means the scheme of organization of fault-tolerant management systems*

1.10. Main Reading

1. V. Tomas, Controlling of Technical Systems, authorized lectures (textbook in preparation), Faculty of Maritime Studies, University of Rijeka, academic 2021/2022.
2. Teaching material for e-course exercises available on the e-learning system - Merlin

1.11. Recommended Reading

1. *B.Novaković: Metode vodjenja tehničkih sistema, Školska knjiga – Zagreb, 1990.*
2. *Konsberg manual-"Integrated ship control-Functional specification-Power menagment system, process control unit, signal acquisation unit"*
3. *Steven X. Ding: Model-Based Fault Diagnosis Techniques: Design Schemes, Algorithms and Tools, Springer, London, 2015.*

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
V. Tomas, Controlling of Technical Systems, authorized lectures (textbook in preparation), Faculty of Maritime Studies, University of Rijeka, academic 2021/2022.	-	15
Teaching material for e-course exercises available on the e-learning system - Merlin	-	15

1.13. Quality Assurance

Quality assurance is based on Faculty ISO 9001 system. Yearly analyze is produced based on quantitative student examination data, and qualitative based on student survey derived at the end of each semester.

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3.2. Course description

Generic information			
Head of Course	prof. dr. sc. Vinko Tomas and prof. dr. sc. Marko Valčić		
Course	Automatic Control of Marine Vessels		
Study Programme	Marine engineering and maritime transport technology		
Level	Graduate degree programme		
Type of Course	Core		
Year of Study	2nd	3rd	
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		6
	Number of Hours (L+E+S)		30+30+0 (2+2+0)

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The aim of the course is to acquire knowledge of the principles and techniques in the guidance, navigation and control of marine vessels with special emphasis on marine autopilots, dynamic positioning systems and propulsion control systems.

1.2. Prerequisites for Course Registration

None.

1.3. Expected Learning Outcomes (LO)

After passing the exam, students will be able to do the following:

1 Discuss the notation characteristic of the area of vessel guidance and control and interpret the application of individual reference frames and vessel motion in six degrees of freedom.
2 Derive a model of kinematics and dynamics of vessels in the horizontal plane, and explain how and why these models are used in the guidance and control of vessels.
3 State and explain in detail the models of environmental loads and discuss how certain external disturbances are treated in vessel control systems.
4 Describe the structure of the system for dynamic positioning and interpret the meaning and purpose of individual parts of the system.
5 Discuss the applications of estimators in marine control systems (adaptive autopilots, dynamic positioning), with special reference to the Kalman filter (possibilities, applications, advantages, disadvantages).
6 Explain the feedback loop of a multivariable controller with feedforward control, with special reference to applications in adaptive autopilots and in dynamic positioning systems.
7 Compare and discuss different approaches in solving the problem of thrust allocation.
8 Analyse and explain concepts for propulsion control.

1.4. Course Outline

Definitions, basic features and principles of guidance, navigation and control of marine vehicles. Structure of ship control systems (autopilots, dynamic positioning). Notation and reference frames. Modelling of surface vessels (kinematics, dynamics). Environmental load models (wind, waves, sea currents). Models of thruster units (ship propeller without and in nozzle, azimuth thrusters). Thrust allocation. Propulsion control. Advanced methods of guidance and control of marine vessels (optimal, adaptive, unmanned remote control). Adaptive autopilots. Dynamic positioning systems. Integrated navigation systems. Autonomous navigation and autonomous maritime systems and facilities. Development trends and perspectives.

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1.5. Modes of Instruction	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ E-learning ☐ Field work	☐ Practical work ☐ Multimedia and Network ☐ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments	The final exam can be held in written and/or oral form.	

1.7. Student Obligations

1st midterm exam, 2nd midterm exam, final exam.

1.8. Assessment[1] of Learning Outcomes

Course attendance	2	Class participation		Seminar paper		Experiment	
Written exam		Oral exam	2	Essay		Research	
Project		Continuous Assessment	2	Presentation		Practical work	
Portfolio							

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The procedure for evaluating the acquired learning outcomes takes place according to the Regulations on Studies of the University of Rijeka and the Regulations on Studying at the Faculty of Maritime Studies in Rijeka as follows:

- 70 % of acquired learning outcomes are evaluated through continuous testing of knowledge during classes:
  - Through the 1st midterm exam - learning outcomes 1-4 (35 %),
  - Through the 2nd midterm exam - learning outcomes 5-8 (35 %),

  where the student must realize a minimum of 50 % of points for each colloquium;
- at the final part of the exam, 30 % of the acquired learning outcomes are evaluated (1-8), whereby the student must realize a minimum of 50 % of points to pass the final exam;
- final ECTS grade is defined on the basis of the achieved total % of knowledge, skills and competencies and numerical grade after the final/remedial exam as follows:
  - grade excellent (5) corresponds to grade A in the ECTS scale and a success rate of 90 to 100 %,
  - a grade of very good (4) corresponds to a grade of B on the ECTS scale and a success rate of 75 to 89.9 %
  - grade good (3) corresponds to grade C on the ECTS scale and a success rate of 60 to 74.9 %,
  - a grade of sufficient (2) corresponds to a grade of D on the ECTS scale and a success rate of 50 to 59.9 %,
  - the grade insufficient(1) corresponds to the grade F in the ECTS scale and the success rate from 0 to 49.9 %

Examples of evaluating learning outcomes in relation to set learning outcomes are:

1 Tabulate all six degrees of freedom; indicate the type of motion, the name of the degree in Croatian and English, forces and moments, linear and angular velocities, position and orientation. (LO 1.3.1)

2 Make a sketch for the analysis of the dynamics of the vessel in the horizontal plane. Clearly indicate the position and orientation of the craft, characteristic coordinate systems, characteristic angles and force vectors, and briefly describe all physical quantities of interest. (LO 1.3.2)

3 The mobile offshore base (MOB) in the form of a cuboid is dynamically positioned ($u = v \approx 0$). It is symmetrical and homogeneous, the origin of $\{b\}$ is in CG. The basic dimensions are Loa = 100 m, B = 40 m, H = 10 m and T = 4 m. The density of sea water is ρ_{sea} = 1025 kg/m^3, and of air ρ_{air} = 1.23 kg/m^3. The gyro- compass shows the current heading ψ = 70°, and the anemometer gives data on the current wind speed and direction V_{wind} = 20 knots and β_{wind} = 140°. The wind load coefficients can be approximated as a function of the wind angle of attack γ_{wind} as $C_X(\gamma_{wind})$ = -0.6cos(γ_{wind}), $C_Y(\gamma_{wind})$ = 0.8sin(γ_{wind}), and $C_N(\gamma_{wind})$ = 0.1sin(2γ_{wind}).
a) Sketch the position of the MOB in relation to $\{n\}$ and plot all characteristic angles and vectors.
b) Express the angle γ_{wind} in terms of β_{wind} and ψ, and calculate it.
c) Calculate the wind load vector $\boldsymbol{\tau}_{wind} = [X_{wind}, Y_{wind}, N_{wind}]^T$ and the resultant wind force. (LO 1.3.3)

4 Sketch the part of the structure of the classical system for dynamic positioning that relates to the thrust allocation. Clearly indicate what enters and what exits each block. (LO 1.3.4)

5 What does estimation refer to in dynamic positioning systems? Describe in detail and discuss the two basic applications of the Kalman filter in vessel control systems. (LO 1.3.5)

6 DP system control logic:
a) Sketch the control feedback loop of a non-linear multi-variable PID controller with wind feedforward control
b) Clarify the individual blocks, inputs and outputs of each block
c) Define the control vector τ_c, express it by the control law of management and explain it
d) What is wind feed-forward control and what is it used for in a DP system? (LO 1.3.6)
7 Thrust allocation:
a) Explain the thrust allocation process, in particular for a fixed pitch propeller (FPP), and in particular for a variable pitch propeller (CPP)
b) Determine the configuration matrix **B** in the case of three azimuth and one tunnel thruster and indicate which part of the matrix refers to which thruster
c) Set up the allocation equation for the above case and offer a solution using a pseudo-inverse matrix. (LO 1.3.7)
8 Propulsion control:
a) State the basic characteristics (quantities, terms, units) of the propeller in the nozzle with fixed pitch in open water conditions
b) Sketch K_T-K_Q-η_0-J diagram and explain its application in dynamic positioning systems
c) Explain the advantages and disadvantages of the propeller in a nozzle, with special reference to the operational profile of DP vessels. (LO 1.3.8)

1.10. Main Reading

Valčić, M., Tomas, V. (2020). *Guidance and 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.

1.11. Recommended Reading

1. 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/marcyb.pdf
2. Valčić, M. (2020). *Optimization of thruster allocation for dynamically positioned marine vessels*. PhD Thesis. University of Rijeka, Faculty of Engineering, Rijeka.
3. Valčić, M. (2015). *Inteligentna estimacija u sustavima za dinamičko pozicioniranje plovnih objekata*. Doktorska disertacija. Sveučilište u Rijeci, Pomorski fakultet u Rijeci, Rijeka.
4. Mandžuka, S. (2009). *Automatsko upravljanje plovnim objektima*. Sveučilište u Rijeci, Pomorski fakultet u Rijeci, Rijeka.

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
Valčić, M., Tomas, V. (2020). *Guidance and Control of Marine Vehicles*. Lecture Notes, Faculty of Maritime Studies Rijeka, University of Rijeka, Rijeka, Croatia.	e- learning/Merlin	25
Fossen, T.I. (2011). *Handbook of Marine Craft Hydrodynamics and Motion Control*. John Wiley & Sons Ltd, Chichester, UK.	2	25

1.13. Quality Assurance

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Course description

Generic information			
Head of Course	Prof. Roko Dejhalla, D.Sc.		
Course	Energetics of propulsion in maritime transport		
Study Programme	Marine Engineering and Maritime Transport Technology		
Type of Course	Elective		
Year of Study	II		
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		5
	Number of Hours (L+E+S)		30+15+0

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

Acquisition of specific competencies from ship propulsion. Developing skills for solving problems in the field of energetics of propulsion in maritime transport.

1.2. Prerequisites for Course Registration

None.

1.3. Expected Learning Outcomes

1. Formulate phenomena in the flow of water around the ship's hull.
2. Assess the ship's resistance and analyze the ship's resistance components.
3. Determine the main features of ship propellers and analyze the way they work.
4. Correctly interpret and evaluate the interaction of the propulsion engine and the propeller.
5. Assess the relationship between ship resistance and propulsion.
6. Valorize different solutions of marine propulsion systems.
7. Review the energy efficiency of the ship.

1.4. Course Outline

Ship's hull form parameters. Operating regimes. Water flow around the ship's hull. Ship resistance. Ship resistance components. Methods for determining ship resistance. Ship propulsion and propulsion devices. Screw propeller. Geometry of the screw propeller. Materials for manufacturing ship propellers. Production of ship propellers. Theory of propeller action. Other propulsion devices: paddle, sail, paddle wheel, vertical-axis propeller, waterjet, transverse and azimuthing propellers, podded propellers. Interaction of screw propeller and hull. Propulsive coefficients. Propeller cavitation. Matching of propeller with propulsion engine. Propeller design point. Engine layout diagram. Examples of different loads. Influence of ship propeller on ship exploitation. Marine diesel engine propulsion systems. Marine diesel-electric propulsion systems. Energy efficiency of the ship.

1.5. Modes of Instruction		
	☒ Lectures	☐ Practical work
	☐ Seminars and workshops	☐ Multimedia and Network
	☒ Exercises	☐ Laboratory
	☐ E-learning	☐ Mentorship
	☒ Field work	☐ Other _____

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1.6. Comments	

1.7. Student Obligations

Regular class attendance and solving tasks assigned to work at home.

1.8. Assessment[1] of Learning Outcomes

Course attendance	1,5	Class participation		Seminar paper		Experiment	
Written exam	1,5	Oral exam		Essay		Research	
Project		Continuous Assessment	2	Presentation		Practical work	
Portfolio							

[1] NOTE: Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The procedure for evaluating the acquired learning outcomes takes place according to the Ordinance on Studies of the University of Rijeka and the Ordinance on Studying at the Faculty of Maritime Studies in Rijeka as follows:

- continuous assessment of knowledge (colloquia) and evaluation of teaching activities: 70%,
- 30% of the acquired learning outcomes are evaluated at the final exam (1-7), whereby the student must realize a minimum of 50% of credits in order to pass the final exam.

Examples of evaluating learning outcomes in relation to set learning outcomes are:

1. Explain the phenomena of water flow around the hull.
2. Specify the parameters on which the ship's resistance depends and explain how these parameters affect the individual components of the ship's resistance.
3. Specify and explain the main features of ship propulsion devices and compare the way they work.
4. Explain the interaction between the propulsion engine and the propeller and explain the method of selecting the propeller operating point on the example of the propeller curve and the engine layout diagram.
5. Explain the relationship between ship resistance and propulsion and specify the parameters that affect the overall efficiency of ship propulsion.
6. Compare different solutions of ship propulsion systems and choose one favorable solution for a certain type of ship.
7. Explain how to evaluate the energy efficiency of a ship and indicate ways in which efficiency could be improved.

1.10. Main Reading

1. Carlton, J. S., Marine Propellers and Propulsion, Butterworth-Heinemann, Oxford, 2007.
2. Ridley, J., Ship Stability, Powering and Resistance, Reeds Marine Engineering and Technology Series, 13, 2014.

1.11. Recommended Reading

Notes from classes.

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
Carlton, J. S., Marine Propellers and Propulsion, Butterworth - Heinemann, Oxford, 2007.	1	20
Ridley, J., Ship Stability, Powering and Resistance, Reeds Marine Engineering and Technology Series, 13, 2014.	1	20

1.13. Quality Assurance

The quality of studies is monitored 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 in Rijeka. Once a year, the results of pass level are analyzed and appropriate measures are adopted.

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Table 2.

3.2. Course description

Generic information		
Head of Course	Predrag Kralj, Associate Professor, Ph.D., BME	
Course	Project task 2	
Study Programme	Marine Engineering and Transport Technology	
Type of Course	Obligatory	
Year of Study	2	
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload	5
	Number of Hours (L+E+S)	0+0+60

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The main goal of the course is enabling students for research of scientific papers and other materials and application of scientific methods in project designing covered previously by one or two courses.

1.2. Prerequisites for Course Registration

None

1.3. Expected Learning Outcomes

It is expected that the student will be able:
1. To evaluate the system, equipment or application condition and suggest optimal improvement.
2. To suggest new solutions aiming to optimize operation of the system, equipment or application and to increase efficiency or level of safety.
3. To evaluate available solutions on the market that could be applied with small adaptations only or to create new one.
4. To evaluate scientific methods applied in the project.
5. To select techno-economic analysis of both existing and new solution.
5. To give final solution with comparison and improvement achieved.

1.4. Course Outline

Definition of the project. Project planning, organization, leading, control. Techno-economic evaluation of the project. Goal achievement measurement. Project results management.

1.5. Modes of Instruction	Lectures ☒ Seminars and workshops Exercises E-learning ☐ Field work	☒ Practical work X Multimedia and Network ☒ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		

1.7. Student Obligations

Students enrolled at the Faculty of Maritime Studies are expected to observe *the code of conduct* required by the academic institution, and regularly attend lectures and practical work sessions.

1.8. Assessment of Learning Outcomes

Course attendance	2	Class participation		Seminar paper	1	Experiment	0,5
Written exam		Oral exam		Essay		Research	1
Project	1	Continuous Assessment		Presentation		Practical work	0,5
Portfolio							

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

Through Partial Exams, Seminar Paper and written Practical Work Report Student achieves up to 70% (Learning Outcomes from 1 to 6), while with the written Final Exam (Learning Outcomes from 1 to 6) up to 30% of total Score.
Examples of Assessment of Learning Outcomes:

1. Numerical model and experimental results comparison (Learning Outcomes 4, 5)
2. Computer application (Learning Outcomes 4, 5)
3. Simulation of different solutions on engine room simulator and optimization (Learning Outcomes 1, 2, 6)

1.10. Main Reading

1. Main reading depends on the course or courses student selected for the topics of the project

1.11. Recommended Reading

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
	web	

1.13. Quality Assurance

Internal:

- Student feedback (SET - Student evaluation of teaching) at the end of academic year.
- Course review by the head of course at the end of academic year.

