University of Rijeka
Faculty of Engineering

CURRICULUM
UNDERGRADUATE UNIVERSITY STUDY OF NAVAL ARCHITECTURE

Rijeka, April 2021

1. CURRICULUM DESCRIPTION

1.1. The list of compulsory and elective courses with the number of active classes required for their performance and ECTS credits

1. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Mathematics I	3	3			6	7
	Statics	3	2			5	6
	Materials I	2	2			4	4
	Electrical Engineering	2	1			3	5
	Computer Applications in Engineering	1		2		3	4
	Engineering Graphics	2			2	4	4
	TOTAL					**25**	**30**

L - lectures, aT – auditory tutorials, IT – laboratory tutorials, dT – design tutorials,

2. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Mathematics II	3	3			6	7
	Kinematics	3	2			5	6
	Strength of Materials	3	2	1		6	7
	Materials II	2	1			3	5
	Engineering Design	2			3	5	5
	TOTAL					**25**	**30**

3. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Dynamics	2	2			4	5
	Fluid Mechanics	3	2			5	5
	Thermodynamics NA	3	2			5	7
	Introduction to Marine Vessels	2	2			4	5
	Basis of Machine Elements Design	3			2	5	5
	English Language I	1	1			2	3
	TOTAL					**25**	**30**

4. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Engineering Statistics	3		1		4	5
	Ship Hull Forms	2	1		2	5	6
	Basics of Ship Production	2			1	3	5
	Ship Structure Elements	3			1	4	6
	English Language II	1	1			2	3
	Professional Practice I						5
	TOTAL					**18**	**30**

5. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Seaworthiness and Stability of the Ship	3	2		1	6	7
	Ship Equipment	3		1		4	6
	Ship Construction	1			3	4	6
	Shipbuilding Technology	2		1	1	4	6
	Elective Project [1]				3	3	5
	TOTAL					**21**	**30**

[1] election from list of offered projects: Basics of Ship Production, Introduction to Marine Vessels, Seaworthiness and Stability of the Ship, Shipbuilding Technology, Ship Construction, Ship Equipment, Ship Hull Forms, Ship Structure Elements.

6. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Organization of Business Systems	2	1			3	4
	Marine Hydrodynamics I	3	2	1		6	8
	Free Elective Subject I[2]						4
	Free Elective Subject II[2]						4
	Final Work						10
	TOTAL					**17**	**30**

[2] Enroll one subject, a total of two subjects

Free Elective Subjects I i II							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Small Craft Building and Maintenance UN	2	1			3	4
	Computational Modelling in Shipbuilding	1	2		1	4	4
	Basic Ship Dynamics	2	1			3	4
	Marine Auxiliary Machinery	2	1	1		4	4
	Environment Protection	3				3	4
	Quality Assurance	2	1			3	4
	Computer Simulations in Engineering	1			2	3	4
	Introduction into Finite Element Method	1		2		3	4
	Energy Sources	3				3	4
	Processes of Heat Treatment	2		1		3	4
	Automation	2	1			3	4
	Introduction to Guidance and Control of Marine Vehicles	2		1		3	4