External:
Programme quality review carried by the QA Agency.

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Table 2.

3.2. Course description

Generic information			
Head of Course	Axel Luttenberger, Ph.D., Full Professor with tenure		
Course	**Maritime Labour Law**		
Study Programme	**Marine Engineering**		
Level	Master		
Type of Course	Elective		
Year of Study	2	Semester	4
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		4
	Number of Hours (L+E+S)		(30+0+0)

1. GENERAL COURSE DESCRIPTION
1.1. Course Objectives
The aim of the course is to introduce students to the characteristics of labour relations in general and the specifics of labour relations between seafarers, namely: sources of labour law, essential elements of employment contracts, protection of the life, health and dignity of workers, working hours, holidays and permits, wages and remuneration, compensation for damages, termination of employment contracts, protection of rights under employment relations, collective entities of labour relations, collective bargaining and collective agreements.
1.2. Prerequisites for Course Registration
None
1.3. Expected Learning Outcomes
Define and interpret fundamental concepts of labour law 1. Explain the rights of seafarers from employment relationships 2. Explain how the rights of seafarers from employment relationships are exercised, 3. Determine ways to protect the rights of seafarers from employment relationships, 4. Analyze the specifics of maritime employment relationships, 5. Analyze the rights and obligations of workers and employers with regard to occupational safety, 6. Explain the role of trade unions and employers' associations in contracting rights and obligations in employment relations
1.4. Course Outline
The concept, legal sources, entities and basic characteristics of the employment contract. Features and elements of the employment contract. Protection of life, health and dignity of workers, working hours, holidays and permits, salaries and remuneration, compensation of special reference to compensation for damages due to an accident at work or occupational disease, termination of the employment contract, protection of rights from employment relationships, collective entities of labour relations, collective bargaining and collective contracts.

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1.5. Modes of Instruction	X Lectures ☐ Seminars and workshops X Exercises X E-learning ☐ Field work	☐ Practical work X Multimedia and Network ☐ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		

1.7. Student Obligations

Students enrolled at the Faculty of Maritime Studies are expected to observe *the code of conduct* required by the academic institution, and regularly attend lectures and practical work sessions.

1.8. Assessment of Learning Outcomes

Course attendance	1	Class participation		Seminar paper	0	Experiment	
Written exam		Oral exam	2	Essay		Research	
Project		Continuous Assessment	1	Presentation		Practical work	
Portfolio							

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

Through continues assessment student achieves up to 70% (Learning Outcomes from 1 to 6), while with the written Final Exam (Learning Outcomes from 1 to 6) up to 30% of total Score.
Examples of Assessment of Learning Outcomes:
1. implementation of the principle of labour law
2. determine the rights of seafarers from employment
3. analyze the out-of-court and judicial exercise of employment rights
4. analyze the specificity of employment and stay in the workplace
5. employer responsibility for occupational safety

1.1. Main Reading

Učur, Marinko: Radnopravni status pomoraca, Pravni fakultet Sveučilišta u Rijeci, 2004
Course teaching material available on e-learning system - Merlin (https://moodle.srce.hr)

1.2. Recommended Reading

Convention of the International Labour Organization, www.ilo.org

1.3. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
Učur, Marinko: Radnopravni status pomoraca, Pravni fakultet Sveučilišta u Rijeci, 2004	20	40
Course teaching material available on e-learning system - Merlin	web	web

1.4. Quality Assurance

The quality of study is monitored in accordance with the ISO 9001 system and in accordance with European quality assurance implemented at the Faculty of Maritime Studies in Rijeka. Once a year, the results of the student pass rate and adopt appropriate measures.

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Opće informacije		
Nositelj predmeta	**Izv. prof. dr. sc. Đani Mohović**	
Naziv predmeta	**UPRAVLJANJE RIZIKOM U POMORSTVU**	
Studijski program	**Brodostrojarstvo i tehnologija pomorskog prometa**	
Status predmeta	**Izborni**	
Godina	**2.**	
Bodovna vrijednost i način izvođenja nastave	ECTS koeficijent opterećenja studenata	**5**
	Broj sati (P+V+S)	**45 + 0 + 15 (3 + 0 + 1)**

1. OPIS PREDMETA

1.1. Ciljevi predmeta

Cilj kolegija je upoznati studente s teoretskom i praktičnom osnovom za analizu pomorskih rizika. Detaljno upoznavanje i analiza specifičnih čimbenika koji utječu na utvrđivanje rizika. Upoznavanje metoda za utvrđivanje rizika. Definiranje prihvatljivog rizika i mjera za smanjenje pomorskog rizika. Sposobnost utvrđivanja rizika na konkretnim primjerima.

1.2. Uvjeti za upis predmeta

Nema posebnih uvjeta za upis predmeta.

1.3. Očekivani ishodi učenja za predmet

Očekuje se da studenti nakon položenog ispita mogu:

1. primjenjivati teoretske i praktične osnove za analizu pomorskih rizika
2. biti u mogućnosti odrediti specifične čimbenike koji utječu na utvrđivanje rizika
3. odabrati i pravilno primijeniti metode za utvrđivanje rizika
4. odabrati odgovarajući način i definirati prihvatljivi rizik
5. odabrati i primijeniti uobičajene mjere za smanjenje pomorskog rizika
6. steći sposobnost utvrđivanja rizika na konkretnim primjerima

1.4. Sadržaj predmeta

Koncept rizika. Što je nezgoda i nesreća? Slika rizika. Statistika nezgoda i nesreća. Preventivne i poboljšane mjere. Upravljanje sigurnošću-praćenje razine rizika. Stvarni rizici i podaci. Statistička analiza sigurnosno orijentiranih alternativa odlučivanja. Modeli pomorskog prometa. Vjerojatnost nasukanja i sudara. Metode analize rizika: Analiza opasnosti, FTA, ETA, FMECA; HazOp. FSA, Analiza troška i dobiti sigurnosnih postupaka. Analiza i modeliranje izvanrednih događaja na brodovima. Analiza troška i dobiti metoda kontrole. Analiza i modeliranje nezgoda brodova. Ljudska pouzdanost i mehanizmi grešaka. Ponašanje u slučaju katastrofa, evakuacije i traganju. Izobrazba, uvježbavanje i simulacije ljudskog ponašanja. Propisi i službena kontrola sigurnosti u pomorstvu. Nacionalne i međunarodne kontrolne vlasti. Sigurnosno i kvalitetno upravljanje. ISO standard. Pregled. Primjeri raznih slučajeva.

1.5. *Vrste izvođenja nastave*	☒ predavanja ☒ seminari i radionice ☐ vježbe ☐ obrazovanje na daljinu ☐ terenska nastava	☐ samostalni zadaci ☐ multimedija i mreža ☐ laboratorij ☒ mentorski rad ☐ ostalo _____
1.6. *Komentari*		

1.7. *Obveze studenata*

Redovito pohađanje nastave, kontinuirano učenje, aktivno prisustvovanje nastavi, grupni rad na primjerima analize rizika, pripremanje i pisanje seminara, predstavljanje istraživanja u seminaru, učenje i polaganje završnog ispita (usmeno).

1.8. Praćenje[1] rada studenata

Pohađanje nastave	2	Aktivnost u nastavi		Seminarski rad	1,5	Eksperimentalni rad	
Pismeni ispit		Usmeni ispit	1,5	Esej		Istraživanje	
Projekt		Kontinuirana provjera znanja		Referat		Praktični rad	
Portfolio							

1.9. *Postupak i primjeri vrednovanja ishoda učenja tijekom nastave i na završnom ispitu*

Tijekom nastave boduje se kvaliteta seminarskog rada, vladanje materijom i prezentacija seminara. Po završetku nastave boduje se usmeni ispit. Postotak vrednovanja je 70% na nastavi i 30% na završnom ispitu (prema Pravilniku o studijima Sveučilišta u Rijeci i Pravilniku o studiranju na Pomorskom fakultetu u Rijeci).
Provjera znanja tijekom nastave:
Kroz mentorski rad prilikom pisanja seminarskog rada te pri prezentaciji seminarskog rada gdje se provjerava znanje iz teorijskih osnova kao i njihova primjena u seminarskom radu.
Završni ispit:
Na završnom ispitu (usmeni ispit) provjerava se cjelovitost teoretskog znanja iz područja Upravljanja rizikom u pomorstvu - potrebno je ostvariti minimalno 50% potrebnog teoretskog znanja.

1.10. Obvezna literatura (u trenutku prijave prijedloga studijskog programa)

1. Autorizirana predavanja, dr. sc. Đani Mohović, dr. sc. Robert Mohović, Rijeka, 2011/2012..
2. "Manging risk in shipping"- The Nautical Institute, London, 1999.
3. "Safety Management and Risk Analysis" – Svein Kristiansen, Butterworth-Heinemann, 2004.

1.11. Dopunska literatura (u trenutku prijave prijedloga studijskog programa)

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.
3. "Acceptable risk"- Baruch Fischoff, Cambridge, Cambridge University Press, 1981.
4. "General Security Risk Assessment"- ASIS International Guidelines Commission, Alexandria, Virginia, 2003.
5. "Procjena opasnosti za opasne tvari", Janeš V., Čavrak B., ZIRS, Intergrafika, Zagreb 1999.
6. "Risk analysis and its applications"- David B. Hertz and Howard Thomas, Chichester: Wiley, 1983.
7. "Quantitative risk analysis: a guide to Monte Carlo simulation modelling" – David Vose, Chichester: John Wiley, 1996.
8. "The risk ranking technique in decision making"- John. C. Chicken and Michael R. Hayns, Oxford: Pergamon Press, 1989.
9. "Reliability, maintainability and risk", Smith J. David, 2001.
10. "Offshore Risk Assessment", Vinnem J. E., Trondheim, Kluwer Academic Publisher, 1999.

"Metode procjene i upravljanja rizikom u procesnoj industriji", Enconet International, Zagreb, 1999.

1.12. Broj primjeraka obvezne literature u odnosu na broj studenata koji trenutno pohađaju nastavu na predmetu

Naslov	*Broj primjeraka*	*Broj studenata*
Autorizirana predavanja dr.sc. Đani Mohović, dr.sc. Robert Mohović, Rijeka, 2011/2012.	neograničen	5
"Manging risk in shipping"- The Nautical Institute, London, 1999.	1	
"Safety Management and Risk Analysis" – Svein Kristiansen, Butterworth-Heinemann, 2004.	1	

1.13. Načini praćenja kvalitete koji osiguravaju stjecanje izlaznih znanja, vještina i kompetencija

[1] **VAŽNO**: Uz svaki od načina praćenja rada studenata unijeti odgovarajući udio u ECTS bodovima pojedinih aktivnosti tako da ukupni broj ECTS bodova odgovara bodovnoj vrijednosti predmeta. Prazna polja upotrijebiti za dodatne aktivnosti.

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Kvaliteta studiranja prati se sukladno ISO 9001 sustavu i u skladu s europskim standardima i smjernicama za osiguranje kvalitete koji se provodi na Pomorskom fakultetu u Rijeci. Jednom godišnje se analiziraju rezultati prolaznosti i donose odgovarajuće mjere.

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Course description

Generic information			
Head of Course	Dario Ogrizović, PhD		
Course	Simulation and modelling		
Study Programme	Marine Engineering and Maritime Transport Technology		
Type of Course	Elective		
Year of Study	2nd		
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		6
	Number of Hours (L+E+S)		30 + 30 + 0

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The course is intended to introduce students to simulation modelling and its application in the analysis and design of business processes. Simulation modelling enables the creation of dynamic business process models, execution of simulation experiments with the model and the evaluation of business process performance. Discrete event simulation allows the development of detailed queue system models.

1.2. Prerequisites for Course Registration

None

1.3. Expected Learning Outcomes

1. Analyze and interpret solutions after simulation experiments
2. Identify problems in the field of business systems that can be solved by different methods of simulation modelling
3. Develop models for identified problems using simulation modelling methods
4. Apply appropriate methods to perform simulation experiments
5. Develop a business decision-making process based on the results of simulation experiments
6. Apply simulation modelling in business process analysis and design
7. Create simulation models using software tools that support methods and techniques of simulation modelling and their verification

1.4. Course Outline

Basic ideas of simulation. Simulation modelling. Modelling and computers. Simulation in decision making. Types of simulation models. Simulation models development. Basic concepts of discrete event simulation. Structure of computer tools for simulating discrete events. Conceptual simulation models. Activity cycle diagrams. Simulation performance strategies. Time shift mechanisms. Simulation strategies. FlexSim simulation software. Simulation software selection criteria. Basic concepts, method of modelling, execution of simulation experiments and their analysis. Modelling and simulation of several problems with FlexSim software. Computer model verification. Evaluation of the conceptual model. Input data analysis. Statistical distributions. Estimation of distribution parameters. Simulation experiments planning. Design of simulation experiments. Variance reduction techniques. Output data analysis of simulation experiments.

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1.5. Modes of Instruction	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ E-learning ☐ Field work	☒ Practical work ☒ Multimedia and Network ☒ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		

1.7. Student Obligations

The student must attend at least 70% of the total hours of lectures and exercises, and must have passed the exams (continuous assessment) to take the final exam.

1.8. Assessment[1] of Learning Outcomes

Course attendance	2	Class participation		Seminar paper		Experiment	
Written exam	1	Oral exam		Essay		Research	
Project	1	Continuous Assessment	1	Presentation		Practical work	1
Portfolio							

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The process of evaluation of the acquired learning outcomes takes place during continuous assessments (through 2 midterm examinations - total 70%) and at the final part of the exam (30%).

Examples of evaluating learning outcomes in relation to the learning outcomes that are set are:

1. Analyze and interpret solutions after conducting simulation experiments
2. Identify problems in the field of business systems that can be solved by different methods of simulation modelling
3. Create models for identified problems using simulation modelling methods
4. Apply appropriate methods to execute simulation experiments
5. Develop business decision-making processes based on the results of simulation experiments
6. Apply simulation modelling in business process analysis and design
7. Create simulation models using software tools that support simulation modelling methods and techniques and their verification
8. Perform a data analysis of the simulation experiment output

1.10. Main Reading

1. Čerić, V. 1993, *Simulacijsko modeliranje*, Školska knjiga, Zagreb.
2. FlexSim user manual, https://docs.flexsim.com
3. Study materials available at e-learning platform (https://moodle.srce.hr)

1.11. Recommended Reading

1. Law, A.M. 2014, *Simulation Modeling and Analysis*, 5th Edition, McGraw-Hill.

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
Čerić, V. 1993, *Simulacijsko modeliranje*, Školska knjiga, Zagreb.	5	75
FlexSim user manual, https://docs.flexsim.com	120	75

1.13. Quality Assurance

The quality of study is constantly monitored in accordance with the ISO 9001 system implemented at the Faculty of Maritime Studies in Rijeka. An analysis of the exams is made annually and a student survey is conducted once a semester. All data, including exam, written work and assessment, are at all times public data for all students who have enrolled in the course (on the e-learning platform).

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3.2. Course description

Generic information			
Head of Course	**Radoslav Radonja, Ph. D., associate professor**		
Course	**Process Ship Systems**		
Study Programme	**Marine Engineering and Maritime Transport Technology**		
Level	Graduate		
Type of Course	Obligatory		
Year of Study	**2**		
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		**5**
	Number of Hours (L+E+S)		**2 + 1 + 0**

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The main goal of teaching the study subject is to acquire knowledge about the principles and laws of selection, management and supervision of process ship systems.

1.2. Prerequisites for Course Registration

-

1.3. Expected Learning Outcomes

After passing the exam, it is expected that students will be able to do the following:
1. Assess the basic concepts of process ship systems
2. Valorize individual ship processes according to the general theory of the system
3. Examine the method of determining the factors influencing the selection of the system and its reliability
4. Classify ship process systems and apply system definition forms
5. Establish and apply methods of selecting a process system from different points of view (environmental, exploitation or energy consumption, …)

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1.4. Course Outline

Basic terms. Development and definition of ship systems according to general system theory. Determining the factors influencing system selection and its reliability. Forms for defining the system. Methods of selecting a process system from different points of view. Process ship systems on a fully automated / autonomous ship.

1.5. Modes of Instruction		
	☒ **Lectures**	☐ Practical work
	☐ Seminars and workshops	☐ Multimedia and Network
	☒ **Exercises**	☐ Laboratory
	☐ E-learning	☐ Mentorship
	☐ Field work	☐ Other _____

1.6. Comments	

1.7. Student Obligations

Active attendance at classes and exercises (at least 70%). Preparation of a seminar paper on an agreed topic and final oral exam.

1.8. Assessment[1] of Learning Outcomes

Course attendance	1,5	Class participation	0,5	Seminar paper	1,0	Experiment	
Written exam		Oral exam	2,0	Essay		Research	
Project		Continuous Assessment		Presentation		Practical work	
Portfolio							

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The procedure for evaluating the acquired learning outcomes takes place in accordance with University's and Faculty's normative acts as follows:
• preparation of a seminar paper on an agreed topic (70%)
• At the final part of the exam, 30% of the acquired learning outcomes are evaluated (1-10), whereby the student must realize a minimum of 50% of points in order to pass the final exam.

Examples of evaluating learning outcomes in relation to set learning outcomes are:

1. Explain the difference between data and information? Explain the concept of interaction and information interaction? Explain the concepts of 'leveling' and 'sampling'? What does the 'sampling theorem' say? How to turn a change in the behavior of a system into information and how to transmit it so that it can be responded to in 'real time'? ...
2. Explain the terms isomorphism and homomorphism of the system and give an example? Explain the elements (potentials) of the technological system and what does its development mean? List and explain the types of system theory? Explain the definition of a system on an object from a particular point of view? What are the basic features of the system? Explain the properties of the system that produce the behavior of the system? Explain how the system can be defined according to the general system theory and the UC and ST structure of the system? How are system boundaries determined? ...
3. List and explain the sets of values involved in establishing a system according to Wymore? Explain cotyledons (input-output / technological / feasibility)?
4. State and explain the language format for defining the system? Give an example of a ship's process system and determine its possible states? Analyze the selected system in terms of inputs, state transition functions and state outputs? Determine the elements of the observed system and their interrelationships? Specify external sizes for the selected system? ...
5. State an example to explain the methods of selecting a marine process system from a particular point of view? ...

1.10. Main Reading

1. Klir, G. J., Trends in General Systems Theory, John Wiley & Sons Inc., New York, 1972

1.11. Recommended Reading

2. Teacher lectures - available in electronic form

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
Teacher lectures - available in electronic form	-	30
Klir, G.J., Trends in General Systems Theory, John Wiley& Sons Inc., New York, 1972.	1	30

1.13. Quality Assurance

Course quality review carried in accordance with ISO 9001 system and European standards and guidance for quality assurance carried through on Maritime faculty. Student Success is evaluated, and corrective measure implemented yearly.

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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Table 2.

3.2. Course description

Generic information		
Head of Course	Predrag Kralj, Associate Professor, Ph.D., BME Dean Bernečić, Associate Professor, Ph.D., BME Davor Lenac, BSTT	
Course	Marine Process Advanced Diagnostics (148516)	
Study Programme	**Marine Engineering and Transport Technology**	
Type of Course	Elective	
Year of Study	2	
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload	5
	Number of Hours (L+E+S)	15+30+15

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The aim of the course is to familiarize the student with advanced methods and techniques as well as the importance of continuous monitoring machinery devices for the purpose of fault diagnosis.

1.2. Prerequisites for Course Registration

None

1.3. Expected Learning Outcomes

It is expected that the student will be able:
1. To explain and analysis the function of measuring instruments
2. To identify and explain essential marine systems and essential alarms for the safety of ship propulsion
3. To analyse the interdependence of the measured parameters and the casual relationships
4. To identify measuring points, control points, detect irregularities in operation of measuring devices and signal transmission and examine the correctness.
5. To diagnose, analyse and explain faults in the ship's main propulsion systems and auxiliary systems

1.4. Course Outline

Malfunction diagnostics of propulsion and auxiliary machinery systems, malfunctions of asynchronous electric motors, malfunction diagnostics of three-phase synchronous generators, processing of sensor signals, types of diagnostic systems, programmable logic controllers, control devices, expert systems in operation, malfunctions in ship propulsion system, tolerances, failures in power systems, failures of auxiliary marine devices

1.5. Modes of Instruction	☒ Lectures ☒ Seminars and workshops ☒ Exercises ☐ E-learning ☐ Field work	☐ Practical work ☐ Multimedia and Network ☐ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		

1.7. Student Obligations

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Students enrolled at the Faculty of Maritime Studies are expected to observe *the code of conduct* required by the academic institution, and regularly attend lectures and practical work sessions.

1.8. Assessment of Learning Outcomes

Course attendance	1	Class participation		Seminar paper	1	Experiment	
Written exam		Oral exam		Essay		Research	
Project		Continuous Assessment	1,5	Presentation		Practical work	
Portfolio		Final exam	1,5				

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

Procedure for evaluating acquired learning outcomes:
- The final grade in the subject is the sum of the points that the student has achieved during the course (70% of the grade) and the points earned on the final exam (30% of the grade) according to the Regulations on Studies of the University of Rijeka and the Regulations on Studying at the Faculty of Maritime Studies in Rijeka.
- Continuous assessment:
Colloquium (seminar) - it is necessary to achieve a minimum of 50% of the predicted number of points
- Final exam:
At the final exam the completeness of knowledge in the field of Advanced diagnostics of ship processes is checked - a minimum of 50% of points is required.

Examples of Assessment of Learning Outcomes:
1. Identify each element on the electrical diagram, explain the device function and possible faults
2. On the basis of the operating parameters, diagnose the fault and properly regulate the system
3. Critically evaluate and analyse the local and remote indication of the measured parameters on engines and electrical devices and predict possible failure

1.10. Main Reading

Advance electrotehnology for marine engineers, Christopher Lavens, Edmund Krall, 2014
Ship automation for marine engineers & ETO's, Aleksandar Yakimchuk, 2012
Pounder's Marine Diesel Engine and Gas Turbines, Doug Woodyard, 2009

1.11. Recommended Reading

Various Ship Instruction Manuals
Martinović Dragan, brodski strojni sustavi, Sv. U Rijeci, Rijeka, 2005
Ozretić Velimir, Brodski pomoćni strojevi I uređaji, Ship management, Split, 1996

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
Advance electrotehnology for marine engineers Edmund Krall, 2014	5	2
Ship automation for marine engineers & ETO's, Aleksandar Yakimchuk, 2012	5	2
Pounder's Marine Diesel Engine and Gas Turbines, Doug Woodyard, 2009	4	2

1.13. Quality Assurance

Internal:
- Student feedback (SET - Student evaluation of teaching) at the end of academic year.
- Course review by the head of course at the end of academic year.

External:
Programme quality review carried by the QA Agency.

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Course description

Generic information			
Head of Course	Full. prof. Dragan Martinović, PhD		
Course	**ENERGY SYSTEMS**		
Study Programme	**Marine Engineering and Maritime Transport Technology**		
Type of Course	**Mandatory**		
Year of Study	II		
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		**6**
	Number of Hours (L+E+S)		**45 + 0 + 15**

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The main goal of the course is to acquire knowledge about available energy sources, energy transformations and energy systems used on land, offshore and offshore facilities and on ships.

1.2. Prerequisites for Course Registration

None

1.3. Expected Learning Outcomes

After passing the exam, students will be able to do the following:
1. Identify concepts related to energy and energy transformations.
2. Assess the processes that take place in energy systems.
3. Choose the manifestations in which energy occurs.
4. Compare the principles of operation of different energy systems, and list their advantages and disadvantages.
5. Validate the factors that affect the efficiency, environmental friendliness and economic viability of energy systems.
6. Evaluate energy systems and processes, and manage the application of process parameters so that the energy system works safely and efficiently with the available primary energy.
7. Select and apply methods for assessing the economic viability of energy systems.

1.4. Course Outline

Basic concepts (work, strength and energy, exergy and anergy). Emerging forms of energy and energy transformation. Basic functions of the energy system. The principle of operation and energy transformations that take place in energy systems with regard to the energy source used or energy source. Analysis of energy efficiency, environmental acceptability and economic justification of energy systems. Selection of the optimal energy system.

1.5. Modes of Instruction	☒ Lectures ☒ Seminars and workshops ☐ Exercises ☐ E-learning ☐ Field work	☐ Practical work ☐ Multimedia and Network ☐ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		

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1.7. Student Obligations							
Active class attendance (at least 70%). Preparation of a seminar paper on an agreed topic.							
1.8. Assessment[1] of Learning Outcomes							
Course attendance	2,0	Class participation	0,5	Seminar paper	1,5	Experiment	
Written exam		Oral exam	2,0	Essay		Research	
Project		Continuous Assessment		Presentation		Practical work	
Portfolio							

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The procedure for evaluating the acquired learning outcomes takes place according to the Ordinance on Studies of the University of Rijeka and the Ordinance on Studying at the Faculty of Maritime Studies in Rijeka as follows:
• preparation of a seminar paper on an agreed topic (50%)
• at the final part of the exam, 50% of the acquired learning outcomes are evaluated (1-7), where the student must realize a minimum of 50% of points to pass the final exam.

Examples of evaluating learning outcomes in relation to set learning outcomes are:
1. What is the difference between exergy and anergy? How is heat flow exergy determined? In what forms does energy occur? What energy transformations are needed to transform the chemical energy of a fuel into mechanical energy? How to achieve direct transformation of thermal energy into electricity. (outcome 1)
2. Show and explain the energy system of a liquid fuel thermal power plant with a block diagram. Explain the transformation of wind energy into electricity. With a block diagram show and explain the principle of operation of a solar power plant with parabolic collectors. With a block diagram show and explain the energy system of a ship with diesel-electric propulsion (outcomes 2, 3 and 4).
3. Analyze the energy efficiency, environmental and economic acceptability of flow and storage hydropower plants. How to improve the energy efficiency of marine energy systems? (outcome 5)
4. How to determine the exergy degree of operation of a ship's steam generator? Write an appropriate term and clarify the determination of the exergy degree of action of a heat exchanger for heating heavy

1.10. Main Reading

Šljivac, D i Šimić, Z. : OBNOVLJIVI IZVORI ENERGIJE, FER 2009.
Nag, P. K. POWER PLANT ENGINEERING, McGraw-Hill

1.11. Recommended Reading

Bošnjaković F.: NAUKA O TOPLINI, knjiga 1 i 2, Tehnička knjiga Zagreb,
Požar, H.: OSNOVE ENERGETIKE, knjiga 1, 2 i 3, Školska knjiga Zagreb, 1992.
Prelec, Z.: ENERGETIKA U PROCESNOJ INDUSTRIJI, Školska knjiga Zagreb, 1994.
Predavanja nastavnika – dostupno u elektroničkom obliku

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
Literature (1.10) available in electronic form.	-	30

1.13. Quality Assurance

The quality of study is constantly monitored in accordance with the ISO 9001 system implemented at the Faculty of Maritime Studies in Rijeka. An analysis of exams is made annually, and once a semester a survey is conducted among students.

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3.2. Course description

Generic information		
Head of Course	**Radoslav Radonja, Ph. D., associate professor**	
Course	**Ship Propulsion Optimization**	
Study Programme	**Marine Engineering and Maritime Transport Technology**	
Level	Graduate	
Type of Course	Elective	
Year of Study	**2**	
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload	**5**
	Number of Hours (L+E+S)	**2 + 1 + 0**

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The main goal of the course is to acquire knowledge about the principles and laws of optimal use and management of ship resources.

1.2. Prerequisites for Course Registration

-

1.3. Expected Learning Outcomes

After passing the exam, it is expected that students will be able to do the following:
1. Valorize the methods of optimizing ship movement in water
2. Determine and explain methods of optimizing energy conversion and its transmission
3. Assess the methods of ship control and management optimization
4. Present the application of new technologies and alternative solutions.

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1.4. Course Outline

Optimizing ship construction and its main components. Underwater paints and coatings. Reduction of resistance. Optimizing fuel and oil consumption of the main and auxiliary engines. Heat recovery systems. Switching to fuel of different qualities (grades). Improving the efficiency of the propeller. Ship fleet management. Transport management. Navigation in accordance with weather conditions and sea currents. Optimizing ship speed. Optimizing electricity production. Connections to onshore power sources. Possibilities of using alternative fuels on ships. Possibilities of applying renewable energy sources. Possibilities of application of fuel cells on ships. The effect of automation on shipping costs. Autonomous vessels.

1.5. Modes of Instruction		
	☒ **Lectures**	☐ Practical work
	☐ Seminars and workshops	☐ Multimedia and Network
	☒ **Exercises**	☐ Laboratory
	☐ E-learning	☐ Mentorship
	☐ Field work	☐ Other _____
1.6. Comments		

1.7. Student Obligations

Active attendance at classes and exercises (at least 70%). Preparation of a seminar paper on an agreed topic and final oral exam.

1.8. Assessment[1] of Learning Outcomes

Course attendance	1,5	Class participation	0,5	Seminar paper	1,5	Experiment	
Written exam		Oral exam	2,0	Essay		Research	
Project		Continuous Assessment		Presentation		Practical work	
Portfolio							

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The procedure for evaluating the acquired learning outcomes takes place in accordance with University's and Faculty's normative acts as follows:
• preparation of a seminar paper on an agreed topic (70%)
• At the final part of the exam, 30% of the acquired learning outcomes are evaluated (1-4), where the student must realize a minimum of 50% of points to pass the final exam.

Examples of evaluating learning outcomes in relation to set learning outcomes are:

1. Explain how the design of the bow bulb affects the resistance to movement of the ship? List and explain several technological solutions of rudder design that reduce the resistance to the movement of the ship? Explain the impact of asymmetric stern design on ship movement? ...
2. List and explain the methods of reducing fuel consumption of the main / auxiliary engines on board? List and explain some of the heat recovery systems on board? Analyze and explain the benefits of connecting a ship to land-based power sources? ...
3. Analyze and explain the possibilities of optimizing the speed of the ship? Analyze and explain the optimization of navigation in accordance with weather conditions and sea currents? ...
4. Analyze and explain the application of alternative fuels on ships? Analyze and explain the possibilities of applying renewable energy sources to ships? Analyze and explain the possibilities of introducing autonomous vessels? ...

1.10. Main Reading

1. Schoppmeyer, D., W., F., "Preservation of Resources in Vessel Operations and Monitoring of Ship Emissions, Gauss mbH, Bremen, 2010.

1.11. Recommended Reading

2. Teacher lectures - available in electronic form
3. Pelić, V., Mrakovčić, T., Radonja, R., Valčić, M., Analysis of the Impact of Split Injection on Fuel Consumption and NOx Emissions of Marine Medium-Speed Diesel Engine, Journal of Marine Science and Engineering, 2020, 8, 820; doi:10.3390/jmse8100820
4. Radonja, R., Pelić, V., Pavić, D., Glujić, D., Methodological approach on optimizing the speed of navigation to reduce fuel consumption and increase energy efficiency of the cruising ship, Pomorstvo – Scientific Journal of Maritime Research, Vol. 33/2 (2019), pgs. 222-231
5. Radonja, R., Bebić, D., Glujić, D., Methanol and Ethanol as Alternative Fuels for Shipping, Promet - Traffic & Transportation, Vol. 31, No. 3 (2019), pgs. 321-327.
6. Radonja, R., Pelić, V., Pavić, D., Tomac, N., Cost efficiency of optimizing automatic temperature control parameters in a diesel engine cooling system on a cruising vessel – a case study, Journal of Applied Engineering Science, Vol.18/2 (2020), pgs. 251-256
7. Vorkapić, A., Radonja, R., Zec, D., Cost Efficiency of Ballast Water Treatment Systems Based on Ultraviolet Irradiation and Electrochlorination, Promet - Traffic & Transportation, Vol. 30/3 (2018), pgs. 343-348
8. Vorkapić, A., Radonja, R., Babić, K., Martinčić-Ipšić, S., Machine learning methods in monitoring operating behavior of marine two-stroke diesel engine, Transport vol. 35/5, 2020 pgs. 474-485

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
References: 1 - 8 : available in electronic form	unlimited	30

1.13. Quality Assurance

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Course quality review carried in accordance with ISO 9001 system and European standards and guidance for quality assurance carried through on Maritime faculty. Student Success is evaluated, and corrective measure implemented yearly.