UNDERGRADUATE UNIVERSITY STUDY OF NAVAL ARCHITECTURE TOTAL	Hours 131	ECTS 180

Basic description		
Course title	**Automation**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Understanding the basic principles of automation and its impact on economic and social development.							
1.2. Course enrolment requirements							
Mathematics I and Mathematics II.							
1.3. Expected course learning outcomes							
Describe the historical development of automation, define the reasons for the introduction of automation and describe the advantages and disadvantages of automation. Define the level of automation and explain the means of automation of manufacturing and service activities. Describe the methods and strategies of automation. Define a methodology for analysis and synthesis of flexible and intelligence systems. Describe the self-organizing system, explain the structure, function, advantages and disadvantages, and describe the evolution of automated devices, machines and systems. Describe case studies of automated devices, machines and systems and define scenarios and strategies of leadership. Describe the current status and development trends of automation and describe barriers to development and forecasting.							
1.4. Course content							
Historical review of the automatic circuits, devices and machines. Ancient and medieval automata. Five levels of automation: assembly, device, machine, system and plant. Automation of manufacturing and service activities. Modern means of automation of production: digital computers, manipulators, robots. Automation strategy. Leading ideas and methodology of synthesis of flexible and intelligent systems. Artificial Intelligence. Self-organizing and autonomous systems. Economic and social aspects of automation of human activities. Selected examples of modern automated machines and systems. Current scientific research projects. Present status and development trends of automation.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attendance, activities in the classroom, homework and self-study.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	1	Oral exam	0.5	Essay		Research	
Project	1	Sustained knowledge check		Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, activities in the classroom, homework, two control written exam and final oral and written exam.

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

Nikolić, G.: Pneumatics And Hydraulics: Part 1, Pneumatics, Školske novine, Zagreb, 2010. (in Croatian)
Croser, P., Ebel, F.: Pneumatics, Festo Didactic GmbH & Co. 2002.
B. Katalinic, Industrieroboter und Flexible Systeme für Drehteile, VDI Verlag, Düsseldorf, 1990.
B. Katalinic, Intelligent Manufacturing Systems, skripta, Technische Universität Wien.

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

Katalinic, B., Bionic Assembly Systems: Selforganizing Complex Flexible Assembly System, Acta Mechanica Slovaca, Vol. 6, No. 2/2002, pp. 15-20, ISSN: 1335-2393.

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

Title	*Number of copies*	*Number of students*
Nikolić, G.: Pneumatics And Hydraulics: Part 1, Pneumatics, Školske novine, Zagreb, 2010. (in Croatian)	1	
Croser, P., Ebel, F.: Pneumatics, Festo Didactic GmbH & Co. 2002.	1	
B. Katalinic, Industrieroboter und Flexible Systeme für Drehteile, VDI Verlag, Düsseldorf, 1990.	0	
B. Katalinic, Intelligent Manufacturing Systems, skripta, Technische Universität Wien	0	

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

Through a structured quality assurance system of the Faculty.

Basic description		
Course title	**Basic Ship Dynamics**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Introduction to basic methods of dynamic analysis of the ship. Understanding stochastic processes and their application in the ship dynamics. Developing the ability to work in small groups (teamwork).							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Specify the methods of dynamic analysis of the ship. Properly explain, and interpret the basic parameters of the waves as a random process and make a simple statistical analysis of random processes. Explain the energy spectrum and the autocorrelation function and describe the application of Fourier series in the analysis of stochastic dynamic response. Define and solve linear oscillating model of rigid floating bodies motion with one degree of freedom on the sea waves. Itemize and explain the consequences of excessive motion of the ship. Define the types and causes of ship vibrations.							
1.4. Course content							
Introduction to dynamic analysis of ship structures. Single and multi-degree of freedom models. Free oscillations. Forced steady state response. Fourier series: application to frequency response. Introduction to random processes and application in linear systems. Rigid floating body motion in one degree of freedom. Sea wave excitation. Hydrodynamic added mass and damping.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, activity, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	0.5	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio		Homework					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, seminar paper, activity, continuous knowledge testing (three mid-term exams), written and oral exam.

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

Prpić-Oršić J.: Basic ship Dynamics, Faculty of Engineering University of Rijeka, Fintrade &Tours, 2009. (in Croatian)
Vorus W.: Vibration, The Principle of Naval Architecture Series: Vibration, SNAME, 2010.

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

Prpić-Oršić J., Čorić V.: Seakeeping, Zigo, University of Rijeka, 2006. (in Croatian)
Senjanović, I.: Ship vibrations I, University of Zagreb, 1974. (in Croatian)

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

Title	*Number of copies*	*Number of students*
Prpić-Oršić J.: Basic ship dynamics, Faculty of Engineering University of Rijeka, Fintrade &Tours, 2009. (in Croatian)	10	8

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Basics of Machine Elements Design**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	45+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Developing capability to calculate, design and apply basic machine elements by means of traditional and computer aided techniques.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Explain Hooke's Law and Hooke's diagram. Explain material fatigue and Woehler's diagram. Apply Smith's diagram. Apply fits and tolerances. Design a welded pressure vessel. Calculate a helical torsion spring. Calculate the tightening torque for fixing bolts. Analyze and design a prestressed bolt joint. Design shafts and axles. Verify the stability of long shafts. Compare interference fits.							
1.4. Course content							
Fits, tolerances and surface roughness. Loading capacity of machine elements (Hook's diagram). Allowable stresses (Material fatigue, Woehler's and Smith's diagrams). Welded joints. Riveted joints. Bolted joints. Key joints. Pins connection. Springs. Shafts and axles. Bearings. Gear transmissions. Coursework: Calculation and design of a pressure vessel accompanied by appropriate sketches and drawings. Calculation and design of a prestressed bolt joint accompanied by appropriate sketches and drawings.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity during class, program task, individual study.							
1.8. Evaluation of student's work							
Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	0.5	Report		Practice	
Portfolio		Homeworks		Program	1.5		
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

Course attendance. Activity during class. Mid-term oral and written examinations. Program task. Oral and written final examination.

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

Križan, B.: Fundamentals of Calculation and Design of Machine Elements, Školska knjiga, Zagreb, 2008. (In Croatian)
Decker, K.H., Elements of Machines, Golden marketing-Tehnička knjiga, Zagreb, 2006. (In Croatian)
Kraut's Mechanical Manual, Axion, Zagreb, 1997. (In Croatian)

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

Engineer's handbook IP1, Školska knjiga, Zagreb, 1996. (In Croatian)
Obsieger, B., Rolling Bearings, Faculty of Engineering, Rijeka, 2012. (In Croatian),
Obsieger, B., Gear Transmissions, Faculty of Engineering, Rijeka, 2012. (In Croatian)

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

Title	*Number of copies*	*Number of students*
Križan, B.: Fundamentals of Calculation and Design of Machine Elements, Školska knjiga, Zagreb, 2008. (In Croatian)	4 (edition 2008.) i 8 (edition 1998.)	18
Decker, K.H., Elements of Machines, Golden marketing-Tehnička knjiga, Zagreb, 2006. (In Croatian)	6 (edition 2006.), 2 (edition 1987.) i 2 (edition 1980.).	18
Kraut's Mechanical Manual, Axion, Zagreb, 1997. (In Croatian)	9	18

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Basics of Ship Production**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Within this course students gain knowledge about the ship production in accordance with defined learning outcomes.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Distinguish materials ship production and other marine objects. Describe technology for protecting ship hull elements. Interpret reproduction of ship hull structure dimensions and shapes. Analyze and explain the configuration of the production lines. Define material flow of ship structure elements, subassemblies, assemblies and blocks. Describe the equipment and machines for prefabrication and fabrication of plates and profiles. Describe the production of ship outfitting components, blocks and modules. Analyze the ship hull preassembly and outfitting process. Interpret ship hull and equipment production breakdown. Describe and classify horizontal and vertical transportation.							
1.4. Course content							
Materials for construction of ships and marine objects. Corrosion Technology. Reproduction of dimensions and shapes of ship structure. Production lines. Material flow of plates, profiles, ship structure elements, subassemblies, assemblies and blocks. Prefabrication of plates and profiles, fabrication of ship structure elements, assembling ship's sections and blocks. Tools and machines for prefabrication and fabrication of plates and profiles. Ship equipment fabrication. Pre-assembly of the ship hull and its equipment. Ship hull and equipment breakdown. Ship sub assemblies, assemblies and sections outfitting. Painting. Horizontal and vertical transportation. Basics of welding in shipbuilding. Ship structure and technology data modelling in specialised shipbuilding softwer.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☒ fieldwork		☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, student projects, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	1	Oral exam	0.5	Essay		Research	
Project	1	Sustained knowledge check	1	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, sustained knowledge check (two mid-term exams), written and oral exam or their combination.