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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3.2. Course description

Generic information		
Head of Course	Ph.D. Jasmin Ćelić, assistant professor	
Course	Intelligent transportation systems	
Study Programme	Marine Engineering and Maritime Transport Technology	
Level	Graduate degree programme	
Type of Course	Elective course	
Year of Study	2.	
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload	5
	Number of Hours (L+E+S)	30+30+0

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The main objectives of this course are to acquire basic knowledge in the field of intelligent transportation systems, as well as to get acquainted with the basic principles and techniques in the design and operation of modern systems.

1.2. Prerequisites for Course Registration

There are no prerequisites.

1.3. Expected Learning Outcomes

After passing the exam, students will be able to do the following:

1. Define the basic laws on which the ITS functionality is based.
2. Explain and demonstrate the principles of network management.
3. Describe the development of ITS.
4. Present and explain the procedures for the implementation of ITS in transport infrastructure.
5. Demonstrate the justification and benefit of ITS implementation.
6. Describe telematic solutions of the transport system.
7. Describe and present the principles of operation of electronic systems of transport entities.
8. Define the prerequisites for the development and implementation of ITS services.

1.4. Course Outline

General information on intelligent transport systems. Standards and norms. Fundamentals of systems theory and cybernetics. Physical and logical architecture of ITS. Traffic modeling. Communications in intelligent transport systems. Expert systems for the application of artificial intelligence to transport systems. Intelligent navigation system. Intelligent transport systems and control systems. Expert maintenance systems. Diagnostics in intelligent transport systems.

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1.5. Modes of Instruction	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ E-learning ☐ Field work	☒ Practical work ☐ Multimedia and Network ☐ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		

1.7. Student Obligations

1st colloquium, 2nd colloquium, development and presentation of a research task, final exam.

1.8. Assessment[1] of Learning Outcomes

Course attendance	2	Class participation	0.5	Seminar paper	1	Experiment	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Continuous Assessment	0.5	Presentation		Practical work	
Portfolio							

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The procedure for evaluating the acquired learning outcomes takes place according to the Ordinance on Studies of the University of Rijeka and the Ordinance on Studying at the Faculty of Maritime Studies in Rijeka as follows:

- *70% of acquired learning outcomes are evaluated through continuous testing of knowledge during classes:*

  through the 1st colloquium - learning outcomes 1.-4. (25%), 2nd colloquium - learning outcomes 5.-8. (25%), research task – learning outcomes 1.-8. (20%); in doing so, the student must realize a minimum of 50% of points for each colloquium, while the presentation of the research task is evaluated on the basis of elaborated assessment criteria;
- *at the final part of the exam, 30% of the acquired learning outcomes are evaluated (1.-8.), whereby the student must realize a minimum of 50% of points to pass the final exam;*
- *final ECTS grade, is defined on the basis of the achieved total % of knowledge, skills and competencies and numerical grade after the final / remedial exam as follows:*
  - *the grade excellent (5) corresponds to the grade A in the ECTS scale and the success rate from 90 to 100%,*
  - *a grade of very good (4) corresponds to a grade of B on the ECTS scale and a success rate of 75 to 89.9%,*
  - *grade good (3) corresponds to grade C on the ECTS scale and a success rate of 60 to 74.9%,*
  - *a grade of sufficient (2) corresponds to a grade of D on the ECTS scale and a success rate of 50 to 59.9%,*
  - *the grade insufficient (1) corresponds to the grade F in the ECTS scale and the success rate from 0 to 49.9%.*

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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Examples of evaluating learning outcomes in relation to set learning outcomes are:

1. Part of the ITS life cycle may be:
   - A Physical analysis ☐
   - B Physical synthesis ☐
   - C Functional composition ☐
   - D Functional decomposition ☐ (IU #1)

2. Types of control include:
   - A Feedforward control ☐
   - B Adaptive control ☐
   - C Control on demand ☐
   - D Feedback control ☐ (IU #2)

3. Physical, logical and communication point of view includes:
   - A Service ITS architecture ☐
   - B ITS Framework architecture ☐
   - C National ITS architecture ☐
   - D Mandatory ITS architecture ☐ (IU #3)

4. The basic step in the request detection process can be:
   - A User specification and problem prevention ☐
   - B User classification and troubleshooting ☐
   - C User prediction and problem separation ☐
   - D User identification and problem definition ☐ (IU #4)

5. The level of service in intelligent roads is measured by:
   - A Driving safety ☐
   - B Freedom of maneuver ☐
   - C Sensors ☐
   - D Driving comfort ☐ (IU #5)

6. ITS vehicle adaptation includes:
   - A Vehicle starting devices ☐
   - B Vehicle controls ☐
   - C Vehicle stopping devices ☐
   - D Vehicle maintenance devices ☐ (IU #6)

7. Sensors can be:
   - A MENS sensors ☐
   - B Chemical sensors ☐
   - C Magnetic sensors ☐
   - D Neon sensors ☐ (IU #7)

8. The benefits of ITS are visible in:
   - A Increase in emissions of pollutants ☐
   - B Reducing the number of road signs ☐
   - C Increasing the number of foreign guests ☐
   - D Number of employees at gas stations ☐ (IU #8)

1.10. Main Reading

- Williams, B. (2008.). Intelligent Transport Systems Standards, Artech House, Boston, USA.

1.11. Recommended Reading

- Group of authors. (2000.). Intelligent Transportation Primer, Institute of Transportation Engineers, Washington, USA.
- Chen, Y., Li, L. (2013.). Advances in Intelligent Vehicles, Elsevier, Academic Press.
- Zilouchian, A., Jamshidi, M. (2001.). Intelligent Control Systems Using Soft Computing Methodoligies, CRC Press, London, UK.
- Gupta, M., Sinha, N. K. (1995.). Intelligent Control Systems - Concept and Applications, IEEE Press, Piscataway NJ, USA.
- Internet:

http://local.iteris.com/arc-it/
http://its.dot.gov/
https://www.itsa.org/technology-scan-assessments
https://www.etsi.org/technologies/
https://www.pcb.its.dot.gov/eprimer/default.aspx
https://www.ieee-itss.org/its-transactions

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
Williams, B. (2008.). Intelligent Transport Systems Standards, Artech House, Boston, USA.	*10*	*40*

1.13. Quality Assurance

The quality of study is constantly monitored in accordance with the ISO 9001 system implemented at the Faculty of Maritime Studies in Rijeka. An analysis of exams is made annually, and once a semester a survey is conducted among students.

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Course description

Generic information			
Head of Course			
Course	GRADUATE THESIS		
Study Programme	MARINE ENGINEERING AND MARITIME TRANSPORT TECHNOLOGY		
Type of Course	Obligatory		
Year of Study	2		
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		15
	Number of Hours (L+E+S)		

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

Preparation of the graduate thesis with continuous consultation with the mentor and successful oral defense of the final thesis aims to prove that the student:
- ability to apply theoretical and practical knowledge acquired during graduate studies,
- ability to independently use current foreign and domestic literature in research and written processing of the defined topic of the final paper,
- ability to use relevant other people's knowledge, attitudes and facts published in the used literature,
- ability to properly process illustrations (tables, graphs, photographs, drawings) in accordance with the methodology of research work.

1.2. Prerequisites for Course Registration

The student enrolls in the course Graduate Thesis by enrolling in the fourth (summer) semester of graduate study, and the conditions for enrollment are: all courses taken from the third (winter) semester and the absence of a possible ban on taking courses from the third (winter) semester.

1.3. Expected Learning Outcomes

1. Analyze and apply the theoretical and practical knowledge acquired in the study.
2. Independently analyze, process and interpret a given (selected) topic.
3. Properly apply the methodology and technology of the thesis.
4. Present conclusions and insights related to the topic and research conducted within the thesis.

1.4. Course Outline

The graduate Thesis is an independent professional or scientific treatment of an established topic. With the graduate thesis, the student proves the possession of competencies and learning outcomes in solving problems in professional and scientific areas that are the content of the graduate study Marine Engineering and Maritime Transport Technology and the use of theoretical and practical knowledge acquired during the graduate study. In the process of presentation the graduate thesis, the student must prove knowledge of basic theoretical and practical knowledge in the field of marine engineering. The graduate thesis at the Faculty is given, written and presented in the Croatian language. Exceptionally, the final paper may be written and presented in a foreign language. The defense of the thesis is conducted orally before the Commission for the defense of the thesis.

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1.5. Modes of Instruction	☐ Lectures ☐ Seminars and workshops ☐ Exercises ☐ E-learning ☐ Field work	X Practical work ☐ Multimedia and Network ☐ Laboratory X Mentorship X Other _____
1.6. Comments		

1.7. Student Obligations

The obligations of students relate to: preparation of the graduate thesis in continuous consultation with the mentor during the summer semester and the successful presentation of the graduate thesis before the Commission. The manner of applying, preparing, presenting and evaluating the graduate thesis is prescribed by the Rulebook on the final thesis at the graduate university study of the Faculty.

1.8. Assessment[1] of Learning Outcomes

Course attendance		Class participation		Seminar paper		Experiment	
Written exam		Oral exam	4	Essay		Research	4
Project	5	Continuous Assessment		Presentation		Practical work	
Portfolio			2	Mentoring work			

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

In accordance with the Instructions on the application of the information system for checking the authenticity of student work of the University of Rijeka, using the Turnitin service (www.turnitin.com), the mentor checks the authenticity of the final work. Based on the above analysis, he compiles a Report on the conducted authenticity of student work - Appendix C (Form of the University of Rijeka) in which he provides data on student work and gives an opinion and explanation on whether the final work meets the requirements of original work. A positive opinion of the mentor and a positive report on the authenticity of the student work is a prerequisite for the acceptance of the graduate Thesis and the organization of the presentation. The presentation of the graduate thesis is held before the Commission, which consists of three members, including a mentor. The members of the Commission examine the candidate and a record is kept of the process of defending the graduate thesis, which records all information about the student and the graduate thesis, questions asked by the members of the Commission and the success of the candidate in defending the graduatethesis.

Examples of evaluating learning outcomes in relation to set learning outcomes are:
1. Present in approx. 10 min. your work and highlight the conclusions! (learning outcomes 1 - 4)
2. Explain the diagram x on the y page of your paper! (learning outcomes 1-4)

1.10. Main Reading

- obligatory literature from the course from which the graduate thesis is applied for and written
- other required literature in agreement with the mentor
- questions about the so-called final exam as part of the defense of the graduate thesis
- Instructions for writing the final paper, editors: dr.sc. I. Kolanović, Ph.D. A. Perić Hadžić, Ph.D. T. Dundović Ph.D. I. Jurdana, Ph.D. I. Rudan, Faculty of Maritime Studies University of Rijeka, Rijeka, 2014
  - available at https://www.pfri.uniri.hr/web/hr/studij_pre_BS.php

1.11. Recommended Reading

- supplementary literature from the course from which the graduate thesis is applied for and written
- other supplementary literature in agreement with the mentor

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
Instructions for writing the final paper, editors: dr.sc. I. Kolanović, Ph.D. A. Perić Hadžić, Ph.D. T. Dundović, Ph.D. I. Jurdana, Ph.D. I. Rudan, Faculty of Maritime Studies University of Rijeka, Rijeka, 2014	Available at https://www.pfri.uniri.hr/web/hr/studij_pre_BS.php	

1.13. Quality Assurance

Course quality review carried in accordance with ISO 9001 system and European standards and guidance for quality assurance carried through on Maritime faculty. Student Success is evaluated, and corrective measure implemented yearly.

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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Course description

Generic information			
Head of Course	Dr.sc. Jakov Karmelić		
Course	International Shipping Business		
Study Programme	Marine Engineering and Maritime Transport Technology		
Type of Course	Elective		
Year of Study	2.	University graduate study program	
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		5
	Number of Hours (L+E+S)		30+15+0

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The aim of the course is to provide students with a comprehensive insight and understanding of the international shipping markets (freight, shipbuilding, second hand and demolition) for different types of shipping (liner, tramp, passenger, off-shore).

Through this course, students will get acquainted with the goals and structure of the work of international maritime and trade organizations, the business of shipping companies and other entities in maritime trade, the structure of world overseas trade and the world fleet.

The course provides a scientific basis for further specialist study of this multidisciplinary course.

During exercises, by studying specific cases, students will acquire basic knowledge of doing business in the international shipping market.

1.2. Prerequisites for Course Registration

No

1.3. Expected Learning Outcomes

1. Explain the basic characteristics of each segment of the shipping market.
2. Distinguish the basic principles, goals and manner of work of the international maritime and trade organizations.
3. Analyze and interpret the structure of world overseas trade by types of cargo and types of ships.
4. Explain the importance and role of maritime transport entities in all types of shipping, especially: shipowners, operators, brokers and agents.
5. Analyze and interpret freight indices in all types of shipping, interpret shipping market cycles and analyze and interpret broker`s reports.
6. Define and explain the basic procedures for designing liner shipping services.
7. Explain the reasons for the business cooperation and the different types of cooperative agreements among the shipowners and operators.
8. Analyze and demonstrate the connection between overseas goods flows/trades of certain types of goods, specific technology and segmentation of ships for the transport of these types of goods and the ways of contracting sea transport.

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1.4. Course Outline

Analysis of world overseas trade by types of cargo and regions, structure of world trade fleet by types of ships, age structure of ships as well as structure of world fleet by ownership (countries) and operators.
An overview of the world's international maritime and trade organizations. Shipowners and operators in all types of shipping. Specifics of the work of brokers and shipping agents.
Shipping market segmentation. Categorization of ships in bulk, liquid, gaseous, containerized cargo transport and offshore industry. Freight indices in all types of shipping. Shipping market cycles. Supply and demand in the maritime shipping market.
Maritime competition regulations. Organizational structure of shipping companies. Ways of outsourcing in shipping: ship management, D / A Desk, C / P Desk, Service Sharing Centres, Planning Centres, etc.
Basics of liner service design. Criteria for selecting the optimal maritime shipping service and operator from the user's point of view.

1.5. Modes of Instruction	X☐ Lectures X☐ Seminars and workshops X☐ Exercises X☐ E-learning ☐ Field work	☐ Practical work ☐ Multimedia and Network ☐ Laboratory X☐ Mentorship ☐ Other _____
1.6. Comments	Email communication with the Head of course: jakov.karmelic@uniri.hr	

1.7. Student Obligations

The student must be present at lectures and exercises at least 70% of the total hours, prepare and present a written seminar paper on a given topic that should be positively assessed before taking the final oral exam.

1.8. Assessment[1] of Learning Outcomes

Course attendance	2	Class participation		Seminar paper	1,5	Experiment	
Written exam		Oral exam	1,5	Essay		Research	
Project		Continuous Assessment		Presentation		Practical work	
Portfolio							

[1] NOTE: Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The procedure for evaluating the acquired learning outcomes is performed according to the Ordinance on Studies of the University of Rijeka and the Ordinance on Studying at the Faculty of Maritime Studies in Rijeka, as follows:
A) Requirements for taking the exam:
· Active class attendance
· Preparation and presentation of seminar paper (40 points)
A. Prerequisite for passing the exam (60 points):
· At least 50% of complete theoretical knowledge in the field of International Shipping Business
Examples of evaluating learning outcomes in relation to set learning outcomes are:
1. Explain the characteristics of each type of maritime shipping market.
2. Describe the principles, goals and mode of operation of international maritime and trade organizations.
3. Interpret the structure of world overseas trade by types of cargo and types of ships.
4. Describe the role of maritime transport entities in all types of shipping, especially: shipowners, operators, brokers and agents.
5. Interpret freight indices, shipping market cycles and broker`s reports in all types of shipping.
6. Explain the basic procedures for designing liner services.
7. Explain the reasons for the cooperation and the different types of shipping cooperation agreements among the shipowners and operators.
8. Demonstrate the connection between the overseas flows of certain types of goods, the specific technology and segmentation of ships for the transport of these types of goods and the ways of contracting sea transport.
During the preparation of the research seminar, individual topics from the field of international maritime business are investigated in more detail.

1.10. Main Reading

1. Domijan-Arneri, I.: Poslovanje u morskom brodarstvu, Redak, Split, 2014.
2. Hess, M., Kos, S.: Ugovaranje u pomorstvu, Pomorski fakultet u Rijeci, 2013.
3. Review of Maritime Transport, UNCTAD, New York and Geneva, web edition
4. Shipping and Shipbuilding Markets, Annual Review Barry Rogliano Salles, web edition
5. Shipping Statistics and Market Review, ISL (Institute of Shipping Economics and Logistics), Bremen

1.11. Recommended Reading

1. Stopford, M.: Maritime Economics, Routledge, 2009.
2. Batalić, M., Mitrović, F.: Financiranje u pomorstvu, Pomorski fakultet u Splitu, Split, 2010.

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
Domijan-Arneri, I.: Poslovanje u morskom brodarstvu, Redak, Split, 2014.	5	40
Hess, M., Kos, S.: Ugovaranje u pomorstvu, Pomorski fakultet u Rijeci, 2013.	5	40
Review of Maritime Transport, UNCTAD, New York and Geneva, web edition	unlimited	40
Shipping and Shipbuilding Markets, Annual Review Barry Rogliano Salles, web edition	unlimited	40
Shipping Statistics and Market Review, ISL (Institute of Shipping Economics and Logistics), Bremen	1	40

1.13. Quality Assurance

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The quality of studies is monitored 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 in Rijeka. Once a year, the results of examination pass rate are analyzed, and appropriate measures are adopted.

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3.2. Course description

Generic information			
Head of Course	Full. prof. Ivica Šegulja		
Course	Numerical methods in Engeneering		
Study Programme	Marine Engineering and Maritime Transport Technologies		
Level	*Graduate degree programme*		
Type of Course	Mandatory		
Year of Study	I		
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		6
	Number of Hours (L+E+S)		45+15+0 (3+1+0)

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

Introduce students to the basics of numerical methods that are most commonly used to solve problems in the field of mechanical engineering and in other engineering fields.

1.2. Prerequisites for Course Registration

.

1.3. Expected Learning Outcomes

Students will be able to:
1. Recognize the applicability of individual numerical methods, for solving mathematical problems, without an analytical solution.
2. Recognize the applicability of each programming language (tool) for solving numerical problems.
3. Master the application of numerical methods to ordinary differential equations.
4. Interpret, evaluate and correctly interpret the results obtained by numerical methods.

1.4. Course Outline

Mathematical modeling. Computer languages. Rounding errors. Solving linear equations. Numerical derivation and integration. Methods of approximate solution of equations: secant method, tangent method, general iteration method. Approximate determination of extremes. Finite difference method: approximate expression of derivatives by finite differences. Demonstration of modeling and analysis using a computer program. Numerical solution of ordinary diff. Equations and partial diff. equations. Finite element method.

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1.5. Modes of Instruction	X Lectures X Seminars and workshops X Exercises ☐ E-learning ☐ Field work	X Practical work ☐ Multimedia and Network X Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		
1.7. Student Obligations		
Regular attendance at classes and solving tasks assigned to work at home.		
1.8. Assessment[1] of Learning Outcomes		

Course attendance	2.5	Class participation		Seminar paper	0.5	Experiment	
Written exam	1	Oral exam		Essay		Research	
Project		Continuous Assessment	2	Presentation		Practical work	
Portfolio		Final exam					

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The procedure for evaluating the acquired learning outcomes takes place according to the Ordinance on Studies of the University of Rijeka and the Ordinance on Studying at the Faculty of Maritime Studies in Rijeka as follows:
• 70% of acquired learning outcomes are evaluated through continuous testing of knowledge during classes o seminar paper - learning outcomes 1-4 (30%),
• 30% of the acquired learning outcomes are evaluated at the final exam, and the student must realize a minimum of 50% of points to pass the final exam.
Examples of evaluating learning outcomes in relation to set learning outcomes are:
1. Select a suitable numerical scheme for solving a simple differential equation.
2. For a given example from engineering practice, create a computer program using the finite difference method.
3. Compare the results obtained by numerical analysis with the results obtained by analytical and / or experimental methods and evaluate their validity.

1.10. Main Reading

S.Chapra, R. Canale : Numerical methods for engineers, McGraw Hill, New York, 2010

1.11. Recommended Reading

Notes from lectures and exercises.

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
S.Chapra, R. Canale : Numerical methods for engineers, McGraw Hill, New York, 2010	10	

1.13. Quality Assurance

The quality of study 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 in Rijeka. Once a year, the results of the transience are analyzed and appropriate measures are adopted.

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Course description

Generic information			
Head of Course	Assoc Prof Ana Perić Hadžić, Assit. Prof. Dražen Žgaljić		
Course	PROJECT MANAGEMENT		
Study Programme	Marine Engineering and Maritime Transport Technology		
Type of Course	Core		
Year of Study	1st	Graduate degree programme	
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		4
	Number of Hours (L+E+S)		30+15+0

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The course aims to explain the importance of projects and international projects and the role of project management in the development of business systems. The emphasis is on strategic preparation, evaluation, initiation, and development of project management models at different management levels in order for students to be able to manage projects in the conditions of modern development of the economy.

1.2. Prerequisites for Course Registration

None

1.3. Expected Learning Outcomes

After passing the exam in this course, students will be able to:
1. correctly interpret the basic theoretical and practical concepts of project management in the development of business systems,
2. distinguish project management processes (strategic preparation, initiation, implementation, control).
3. analyze different stakeholders
4. apply skills and competencies that contribute to more effective implementation and help solve complex organizational and other problems related to project management.
5. correctly define the terms related to the structure of EU-funded projects
6. design, analyze and formulate their own idea and make a project proposal.

1.4. Course Outline

Theoretical-Methodological determination of project management (defining project, project management, Project life cycle, Projects section-stakeholder), Processes of project management (project planning, organization, management, control). Strategic aspects of project management, project management of company development (development policy, investment policy, evaluation of investment projects). Management of international projects. Organization and programmes of the EU (focusing on programmes that finance the development of Transport), planning of EU projects, logical matrix (log frame), measuring the achievement of objectives, management of work packages and project results, consortium agreements and protection Intellectual property, communication and project management team, exploitation, dissemination and sustainability of EU projects, quality planning, quality assurance and control, risk management. Business case: Harbour Business Plan, the justification for the concession in the field of maritime domain, the EU project.

1.5. Modes of Instruction	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ E-learning ☐ Field work	☒ Practical work ☐ Multimedia and Network ☐ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		
1.7. Student Obligations		
1.8. Assessment[1] of Learning Outcomes		

Course attendance	1,5	Class participation		Seminar paper		Experiment	
Written exam		Oral exam	1	Essay		Research	
Project	1	Continuous Assessment	1,5	Presentation		Practical work	
Portfolio							

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The final grade of the student's success in the course is the sum of the percentage of success achieved by the student during classes (70% of the grade) and the percentage of success achieved in the final exam (30% of the grade) according to the rules of the University of Rijeka and the Faculty of Maritime Studies in Rijeka.
Continuous assessment of knowledge:
- it is necessary to achieve at least 50% correct answers from continuous assessments
- project - it is necessary to show the acquired knowledge and application of project methodology for the selected example
Final exam:
- at the final exam it is necessary to achieve at least 50% correct answers

Examples of evaluating learning outcomes in relation to set learning outcomes are:
1. Draw the project life cycle and mark the basic stages in the project life cycle
2. List the basic processes / functions of project management and explain their purpose
3. Explain who the primary and secondary stakeholders are and explain their role in the project
4. On the given example, use the critical path method to show the sequence of project activities, print the critical path of project activities, calculate the total duration of the project and Gantt chart show the sequence of project activities
5. Explain the role of EU structural funds and programs in financing projects related to sustainable transport development
6. Formulate a project proposal individually or in a team that includes the project description, relevance of the project application, implementation capacities of applicants and partners (if you have a partner), project efficiency and feasibility, project budget, project sustainability.

1.10. Main Reading

1. Authorized lectures on the e-learning platform MERLIN (online materials)

1.11. Recommended Reading

1. European Funds for Croatian Projects, A Handbook of financial cooperation and European Union, Supported Programmes in Croatia, Središnji državni ured za razvojnu strategiju i koordinaciju fondova Europske Unije, Zagreb, 2009
2. Aid Delivery Methods, Volume 1. Project Cycle Management Guidelines, European Comission, Brusseles, 2004
3. Project Management Institute, A Guide to the Project management Body of Knowledge (PMBOK Guide), Fourth Edition, 2008.

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
1. Authorized lectures on the e-learning platform MERLIN (online materials)	50	50

1.13. Quality Assurance

The quality of studies is monitored in accordance with the system ISO 9001 and in accordance with the European standards and guidelines for quality assurance carried out at the Faculty of Maritime Studies in Rijeka. Once a year, the results of passability are analyzed and appropriate measures are taken.

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Course description

Generic information			
Head of Course	Assoc. Prof. Borna Debelić, PhD		
Course	Financing in Maritime Affairs		
Study Programme	Marine Engineering And Maritime Transport Technology		
Type of Course	Elective		
Year of Study	1st	I	
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		6
	Number of Hours (L+E+S)		30+15+0

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

Acquiring knowledge in the special field of financing maritime projects and maritime organizations, necessary for persons responsible for the management and management of business and technological processes in projects and organizations in maritime affairs.

1.2. Prerequisites for Course Registration

No additional prerequisites.

1.3. Expected Learning Outcomes

1. Describe the system, market structures and elements of maritime investment and the sources, methods and models of financing.
2. Describe the principles, constituent elements and importance of financing the purchase of new and used ships, and describe the sources of possible financing.
3. Analyze the elements of credit business in the purchase and sale of ships, and describe the models of calculation and repayment and analyze the return through annuities in relation to installments.
4. Analyze the impact of liquidity and solvency on debt service management in terms of inflows of operating funds.
5. Analyze and explain financial transactions and their basic principles in the purchase and sale of ships, as well as business performance indicators as a basis for financial decisions and risk management.
6. Apply quantitative and qualitative methods of analysis of inflows of operating funds, operating costs, analysis of profit and loss account, and approaches, methods and techniques of risk management from the aspect of financing.
7. Identify and analyze the specifics of financing infrastructure investments in maritime and transport.

1.4. Course Outline

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Generally about maritime investments. Sources, methods and models of financing in maritime affairs. Financing the construction of new ships from public sources and commercial banks. Financing the procurement of used ships and sources of funds. Buying used boats and specific reasons for buying and selling. Basic elements of credit business in the purchase and sale of ships. Interest and principal, calculation and repayment models. Loan repayment through annuities and through installments. Calculation of Libor and Euribor. Liquidity and solvency in the domain of debt service management expected expected inflow of funds. Analysis of financial transactions in the purchase and sale of ships and basic principles and conditions. Forecasting of operating cash inflows, operating expenses, profit and loss account analysis, and risk management from the aspect of debt financing. Receivables security instruments. Specific financing of infrastructure investments in maritime and transport. Documentation and execution of financial transactions.

1.5. Modes of Instruction	☒ Lectures ☐ Seminars and workshops ☐ Exercises ☒ E-learning ☐ Field work	☒ Practical work ☒ Multimedia and Network ☒ Laboratory ☒ Mentorship ☐ Other _____
1.6. Comments		

1.7. Student Obligations

Regular attendance at classes and solving tasks assigned to work at home.

1.8. Assessment[1] of Learning Outcomes

Course attendance	1,5	Class participation	1	Seminar paper		Experiment	
Written exam	1,5	Oral exam		Essay		Research	
Project		Continuous Assessment	2	Presentation		Practical work	
Portfolio							

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

Discussion in class (10% of learning outcomes) in which students analyze the system of financing and sources of financing in maritime affairs and their characteristics as well as the impact on business, and principles, components and importance of different sources and dynamics of financing (I1 - I7) from the aspect of modern maritime organization and projects.

Written continuous knowledge test (2nd colloquium, 30% of learning outcomes each, which is a total of 60% of learning outcomes and a minimum of 50% of points achieved per colloquium) in which the student shows understanding of theoretical concepts and practical implications of specialist funding in maritime (I1 - I7) , mechanisms of action and effects on the operations of maritime companies and on the overall economy.

Final written test (30% of learning outcomes and a minimum of 50% of achieved points) in which the student shows understanding of the application and techniques of financial transactions of financial processes in maritime systems and projects, in the function of quality management decisions on financing development and infrastructure processes and projects in maritime I1 - I7).

1.10. Main Reading

1. Batalić, M., Mitrović, F.: Financiranje u pomorstvu, Pomorski fakultet Split, Split, 2010.

1.11. Recommended Reading

1. Harwood, S.: Shipping finance, third edition, Euromoney books, 2006.
2. Paine, F.: The Financing of Ship Acquisitions, Coulsdon, 1989.
3. Stokes, P.: Ship finance, second edition, LLP, 1997.

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*

1.13. Quality Assurance

Quality assurance system of educational process is in accordance with ISO 9001:2000 system as implemented on Faculty of Maritime Studies Rijeka. Analysis of exams is carried out annually. Students' evaluation is carried out each semester (more details provided in part describing organization of the Faculty).

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Course description

Generic information			
Head of Course	Dr.sc. Biserka Draščić Ban		
Course	Applied Mathematics		
Study Programme	Marine Engineering and Maritime Transport Technology		
Type of Course	mandatory		
Year of Study	1.		
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload	6	
	Number of Hours (L+E+S)	30+30+0 (2+2+0)	

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

Introduction to the elements of numerical mathematics and the basic concepts of probability theory.

1.2. Prerequisites for Course Registration

none

1.3. Expected Learning Outcomes

1. Describe the space of elementary events
2. Explain and apply probability to specific problems in practice
3. Recognize and apply the Total probability and Bayesian formula
4. Describe random variables
5. Use and calculate numerical characteristics of random variables
6. State and apply the Poisson and Moivre - Laplace theorems in specific situations
7. Calculate the errors in the approximate calculation
8. Describe and apply interpolation polynomials, numerical methods for solving equations, and numerical integration

1.4. Course Outline

The space of elementary events. Probability. Total probability and Bayesian formulas. Random variables. Numerical characteristics of random variables. Binomial, Poisson, uniform, normal distribution. Poisson's and Moivre-Laplace theorems. Error analysis. Interpolation. Numerical solution of equations. Numerical integration

1.5. Modes of Instruction	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ E-learning ☐ Field work	☐ Practical work ☐ Multimedia and Network ☐ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		

1.7. Student Obligations

Regular attendance at classes and homework.

1.8. Assessment[1] of Learning Outcomes

Course attendance	2	Class participation		Seminar paper		Experiment	
Written exam		Oral exam	1,5	Essay		Research	
Project		Continuous Assessment	2,5	Presentation		Practical work	
Portfolio							

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

Assesment of learning outcomes outcomes is done according to the Ordinance on Studies of the University of Rijeka and the Ordinance on Studying at the Faculty of Maritime Studies in Rijeka as follows:

- through continuous testing of knowledge during classes, 70% of acquired learning outcomes are evaluated through the 1st written exam - learning outcomes 1-6 (30%), the 2nd written exam - learning outcomes 6-8 (30%), and through regular class attendance (10 %)
- At the final part of the exam, 30% of the acquired learning outcomes are evaluated (1-8), where the student must realize a minimum of 50% of points to pass the final exam.

Examples of evaluating learning outcomes in relation to set learning outcomes are:

WRITTEN EXAM:

1. There are 1000 dice in the box, all of which are correct, except for one, which has a six on all sides. Fortunately, one dice was drawn and thrown four times. All four times it dropped to number 6. What is the probability that it is a faulty dice?

2. The random variable X has a normal distribution with expectation EX = 3 and is valid P (X <5) = 0: 6915. Calculate the probability of event P (-1 <X <6) .l

3. Determine the zero point of the function f (x) = x2-2 / x with an accuracy of 0.005.

4. The function is given in the table:

x	0	1	2	3
f(x)	0,1232	0,3687	0,4587	0,6899

Using Simpson's formula with 2n = 6, determine the integral of the function f (x) on the segment [0,3].