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

Class teacher learning material: „ Basics of Ship Production " (in Croatian)
Furlan, Z., Lučin, N., Pavelić, A.: Shipbuilding Technology, Školska knjiga, Zagreb, 1986**.** (in Croatian)

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

D.J.Eyres: Ship Construction, 2012.
Klaas van Dokkum : Ship Knowledge: Ship Design, Construction, DOKMAR, Netherland, 2011.

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

Title	*Number of copies*	*Number of students*
Class teacher learning material: „ Basics of Ship Production " (in Croatian), pdf		
Furlan, Z., Lučin, N., Pavelić, A.: Shipbuilding Technology, Školska knjiga, Zagreb, 1986. (in Croatian)	10	10

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Computational Modelling in Shipbuilding**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	15+45+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Within the course, students will be introduced to advanced shipbuilding CAE / CIM systems and tools in the design and analysis of shipbuilding products and processes.		
1.2. Course enrolment requirements		
Basics of Ship Production, Ship Structure Elements		
1.3. Expected course learning outcomes		
Get introduced to the specifics of modern shipbuilding CAE / CIM systems. Distinguish integration tools for connecting shipbuilding products and processes. Interpret the interaction of complex CAE / CIM tools with other special tools. Present and correctly interpret the basic properties of the modern shipbuilding integrated software package 3D EXPERIENCE within the concept of digital shipyard, for product design and design and management of production processes. Define and create a computer model of ship construction and related technological information. Correctly interpret and apply the relevant input documentation, as well as the rules and regulations of classification societies in the process of preparing shipbuilding classification documentation, as well as shipyard standards for creating a detailed computer model with associated technical and technological documentation.		
1.4. Course content		
Introduction to the specifics of modern shipbuilding CAE/CIM systems. 3D product database model. Integration tools for connecting shipbuilding products and processes. Data transfer for production documentation. Interaction of complex CAE/CIM tools with other special tools. Data transfer between integral and specific software packages. Demonstration of a modern PLM special tool for product design and design and management of production processes; 3D EXPERIENCE. Based on the relevant input documentation and information, develop computer models of ship structure and related technological information and produce relevant documentation. Review of the process for defining the shipbuilding classification and technological documentation for design, construction and outfitting of shipbuilding products in accordance with shipbuilding standards.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		
Course attendance, activity, student project, studying.		

1.8. Evaluation of student's work

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

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, student project, oral exam.

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

Teaching material of class „Computational Modelling in Shipbuilding"
User documentation and manual of 3D EXPERIENCE software
Classifications rules and regulations; IACS-CSR, LR, DNV-GL, ABS, BV, HRB.
ISSC Specialist Committee Reports V.3. Materials and Fabrications Technology

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

Fei Tao , Meng Zhang et al, Digital Twin Driven Smart Manufacturing, 2019
Book of proceedings of International Conference on Computer and IT Applications in the Maritime Industries, Pontignano, 17-19 August 2020, Hamburg, Technische Universität Hamburg-Harburg, 2020, ISBN 978-3-89220-717-7
Lamb, T., et al., Ship Design & Construction, Vol. I, II, SNAME, 2003.