ORAL EXAM:
1. The Total probability theorem
2. Approximation of the Binomial Distribution by the Normal Distribution
3. Iterative method for solving equations

1.10. Main Reading

1. . Poganj: Teorija vjerojatnosti. Metodička zbirka riješenih ispitnih zadataka, Pomorski fakultet u Rijeci, 1997.
2. B. Draščić, T. Poganj, Primijenjena matematika, Pomorski fakultet u Rijeci, Sveučilište u Rijeci, Rijeka, 2010. (e-izdanje)

1.11. Recommended Reading

1. N.V.Kopchenova, I.A.Maron: Computational mathematics, MIR Publishers, Moscow, 1972.
2. P. Vranjković: Zbirka zadataka iz vjerojatnosti i statistike, Školska knjiga, Zagreb, 1992.
3. W. Feller: An Introduction to Probability Theory and its Applications, I,II, J. Wiley & Sons, New York, 1950, 196

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
T. Poganj: Teorija vjerojatnosti. Metodička zbirka riješenih ispitnih zadataka, Pomorski fakultet u Rijeci, 1997.	35	

B. Draščić, T. Poganj, Primijenjena matematika, Pomorski fakultet u Rijeci, Sveučilište u Rijeci, Rijeka, 2010.	As needed	

1.13. Quality Assurance

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Course description

Generic information			
Head of Course	Ines Kolanović, full professor		
Course	Scientific research methodology		
Study Programme	Marine Engineering and Maritime Transport Technology		
Type of Course	Mandatory		
Year of Study	1.		
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		4
	Number of Hours (L+E+S)		30 + 0 + 15

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The aim of this course is that students after completing the course will be able to apply basic knowledge about the technology and methodology of scientific and professional research in writing student theses at graduate level.

1.2. Prerequisites for Course Registration

1.3. Expected Learning Outcomes

After passing the exam in this course, students will be able to:
1. correctly explain and interpret the basic terms: science, technology and methodology of scientific research
2. systematically analyze and explain the classification of science in the Republic of Croatia
3. recognize and single out the basic characteristics of certain types of scientific, scientific and professional works
4. explain and apply the rules of scientific research methodology in writing student papers
5. explain and apply the rules of scientific research technology in writing student papers

1.4. Course Outline

About science, scientific activity and research: theory of science, features of modern science, Croatian qualification framework, classification of science in the Republic of Croatia, scientific institutions. Scientific, scientific and professional works: classification of written works, concept, types and characteristics of scientific, scientific and professional works. Characteristics of work in the system of higher education in graduate and postgraduate studies. The concept and features of scientific methods. Scientific research methodology. Technology of scientific research: observation of a scientific problem, setting a hypothesis, selection and analysis of a topic (title), making a research plan, compiling a working bibliography, collecting and studying literature and scientific information, solving a problem, formulating research results, applying research results. Writing a text and technical processing of a scientific and professional work: documentary basis of the manuscript, citation of literature, referencing in the text, presentation of illustrations.

1.5. Modes of Instruction		
	+ Lectures	+ Practical work
	+ Seminars and workshops	☐ Multimedia and Network
	☐ Exercises	☐ Laboratory
	☐ E-learning	☐ Mentorship
	☐ Field work	☐ Other _____

1.6. Comments	

1.7. Student Obligations

Students are obliged to: attend at least 70% of classes, 1 colluquia, seminar paper, final exam

1.8. Assessment[1] of Learning Outcomes

Course attendance	1,5	Class participation		Seminar paper	1	Experiment	
Written exam	0,5	Oral exam		Essay		Research	
Project		Continuous Assessment	1	Presentation		Practical work	
Portfolio							

[1] NOTE: Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The final grade on the course is the sum of points earned by the student during classes (70% of the grade) and points earned in the final exam (30% of the grade) according to the Regulations on Studies of the University of Rijeka and the Regulations on studying at the Faculty of Maritime Studies in Rijeka.

Continuous assessment:
• 1 colloquia - it is necessary to achieve a minimum of 50% of the total number of points
• seminar paper - t is necessary to present the acquired knowledge and the application of the methodology and technology of scientific research

Final exam:
At the final exam, the integrity of theoretical knowledge in the field of Methodology of scientific research work is checked (minimum 50% of points)

Examples of evaluating learning outcomes in relation to set learning outcomes are:
1. Define the terms science, technique, technology and methodology of scientific research. (LO1)
2. Explain the classification of science in the Republic of Croatia. (LO2)
3. On a concrete example, single out the basic features of scientific works. (LO3)
4. Present the features of the methodology of scientific research when writing seminar papers at the graduate level. (LO4)
5. Analyze the rules of scientific research technology and their application in writing seminar papers at graduate level. (LO5)

1.10. Main Reading

1. Zelenika, Ratko: Metodologija i tehnologija izrade znanstvenog i stručnog djela, Pisana djela na stručnim i sveučilišnim studijima, knjiga peta, Ekonomski fakultet u Rijeci, Rijeka, 2011.
2. Kolanović, I.: Teaching material published on Merlin

1.11. Recommended Reading

1. Zelenika, Ratko: Metodologija i tehnologija izrade znanstvenog i stručnog djela, Znanost-poluga održive egzistencije čovječanstva, knjiga treća, Ekonomski fakultet u Rijeci, Rijeka, 2011.
2. Žugaj, Miroslav; Dumičić, Ksenija; Dušak, Vesna: Temelji znanstvenoistraživačkog rada, Metodologija i metodika, Fakultet organizacije i informatike, Varaždin, 2006.

1.12. Number of Main Reading Examples

Title	Number of examples	Number of students

Kolanović, I.: Teaching material published on Merlin	Unlimited (web)	
Zelenika, Ratko: Metodologija i tehnologija izrade znanstvenog i stručnog djela, Pisana djela na stručnim i sveučilišnim studijima, knjiga peta, Ekonomski fakultet u Rijeci, Rijeka, 2011.	6	13

1.13. Quality Assurance

The quality of studies is monitored 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 in Rijeka. Once a year, the results of passability are analyzed and appropriate measures are adopted.

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Table 2.

3.2. Course description

Generic information		
Head of Course	Predrag Kralj, Associate Professor, Ph.D., BME	
Course	Refrigerating Container Systems	
Study Programme	**Marine Engineering and Transport Technology**	
Type of Course	Elective	
Year of Study	1	
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload	5
	Number of Hours (L+E+S)	30+15+0

1. GENERAL COURSE DESCRIPTION		
1.1. Course Objectives		
The course aims to enable students to become proficient in design, optimization and advanced diagnostics of refrigerating container and other familiar systems.		
1.2. Prerequisites for Course Registration		
None		
1.3. Expected Learning Outcomes		
It is expected that the student will be able: 1. To recognize the elements of unknown refrigerating container system and its functions, the electric energy elements and system and the system of automatic operation. 2. To analyze the automatic operation of the refrigerating system, above all the system of refrigeration capacity regulation. 3. To diagnose malfunctions in the system and to plan and manage the overhaul procedure. 4. To design new solutions with aim to optimize the operation and increase the level of protection.		
1.4. Course Outline		
1. Basics of refrigerating container systems 2. Main manufacturers ant types 3. Management of operation and diagnostics 4. Exploitation of refrigerating container systems 5. The refrigerating container electric energy systems 6. The refrigerating container electronic regulation systems 7. The refrigerating container electric and electronic systems diagnosis		
1.5. Modes of Instruction	X Lectures ☐ Seminars and workshops X Exercises ☐ E-learning ☐ Field work	☐ Practical work ☐ Multimedia and Network X Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		
1.7. Student Obligations		

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Students enrolled at the Faculty of Maritime Studies are expected to observe *the code of conduct* required by the academic institution, and regularly attend lectures and practical work sessions.

1.8. Assessment of Learning Outcomes

Course attendance	1,5	Class participation		Seminar paper		Experiment	
Written exam		Oral exam		Essay		Research	
Project		Continuous Assessment	1,5	Presentation		Practical work	0,5
Portfolio		Final exam	1,5				

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

Through Partial Exams, Seminar Paper and Evaluation of Student's Practical Work on the Simulator Student achieves up to 70%. First partial exam deals with theory of refrigeration and applied solutions and characteristics of refrigerating container systems (Learning Outcomes from 1 to 3). The second partial exam deals with the systems of electric energy and electronic regulation (Learning Outcomes from 1 to 3). The practical work is evaluated on the simulators (Learning Outcomes from 1 to 3). With the written Final Exam (Learning Outcomes from 1 to 4) Student achieves up to 30% of total Score.
Examples of Assessment of Learning Outcomes:

1. on schematic representation and on the simulator recognize the type of the compressor and method of refrigeration regulation (Learning Outcomes from 1 to 3)
2. on the simulator perform starting procedure and manage the normal operation of the system (Learning Outcomes from 1 to 3)
3. recognize the malfunction on the simulator and list possible causes (Learning Outcomes from 1 to 3)

1.10. Main Reading

1. Lecturers' notes published on official webpage

1.11. Recommended Reading

None

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
	web	

1.13. Quality Assurance

Internal:

- Student feedback (SET - Student evaluation of teaching) at the end of academic year.
- Course review by the head of course at the end of academic year.

External:
Programme quality review carried by the QA Agency.

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Course description

Generic information			
Head of Course	Lovro Maglić, Ph.D.		
Course	MARINE TECHNOLOGIES		
Study Programme	Marine Engineering		
Type of Course	Optional		
Year of Study	1.		
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		6
	Number of Hours (L+E+S)		30 + 0 + 15

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

Objective of the course is to familiarize students with most important features, governing rules and regulations as well as principles of numerous activities for sea and seabed exploration and exploitation. The course deals only with those activities employing modern technologies or those which are caused by recent technological developments.

1.2. Prerequisites for Course Registration

There are no special requirements for enrolling in the course.

1.3. Expected Learning Outcomes

1. Define the content and concept of marine technologies.
2. Distinguish the rights and obligations in the exploitation of the sea in the area of jurisdiction of coastal states and in international waters in accordance with the UN Convention on the Law of the Sea.
3. Explain technological concepts and distinguish methods of fishing marine organisms.
4. Explain modern techniques of mariculture and compare their advantages and disadvantages.
5. Explain technological concepts and distinguish methods of exploration and exploitation of hydrocarbons and ores from the seabed.
6. Explain technological concepts and compare the conditions and efficiency of seawater exploitation methods
7. Explain technological concepts and analyze the applicability of certain methods of using sea energy.
8. Explain towing technological concepts, differentiate equipment and compare towing methods.
9. Distinguish rights and obligations in contracting and carrying out rescue of property at sea and describe specialized vessels for rescue of property.
10. Explain technological concepts and basic activities in the field of shipbuilding and nautical tourism.
11. Explain the technological concepts and underwater activities of divers and modern systems such as remotely controlled and autonomous vehicles.

1.4. Course Outline

The concept of marine technologies in general. The right to exploit the sea and the seabed. Marine fishing and mariculture. Hydrocarbon exploration and exploitation. Marine mining and dredging. Exploiting the energy of the sea. Seawater treatment. Towing and rescue at sea. Nautical tourism. Shipbuilding. Underwater activities - divers and autonomous and remotely controlled vehicles.

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1.5. Modes of Instruction	☒ Lectures ☒ Seminars and workshops ☐ Exercises ☐ E-learning ☐ Field work	☒ Practical work ☐ Multimedia and Network ☐ Laboratory ☒ Mentorship ☐ Other _____
1.6. Comments	none	

1.7. Student Obligations

- Attendance at classes
- Conducting research and presenting the project assignment
- Final oral exam

1.8. Assessment[11] of Learning Outcomes

Course attendance	1,5	Class participation		Seminar paper	1	Experiment	
Written exam		Oral exam	2,5	Essay		Research	1
Project		Continuous Assessment		Presentation		Practical work	
Portfolio							

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

Outcome evaluation procedure:
- Presentation of the project assignment and research outcomes (Outcomes 1-11) - 50%
- Final oral exam (outcomes 1-11) - 50%

Examples of evaluating learning outcomes:
- Describe the rights and obligations of the coastal state in the exploitation of resources in the exclusive economic zone.
- Explain the technologies of fishing pelagic species.
- Describe the principle of hydrocarbon exploration by seismic ships.
- Compare the features of different types of platforms for hydrocarbon exploration.
- State and explain the principles of using wave energy.
- Assess which principle of sea energy use is applicable in the Adriatic Sea.
- Compare and explain different dredging methods with hydraulic dredgers.
- Explain the rights and obligations of users of anchorages in nautical tourism in accordance with the regulations of the Republic of Croatia.

1.10. Main Reading

Marine Technology lecture script available on the Merlin e-learning system

1.11. Recommended Reading

Selected entries of the Maritime Encyclopedia and a selection of articles and studies available on the Merlin e-learning system.

1.12. Number of Main Reading Examples

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities

Title	*Number of examples*	*Number of students*
Marine Technology lecture script available on the Merlin e-learning system	unlimited	30
selection of articles and studies available on the Merlin e-learning system	unlimited	30
Selected entries of the Maritime Encyclopedia	1	30

1.13. Quality Assurance

The quality of studies is monitored in accordance with the system ISO 9001 and in accordance with European standards and guidelines for quality assurance, which is carried out at the Faculty of Maritime Studies in Rijeka. Once a year, the results of pass rate are analyzed and appropriate measures are adopted.

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Course description

Generic information			
Head of Course	Full. prof. Dragan Martinović, PhD		
Course	APPLIED THERMODINAMICS AND TERMOTECHNICS		
Study Programme	Marine Engineering and Transport Technology		
Type of Course	Obligatory		
Year of Study	1		
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		6
	Number of Hours (L+E+S)		45 + 15 + 0

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The objective of the course is to introduce the students with the methods of more efficient use of heat engines and heat energy on board, the basics of calculation and design of ship heat exchangers, as well as problems that arise during the operation of exploitation of thermal power plants.

1.2. Prerequisites for Course Registration

Without special conditions

1.3. Expected Learning Outcomes

1. Valorize heat transfer and establish lows on maintenance and mass and energy transfer. Evaluate technical heat exchangers.
2. Compare the flow of gases and liquids, evaluate the flow in the nozzles, estimate the main sizes of the nozzle and the energy conversion processes in the nozzles. Compare the application of nozzles in thermal devices.
3. To determine changes in the state of humid air and to compare technical processes with humid air in the ship's engine complex.
4. Review models for improving the Clausius-Rankine process.
5. Evaluate thermal stresses, determinate the principles of thermomechanics and evaluate the behavior of materials under elevated temperatures.
6. Valorize marine energy and process devices.

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1.4. Course Outline

Introduction; definitions and units; mass and energy maintenance; Heat conduction, non-stationary heat conduction, convection heat transfer, radiation heat transfer, heat balance; Nozzle flow, de Laval nozzle, critical cross sections, nozzle calculation, energy conversion in nozzles, ejectors and injectors, application of flow law to steam and gas turbines; Humid air, h-x diagram of humid air, changes in the state of humid air, processes with humid air, humid air in the ship' engine complex; Marine energy and process devices, purpose, division, characteristics, performance, thermal processes, efficiency, heat balances, flue gas flow, heat pumps; Thermomechanics thermal stresses, behavior of materials under elevated temperatures.

1.5. Modes of Instruction	☐ Lectures ☐ Seminars and workshops ☐ Exercises ☐ E-learning ☐ Field work	☐ Practical work ☐ Multimedia and Network ☐ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		

1.7. Student Obligations

A student who is not present of more than 70 % of the total hours of lectures and exercises cannot take the exam.

1.8. Assessment[1] of Learning Outcomes

Course attendance	2	Class participation		Seminar paper		Experiment	
Written exam		Oral exam	2	Essay		Research	
Project		Continuous Assessment	2	Presentation		Practical work	
Portfolio							

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The procedure for evaluating the acquired learning outcomes takes place according to the Odinance on Studies of the University of Rijeka and the Ordinance on Studying at the Faculty of Maritime Studies in Rijeka as follows:

• 70% of acquired learning outcomes are evaluated through continuous testing of knowledge during classes

o seminar paper - learning outcomes 1-4 (30%),

• 30% of the acquired learning outcomes are evaluated at the final exam, and the student must realize a minimum of 50% of points to pass the final exam.

Examples of evaluating learning outcomes in relation to set learning outcomes are:

1. Calculate and design the Main Engine heavy oil heater for the given parameters.
2. Determine the magnitudes of the critical state of the nozzle in which the superheated steam of the given state expand. Determine the shape of the whole nozzle with specific cross-sections and construct a diagram of the change in cross-section, velocity and volume along the nozzle.
3. For the given parameters, define the ratio of mixing fresh and circulating air in the air chamber, in order to achieve the so-called a relaxed state of air. Calculate the required amount of head to be supplied to the air chamber to reheat the resulting mixture.
4. Explain the Rankine Counterpressure process and the model of cogeneration of mechanical power and heat flow.
5. Analyze the behavior of individual materials under elevated temperatures and define thermal stresses.
6. Analyze the improvement in the efficiency of the Joule-Brayton process by increasing the combusting temperature.

1.10. Main Reading

1. B. Halasz, *Uvod u termodinamiku*, Fakultet strojarstva i brodogradnje Sveučilišta u Zagrebu, 2015
2. F. Bošnjaković, *Nauka o toplini I Dio*, Tehnička knjiga Zagreb, 1978.
3. F. Bošnjaković, Nauka o toplini II Dio, Tehnička knjiga Zagreb, 1976.

1.11. Recommended Reading

Teaching materials for e-course available on the e-learning system Merlin.
N. Afgan and E.U. Schlunder; Heat Exchangers, Design and Theory Sourcebook; McGraw-Hill Book Company
M. D. Burghardt; *Engineering Thermodynamics with Applications*; U.S. Merchant Marine Academy, Kings Point, New York
Kenneth S. Pitzer; Thermodynamics; McGraw-Hill Book Company
N. Petrić, I. Vojnović, V. Martinac; *Tehnička termodinamika*;HINUS, Zagreb, 1999.

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
F. Bošnjaković; Nauka o toplini I , II, Tehnička knjiga Zagreb	10	20
B. Halasz; Uvod u termodinamiku, FSB Zagreb,2015.	10	20

1.13. Quality Assurance

The quality of study 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 in Rijeka. Once a year, the results of the transience are analyzed and appropriate measures are adopted.

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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Course description

Generic information			
Head of Course	Goran Vukelić		
Course	Application of Numerical Methods in Engineering		
Study Programme	MSc Marine Engineering and Maritime Transport Technology		
Type of Course	elective		
Year of Study	1		
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		6
	Number of Hours (L+E+S)		1+2+2

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

Adoption of theoretical and practical knowledge of numerical structural modelling and strength analysis.

1.2. Prerequisites for Course Registration

Passed exams from Engineering Mechanics (Strength of Materials).

1.3. Expected Learning Outcomes

1. To perform structural numerical modelling.
2. To perform finite element discretization.
3. To determine stress and strain distribution.
4. To apply finite element software for solving structural problems.
5. To interpret, assess and explain the results of numerical analysis.

1.4. Course Outline

CAE systems. Introduction to the application of numerical methods in solving structural problems. Defining geometry for assigned problem. Mathematical modelling. Defining loads and boundary conditions. Application of finite element method for assigned structural problem.

1.5. Modes of Instruction		
	☒ Lectures	☐ Practical work
	☒ Seminars and workshops	☐ Multimedia and Network
	☒ Exercises	☐ Laboratory
	☐ E-learning	☐ Mentorship
	☐ Field work	☐ Other _____

1.6. Comments

1.7. Student Obligations

Attending the classes, fulfilling the assignments.

1.8. Assessment[1] of Learning Outcomes

Course attendance	2.5	Class participation	0.5	Seminar paper	2	Experiment	
Written exam	1	Oral exam		Essay		Research	
Project		Continuous Assessment		Presentation		Practical work	

Portfolio							

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

- Continuous assessment during semester (70% of learning outcomes)
  - seminar paper (learning outcome 1-4)
- Final exam (30% of learning outcomes 4,5)

1.10. Main Reading

Klaus-Jurgen Bathe: Finite Element Procedures, 2nd Ed., Bathe, Watertown, 2014

1.11. Recommended Reading

Saeed Moaveni: Finite Element Analysis: Theory and Application with ANSYS, 4th Ed.

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
Klaus-Jurgen Bathe: Finite Element Procedures	Free PDF online	10

1.13. Quality Assurance

According to ISO 9001 standard set on the Faculty of Maritime Studies Rijeka.

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Course description

Generic information			
Head of Course	Assoc. Prof. Goran Vukelić		
Course	Project assignment 1		
Study Programme	MSc Marine Engineering and Maritime Transport Technology		
Type of Course	Elective		
Year of Study	1		
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		5
	Number of Hours (L+E+S)		0+0+60

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

Developing independent research capabilities by browsing published references and application of research methods in fulfilling given project assignment that is linked to one or two principal course(s).

1.2. Prerequisites for Course Registration

None.

1.3. Expected Learning Outcomes

1. Analysing the current mechanical condition of the engineering structure.
2. Assessing the possible solutions for improving the condition of the engineering structure.
3. Proposing new optimized solutions.
4. Understanding basic methods and techniques of non-destructive testing.
5. Applying research methods in fulfilling given project assignment.
6. Producing the final solution.

1.4. Course Outline

Literature review. Defining of a project. Planning, organisation, managing and control of the project. Experimental and numerical analysis of selected engineering structure. Assessing the obtained solution. Writing of final report. Managing the results.

1.5. Modes of Instruction	☐ Lectures ☒ Seminars and workshops ☐ Exercises ☐ E-learning ☐ Field work	☒ Practical work ☒ Multimedia and Network ☒ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments	-	

1.7. Student Obligations

Attending the lectures.

1.8. Assessment[1] of Learning Outcomes

Course attendance		Class participation	1	Seminar paper		Experiment	0,5
Written exam		Oral exam		Essay		Research	2
Project	2	Continuous Assessment		Presentation		Practical work	0,5
Portfolio							

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

According to the study rulebooks of University of Rijeka and Faculty of Maritime Studies:
- through continuous assessment during the semester 70% of learning outcomes (1-5)
- through final exam 30% of learning outcomes (1-5).

Examples of evaluation in correlation to learning outcomes:
1. Experimentally and numerically analyse the selected engineering structure.
2. Perform literature review for the selected problem.
3. Perform the numerical optimization of the selected engineering structure according to the set goal.
4. Define project plan.
5. Asses the optimized solution.

1.10. Main Reading

According to the principal course selected for the project assignment.

1.11. Recommended Reading

According to the principal course selected for the project assignment.

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*

1.13. Quality Assurance

According to ISO 9001 system set at Faculty of Maritime Studies, Rijeka. Once a year analysis of passing exam rate. Once a semester anonymous students online survey.

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Course description

Generic information			
Head of Course	Assoc. Prof. Dean Bernečić, Assoc. Prof. Goran Vukelić		
Course	Welding and non-destructive testing		
Study Program	MSc Marine Engineering and Maritime Transport Technology		
Type of Course	Elective		
Year of Study	1		
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		5
	Number of Hours (L+E+S)		2+2

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

Acquiring theoretical and practical knowledge in cutting, welding and non-destructive testing of materials.

1.2. Prerequisites for Course Registration

None.

1.3. Expected Learning Outcomes

1. Understanding basic techniques of welding, soldering and cutting metals.
2. Apply certain techniques of welding, soldering and cutting metals.
3. Analyzing the differences, advantages and disadvantages of welding techniques and determine the optimal application for individual cases and materials.

4. Understanding basic methods and techniques of non-destructive testing.
5. Applying selected methods and techniques of non-destructive testing in practice.
6. Analyzing the results of non-destructive testing.

1.4. Course Outline

Basics and problems of welding construction steel, stainless steel, cast iron, copper and copper alloys, aluminum and the selection of the optimal welding or soldering method. Arc cutting and welding: MAG, MIG, TIG, plasma and water cutting. Cutting, welding and soldering with gas mixtures: acetylene - oxygen, propane - butane - oxygen, hydrogen - oxygen.

Introduction to non-destructive testing (NDT). Material flaws. Principles of NDT method selection. NDT equipment and instruments. Basic NDT methods: visual, penetrant, ultrasonic, magnetic particle, eddy current, radiography. Other NDT methods: leak testing, vibration testing.

1.5. Modes of Instruction	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ E-learning ☒ Field work	☐ Practical work ☐ Multimedia and Network ☒ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments	-	

1.7. Student Obligations

Attending the lectures and laboratory exercises, fulfilling other assignments.

1.8. Assessment[1] of Learning Outcomes

Course attendance	2	Class participation	1	Seminar paper		Experiment	
Written exam	1	Oral exam		Essay		Research	
Project		Continuous Assessment		Presentation		Practical work	1
Portfolio							

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

According to the study rulebooks of University of Rijeka and Faculty of Maritime Studies:

- through continuous assessment during the semester 60% of learning outcomes
  - lab. work (welding) – learning outcomes 2-3 (30%),
  - lab. work (NDT) – learning outcomes 5-6 (30%)
- through final exam 40% acquired learning outcomes (5-6) with passing rate set at min. 50% of final exam points.

Examples of evaluation in correlation to learning outcomes:

1. Explain certain methods of welding and soldering.
2. Select and apply a particular method to a given example with respect to material, optimality and quality of welds.
3. Analyze the influence of each method on the deformation of the material.
4. Explain the principles of a selected NDT method.
5. Select the suitable NDT method according to the assigned example.
6. Asses the validity of obtained NDT results.

1.10. Main Reading

G. Meden, A. Pavelić, D. Pavletić: „Osnove zavarivanja“, Tehnički fakultet, Rijeka, 2000.
P.E. Mix: „Introduction to Nondestructive Testing“, Wiley&Sons, 2005

1.11. Recommended Reading

1. Welding: Supplementary literature on Melin e-learning platform
2. NDT: C.J. Hellier: „Handbook of Nondestructive Evaluation“, McGraw&Hill, 2003

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
G. Meden, A. Pavelić, D. Pavletić: „Osnove zavarivanja”	1	10
P.E. Mix: „Introduction to Nondestructive Testing”	1	10

1.13. Quality Assurance

According to ISO 9001 system set at Faculty of Maritime Studies, Rijeka. Once a year analysis of passing exam rate. Once a semester anonymous students online survey.

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Course description

Generic information			
Head of Course	Vlado Frančić, Associate Professor, Ph.D.		
Course	International Maritime Safety System		
Study Programme	**Marine Engineering and Maritime Transport Technology**		
Type of Course	Elective		
Year of Study	1	Semester **2**	
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		5
	Number of Hours (L+E+S)		**30 + 15 + 0 (2 + 1 + 0)**

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The course objectives are to explicate basic characteristics, laws and regulations related to the navigation safety and marine environment pollution prevention systems. The course describes International maritime safety system in general, based on international and national regulations including industry standards. Furthermore, principals of surveys, Certification procedures and Port State Inspection (PSC) are explained. Emphasis is given to the way of carrying out decisions and regulations on political, technological and implementation level as well as their influence to the business efficiency of the maritime companies on international and national level.

1.2. Prerequisites for Course Registration

It is expected that students possess at least basic knowledge about International Maritime Organization (IMO) maritime and associate requirements related to safety of navigation.

1.3. Expected Learning Outcomes

It is expected that the student will be able to:

1. Determine and discuss the international legal framework and its principles related to safety of navigation and protection of the marine environment;
2. Explain and analyses the structure and organization activities of the International Maritime Organization (IMO);
3. Explain in detail important maritime conventions related to safety of navigation;
4. Determine and explain the role, rights and obligations of Recognized organizations (ROs);
5. Elaborate certification system;
6. Elaborate and discuss principles of Port State Inspection in shipping and related procedures;
7. Determine sand envisage the PSC procedure in accordance with Paris MoU requirements;
8. Compare surveys and port state inspection process.
9. Assess the implication of required safety measures on business efficiency of the shipowner and ship operator.

1.4. Course Outline

Principles of implementation and managing of safety of navigation. Marine environment protection and the navigation safety system. The safety of navigation and marine environment protection and its position in respect of international legal framework. International Maritime Organization (IMO) structure and organizational activities, goals. IMO Convention - organization, principles and activities. Assembly, committees, and sub-committees. The most important maritime conventions: SOLAS, COLREG, MARPOL, STCW, MLC 2006, SAR, TONNAGE, LOADLINE, AFS, BWM. Recommendations and codes adopted by the IMO. Implementation of the international sources related to the safety of navigation on national level and ship operators' level. Privileges and obligations of the state to ships sailing under the national flag (Flag State Control – FSC). Privileges, obligations and the role of the Recognized organizations (ROs). Classification societies and IACS. Harmonized System of Survey and Certification (HSSC). Rights and obligations of the coastal state to ships sailing under foreign flag (Port State Control – PSC). Port State Control Regime. Regional cooperation. Rights and obligations and procedures according Paris Memorandum of Understandings. Future development of the safety of navigation. Influence and limitations of modern technological solutions. Influence of the safety measures to the business efficiency of the ship operators and ship-owners.

1.5. Modes of Instruction	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ E-learning ☐ Field work	☒ Practical work ☐ Multimedia and Network ☐ Laboratory ☒ Mentorship ☐ Other _____
1.6. Comments		

1.7. Student Obligations

Students enrolled at the Faculty of Maritime Studies are expected to observe the code of conduct required by the academic institution, and regularly attend lectures and practical work sessions.

1.8. Assessment[1] of Learning Outcomes

Course attendance	1	Class participation	0,5	Seminar paper		Experiment	
Written exam		Oral exam	2	Essay		Research	1,5
Project		Continuous Assessment		Presentation		Practical work	
Portfolio							

[1] NOTE: Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

Through oral examination and seminar Paper (research article) student will achieve learning outcomes.
On the final exam (oral exam) student need to present theoretical knowledge in the field of the international maritime safety system, where it is necessary to achieve a minimum of 50% of the required theoretical knowledge.
Examples of Assessment of Learning Outcomes:

1. Explain certification process and port state control inspection procedures (Learning Outcomes 4,5,6)
2. Determine ship risk profile of the specific ship type according the rules of the Paris MoU. (Learning Outcomes 7, 8)

1.10. Main Reading

1. **Lecturer's notes published on official webpage**
2. **Damir Zec, Sigurnost na moru, University textbook, Faculty of Maritime Studies Rijeka, 2001.**
3. **Recognized Organizations Code, IMO.**
4. **Paris Memorandum of Understanding on Por State Control – latest annex.**

1.11. Recommended Reading

1. **Relevant IMO Resolutions, Circular letters, recommendations, Codes and circular letters) of IMO in electronic and paper form.**
2. **Original texts of the basic International Maritime Organization's conventions: SOLAS, MARPOL, MLC 2006, STCW.**

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
1,3 and 4	**Web**	**30**
2	**5**	**5**

1.13. Quality Assurance

Internal:

- **Student feedback (SET - Student evaluation of teaching) at the end of academic year.**
- **Course review by the head of course at the end of academic year.**

External:
Programme quality review carried by the QA Agency.

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Table 2.

3.2. Course description

Generic information		
Head of Course	Predrag Kralj, Associate Professor, Ph.D., BME	
Course	Cogeneration Plants	
Study Programme	Marine Engineering and Transport Technology	
Type of Course	Elective	
Year of Study	1	
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload	5
	Number of Hours (L+E+S)	15+0+30

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

Introduction to the methods of more efficient energy consumption on board ships, the basis of marine cogeneration and tri-generation plants and their management systems design, as well as to the problems emerging during their exploitation.

1.2. Prerequisites for Course Registration

None

1.3. Expected Learning Outcomes

It is expected that the student will be able:
1. To analyze the energy transformation processes in cogeneration and tri-generation marine plants.
2. To optimize the power plants with different engine types and to determine the energy ratio and overall efficiency.
3. To compare marine equipment applied in the processes of main engines waste heat recuperation and to give explanations of their effect on the total efficiency coefficient of the process.
4. To design the cogeneration and tri-generation main components and to determine the possibilities of efficiency improvement of each element and the system altogether.
5. To create the basic concept of a cogeneration and tri-generation plant and its managing system.

1.4. Course Outline

Basics of cogeneration: energy transformation, mechanical work, waste heat, waste heat recuperation, heat balance and total efficiency coefficient increase. Marine systems and equipment used in waste heat recuperation processes: waste heat steam generators, thermal fluid systems, fresh water generators, refrigeration systems etc. Examples of cogeneration plants. Techno-economic analysis of fresh water generators. Techno-economic analysis of refrigeration processes. Application in tri-generation plants. Influencing factors on plants and its managing systems design. The Plants Exploitation expenses and plants optimization.

1.5. Modes of Instruction	X Lectures ☒ Seminars and workshops Exercises E-learning ☐ Field work	☐ Practical work Multimedia and Network ☐ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		

1.7. Student Obligations

Students enrolled at the Faculty of Maritime Studies are expected to observe *the code of conduct* required by the academic institution, and regularly attend lectures and practical work sessions.

1.8. Assessment of Learning Outcomes

Course attendance	1,5	Class participation		Seminar paper	1	Experiment	
Written exam		Oral exam	0,5	Essay		Research	1
Project		Continuous Assessment	1	Presentation		Practical work	
Portfolio							

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

Through Partial Exams, Seminar Paper and written Practical Work Report Student achieves up to 70% (Learning Outcomes from 1 to 5), while with the written Final Exam (Learning Outcomes from 1 to 5) up to 30% of total Score.
Examples of Assessment of Learning Outcomes:

1. Marine Power Plants Comparison with the Objective of Total Efficiency Coefficient Determination (Learning Outcomes 1, 3, 5)
2. Specify several Methods of Marine Power Processes Efficiency Coefficient Increase and several Methods used to determine the Efficiency and explain their advantages and disadvantages (Learning Outcomes 2,3, 5)
3. Demonstrate familiarization with tri-generation Processes using a Model (Learning Outcomes 1, 4, 5)

1.10. Main Reading

1. Prelec, Z. Energetika u procesnoj industriji, Školska knjiga, Zagreb, 1994.
2. Lior, N., Measurement and control in water desalination, Elsevier, Amsterdam, 1986.
3. Martinović, D., Brodski rashladni uređaji, Školska knjiga, Zagreb, 1994.

1.11. Recommended Reading

1. Lecturer's notes published on official webpage
2. Požar, H., Osnove energetike – prvi I drugi svezak, Šk. Knjiga, Zagreb, 1978.
3. Đorđević, B., Valent, V., Šerbanović, S., Termodinamika i termotehnika, IRO Građevinska knjiga, Beograd, 1987.
4. www.cogeneurope.eu

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
	web	

1.13. Quality Assurance

Internal:

- Student feedback (SET - Student evaluation of teaching) at the end of academic year.
- Course review by the head of course at the end of academic year.

External:
Programme quality review carried by the QA Agency.

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3.2. Course description

Generic information		
Head of Course	Izv.prof.dr.sc. Dean Bernečić	
Course	Marine transmission system	
Study Programme	Marine Engineering and Maritime Transport Technology	
Level	Graduate degree programme	
Type of Course	mandatory	
Year of Study	1.	
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload	5
	Number of Hours (L+E+S)	2+1+0

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

Introduce students to modern marine power transmissions, clutches, gears, transmissions with multiple propulsion system and power transmissions by fluids.

1.2. Prerequisites for Course Registration

No conditions

1.3. Expected Learning Outcomes

1. Explain the types and application of mechanical power transmissions.
2. Explain the ship's propulsion clutches.
3. Evaluate the durability of the belt, chain and friction transmission.
4. Valorize the types, loads and application of gears.
5. Explain types of gearbox with multiple drive, planetary gears and combined multi-drive gears.
6. Identify fluid power transmission systems and implement the acquired knowledge in complex hydraulic and pneumatic systems.

1.4. Course Outline

Types and applications of mechanical power transmissions on marine propulsion.
Ship propulsion system clutches.
Belt, chain and friction power transmission.
Types, geometry, load and application of gears.
Marine geared systems and power train in gearbox

1.5. Modes of Instruction	X Lectures X Seminars and workshops X Exercises X E-learning ☐ Field work	X Practical work ☐ Multimedia and Network ☐ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		

1.7. Student Obligations

Regular class attendance and solving project tasks related to default project.

1.8. Assessment[1] of Learning Outcomes

Course attendanc	1.5	Class participation	0,5	Seminar paper	1	Experiment	
Written exam	1	Oral exam		Essay		Research	
Project		Continuous Assessment	1	Presentation		Practical work	
Portfolio							

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

70% in class, 30% in final exam; according to "Pravilnik o studijima Sveučilišta u Rijeci" and "Pravilnik o studiranju na Pomorskom fakultetu u Rijeci" (the regulations on Studies of the University of Rijeka and the regulations on studies at the Faculty of Maritime Studies in Rijeka).
Of the possible 70% during the semester, 50% is spent on default program, 20% on the completed exercises.
The condition for taking the final exam is, according to the regulations is 35%.
Examples of evaluation and final exam:
1. 20% is accounted for by correctly done exercises. (learning outcomes 1,2,3,4,5)
2. 50% is on the program task (learning outcomes 1,2,3,4,5) with mandatory program development in CAD.
3. The final exam includes a test from the outcomes 1,2,3,4,5,6 in oral form
Examples of evaluation by individual outcome in exercises and final exam:
1. On the basis of the displayed parameters, calculate and determine all the necessary elements of the gearbox shown on picture. learning outcomes 1,2,3,4,5.
2. Final exam: Explain gearbox power distribution with two inputs and one output. Learning outcomes 1,2,3,4,5.

1.10. Main Reading

1. Karl-Heinz Deecker, Elementi strojeva, Tehnička knjiga, Zagreb 2006.
2. Koljesnikov O., Bukša A., Zupčani prijenosi brodskog porivnog sustava, Pomorstvo, god. 23, br. 2 (2009), str. 515 – 525.
3. Bukša A.,- Kralj P., Martinović D., Istraživanje raspodjele opterećenja kod planetarnih prijenosa s elastičnim osovinama u brodskim reduktorima, Brodogradnja, god. 4, br. 1, Zagreb, 2001.
4. Bukša A. - Kralj P., Zupčani prijenosi u brodskim reduktorima porivnog sustava, "Naše more" (1998)1-2, str. 33-38.
5. Bukša A.: Izjednačenje opterećenja kod zupčanih prijenosa s višestrukim zahvatom u brodskim reduktorima i njihova konstruktivna rješenja, Zbornik radova Pomorskog fakulteta u Rijeci, God. 10, Rijeka 1996.

1.11. Recommended Reading

Bukša A., Istraživanje raspodjele opterećenja kod običnih zupčanih prijenosa s dijeljenjem ili spajanjem snage u brodskim reduktorima, "Naše more", (1997)3-4, str. 135-141.

Bukša A., - Kralj P., - Martinović D., Opterećenje vijenca centralnog zupčanika s unutrašnjim ozubljenjem kod planetarnih prijenosa u brodskim reduktorima, "Naše more", (1999) 2-3, str. 96-102.

Bukša A., - Kralj P., Opterećenje vijenca centralnog zupčanika s vanjskim ozubljenjem kod planetarnih prijenosa, Pomorstvo : scientific journal of maritime research, 13 (1999), 1-2

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
Karl-Heinz Deecker, Elementi strojeva, Tehnička knjiga, Zagreb 2006	10	20
Course syllabus is available on the e-learning system - Merlin in electronic format.		30

1.13. Quality Assurance

The quality of study 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 in Rijeka. Once a year, the results of the transience are analyzed and appropriate measures are adopted.

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3.2. Course description

Generic information		
Head of Course	**Radoslav Radonja, Ph. D., associate professor**	
Course	**Ecology in Maritime Transport**	
Study Programme	Marine Engineering and Maritime Transport Technology	
Level	Graduate	
Type of Course	Obligatory	
Year of Study	**1**	
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload	**5**
	Number of Hours (L+E+S)	**2 + 1 + 0**

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

The main goal of the course is to acquire knowledge about the principles and laws of environmental protection, and to understand the theoretical, technical and legislative considerations of pollution.

1.2. Prerequisites for Course Registration

-

1.3. Expected Learning Outcomes

After passing the exam, it is expected that students will be able to do the following:
1. Critically assess the diversity of coastal sea and open ocean ecosystems.
2. Identify sources of marine pollution (including noise pollution)
3. Argue the impact of the ship as a source of pollution and analyse the environmental impacts of different types of ships
4. Evaluate the causes of acidification and eutrophication of the sea
5. Assess the impact of climate change on maritime business
6. Review requirements and development of legislation and analyse their impact on maritime business
7. Suggest the sustainable development of maritime affairs from the ecological, bioethical and technological aspect
8. Select marine pollution prevention measures, pollution contingency plans and cooperation in the framework of integrated coastal zone management
9. Argue the impacts of seabed mining on its ecosystem
10. Assess the environmental impacts of autonomous vessels.

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1.4. Course Outline

Basic concepts of sustainable development and sustainable maritime affairs. Differences in coastal sea and open ocean ecosystems. Ship as a source of environmental pollution. Acidification and eutrophication of the sea. Climate change and maritime business. Environmental legislative requirements in maritime affairs and their development. Sustainable development of maritime affairs from the ecological, bioethical and technological aspect. Integrated coastal zone management and marine pollution contingency plans. Seabed mining and its impact on its ecosystems. Ecological aspects of autonomous vessels.

1.5. Modes of Instruction	☒ **Lectures** ☐ Seminars and workshops ☒ **Exercises** ☐ E-learning ☐ Field work	☐ Practical work ☐ Multimedia and Network ☐ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		

1.7. Student Obligations

Active attendance at classes and exercises (at least 70%). Preparation of a seminar paper on an agreed topic and final oral exam.

1.8. Assessment[1] of Learning Outcomes

Course attendance	1,5	Class participation	0,5	Seminar paper	1,0	Experiment	
Written exam		Oral exam	2,0	Essay		Research	
Project		Continuous Assessment		Presentation		Practical work	
Portfolio							

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The procedure for evaluating the acquired learning outcomes takes place in accordance with University's and Faculty's normative acts as follows:
• preparation of a seminar paper on an agreed topic (70%)
• At the final part of the exam, 30% of the acquired learning outcomes are evaluated (1-10), whereby the student must realize a minimum of 50% of points in order to pass the final exam.

Examples of evaluating learning outcomes in relation to set learning outcomes are:

1. Explain the differences in the ecosystems of the coastal area and the open oceans ??
2. List and explain possible sources of marine pollution with special reference to noise pollution (what can be the reasons for their occurrence and impact)? What impact on the marine environment comes from submarine seismic survey vessels? ...
3. List and explain possible adverse environmental impacts coming from crude oil tankers / cruise ships / etc.? ...
4. Explain the possible sources of sea acidification? Explain the origin and reasons for the appearance of 'sea blooms'? ...
5. How can the 'opening of the northern route' affect maritime business and what impact can it have on the ecosystems there? ...
6. Compare the development of environmental legislation at the global level and the legislation of the European Union? How is this reflected at national levels? Can the state pass 'mild' or 'stringent' regulations? ...
7. Explain the impact of environmental technology development and maritime applications (SCR, EGR, scrubbers, …)? ...
8. Explain interstate cooperation in the framework of action in cases of incidental marine pollution? ...
9. Analyze the causes and impacts of seabed mining? What are your personal views in the context of the possible development of seabed mining legislation?
10. State your personal thinking in the context of the development of autonomous vessels and explain their impact on the environment that you expect?

1.10. Main Reading

1. IMO, MARPOL 73/78., Consolidated Edition, London 2013.

1.11. Recommended Reading

2. Teacher lectures - available in electronic form
3. Botkin, D., Keller, E., Environmental science, J. Wiley & sons, Inc., New York, 1995.
4. Sarić, I., Radonja, R., Noise as a source of marine pollution, Pomorstvo – Scientific Journal of Maritime Research, Vol. 28 (2014), pgs. 31-39
5. Radonja, R., Koljatić, V., The marine ecosystem as a functional whole, Pomorstvo – Scientific Journal of Maritime Research, Vol. 24/1 (2010), pgs. 3-18.
6. Radonja, R., Jugović, A., Ship owners' business policy in the context of development in the environmental legislation , Pomorstvo – Scientific Journal of Maritime Research, Vol. 25/2 (2011), pgs. 319-341

1.12. Number of Main Reading Examples

Title	*Number of examples*	*Number of students*
Teacher lectures - available in electronic form	-	30
IMO, MARPOL 73/78., Consolidated Edition, London 2013.	1	30

1.13. Quality Assurance

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Course quality review carried in accordance with ISO 9001 system and European standards and guidance for quality assurance carried through on Maritime faculty. Student Success is evaluated, and corrective measure implemented yearly.

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

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3.2. Course description

Generic information			
Head of Course	Full. prof. Ivica Šegulja		
Course	Maintenance systems		
Study Programme	Marine Engineering and maritime transport technologies		
Level	*Graduate degree programme*		
Type of Course	Mandatory		
Year of Study	I		
Estimated Student Workload and Methods of Instruction	ECTS coefficient of Student Workload		5
	Number of Hours (L+E+S)		15+0+15 (1+0+1)

1. GENERAL COURSE DESCRIPTION

1.1. Course Objectives

Introducing students to the basic laws of failure, and transfer this knowledge to ship systems and the ship as a whole. Introduction to advanced diagnostic techniques and determination of maintenance strategy for set goals and possibilities.

1.2. Prerequisites for Course Registration

.

1.3. Expected Learning Outcomes

Students will be able to:
1. Recognize the basic concepts of maintenance strategies, and the impact of technical equipment, working conditions and types of application on maintenance strategies.
2. Express and correctly interpret the basic advantages and disadvantages of each maintenance strategy.
3. Master the application of the RCM method in order to define a maintenance strategy with set limits

1.4. Course Outline

Maintenance costs. Damage and malfunctions. Reliability of technical systems. Technology and maintenance organization. Maintenance strategies. SPM (Shock pulse method). RCM (Reliability Centered Maintenance). FMEA (Failure Modes and Effects Analysis). KPI in maintenance. Maintenance support information systems.

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1.5. Modes of Instruction	X Lectures X Seminars and workshops ☐ Exercises ☐ E-learning ☐ Field work	X Practical work ☐ Multimedia and Network ☐ Laboratory ☐ Mentorship ☐ Other _____
1.6. Comments		

1.7. Student Obligations

Regular class attendance and preparation of seminars.

1.8. Assessment[1] of Learning Outcomes

Course attendance	1	Class participation		Seminar paper	2	Experiment	
Written exam	1	Oral exam		Essay		Research	
Project		Continuous Assessment	1	Presentation		Practical work	
Portfolio		Final exam					

[1] **NOTE:** Name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course. Use empty fields for additional activities.

1.9. Assessment of Learning Outcomes and Examples of Evaluation during Classes and on the Final Exam

The procedure for evaluating the acquired learning outcomes takes place according to the Ordinance on Studies of the University of Rijeka and the Ordinance on Studying at the Faculty of Maritime Studies in Rijeka as follows:
• 30% of acquired learning outcomes are evaluated through continuous testing of knowledge during classes
o seminar paper - learning outcomes 1-3 (70%),
• 30% of the acquired learning outcomes are evaluated at the final exam, and the student must realize a minimum of 50% of points to pass the final exam.
Examples of evaluating learning outcomes in relation to set learning outcomes are:
1. Define a variant of the maintenance strategy for the defined goals and technical equipment.
2. Evaluate the advantages of the disadvantages of the chosen maintenance strategy.
3. Define the basic steps of applying the RCM method for a given example.

1.10. Main Reading

Šegulja, Bukša, Tomas: Održavanje brodskih sustava, Pomorski fakultet u Rijeci, 2007.

1.11. Recommended Reading

1. I.Berezovski: Reliability Theory and Practise
2. A.Kelly: Maintenance Planning nad Control
3. B.Vučinić: Maintenance Concept Adjustement of Design.

1.12. Number of Main Reading Examples

Title	*Number of*	*Number of*
Šegulja, Bukša, Tomas: Održavanje brodskih sustava, Pomorski fakultet u Rijeci, 2007	20	20

1.13. Quality Assurance

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The quality of study 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 in Rijeka. Once a year, the results of the transience are analyzed and appropriate measures are adopted.