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

Title	*Number of copies*	*Number of students*
User documentation and manual of 3D EXPERIENCE software	20	20
Classifications rules and regulations; IACS-CSR, LR, DNV-GL, ABS, BV, HRB.	20	20
ISSC Specialist Committee Reports V.3. Materials and Fabrications Technology	2	20
Teaching material of class „Computational Modelling in Shipbuilding", pdf,video		

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Computer Applications in Engineering**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student's workload coefficient	4
	Number of hours (L+E+S)	15+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Acquiring knowledge and skills necessary for active participation in an computer aided engineering environment. This primarily refers to acquiring basic knowledge of computer technology and the use of office software, as well as acquiring knowledge of the basics of programming in high-level programming languages.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Adopt the basic concepts of computer technology. Use standard table calculators. Use high-level programming languages for general engineering purposes.

1.4. Course content

Basic concepts of computer technology (types of computers, computer hardware, operating systems, Internet, computer security). Tabular calculations. Programming in high-level programming language for engineering needs.

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

1.7. Student's obligations

Attendance, class participation, studying.

1.8. Evaluation of student's work

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

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Continuous knowledge testing, written exam.

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

Johnson, S.: Microsoft Office 2007 - Na dlanu, Miš, Zagreb, 2007.
Računarsko inženjerstvo uz programski jezik Python (textbook), Faculty of Engineering, 2018. (e-book)

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

Oliphant, T. E.: Guide to NumPy: 2nd Edition, CreateSpace Independent Publishing Platform, 2015.
McGreggor, D. M.: Mastering matplotlib, Packt Publishing, 2015.

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

Title	*Number of copies*	*Number of students*
Johnson, S.: Microsoft Office 2007 - On the palm of your hand, Miš, Zagreb, 2007. (in Croatian)	1	200
Računarsko inženjerstvo uz programski jezik Python (textbook), Faculty of Engineering, 2018. (e-book)	e-book	200

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Computer Simulations in Engineering**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student's workload coefficient	4
	Number of hours (L+E+S)	15+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
General knowledge of computer simulation techniques for technical purposes. Understanding the basis of mathematical modeling. General understanding of basic numerical procedures. Understanding the problem of calibrating the numerical model and the capabilities and limitations of computer simulations. Understanding the differences between numerical and physical models. Adopting simulation results interpretation skills.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Properly interpret the methodology of mathematical modeling. Classify computer models typical of technical systems. Identify the basic types of numerical grids. Explain the entire process of applying computer simulations to solving engineering problems. Apply computer modeling technology in an available software to simpler technical problems.							
1.4. Course content							
Overview of computer modeling methodology. The procedure of mathematical modeling and numerical methods of solving the model. An overview of the entire process of preparation and implementation of computer simulations and interpretation of results, in specific examples of engineering practice. Getting acquainted with standard engineering software for computer modeling. Conducting simulations in the provided software for specific tasks.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments	-						
1.7. Student's obligations							
Attendance, class participation, individual assignment.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	2	Experimental work	
Written exam		Oral exam		Essay		Research	
Project	0.5	Sustained knowledge		Report		Practice	

		check					
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, continuous knowledge testing, seminar paper.

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

User Manuals and Tutorials for engineering software used in the course.

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

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

Title	*Number of copies*	*Number of students*
User Manuals and Tutorials for engineering software used in the course	online copies	50

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Dynamics**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION		
1.1. Course objectives		
Obtaining theoretical knowledge and develop skills for determination of dynamics characteristics of motion of particles, systems of particles and rigid body. Capability of qualitative and quantitative analysis of basic characteristics of dynamical systems.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Define and explain Newton's laws and the concept of inertial forces. Define the concept of momentum, angular momentum as well as kinetic energy of a particle and work done by a force and calculate simple examples. Calculate the tasks based on the principles of the change of linear momentum, angular momentum and the principle of kinetic energy of a system of particles. Define the generalized coordinates, and determine the equation of motion using Lagrange's equations of motion of second kind. Analyze the dynamics of systems with variable mass. Define the mass moment of inertia of a rigid body. Classify and compare the methods of experimental testing of the mass moment of inertia of a rigid body. Set up the loads and calculate the dynamic reactions for the rotation of a rigid body around the fixed axis. Calculate and analyze the equation of particles motion and/or rigid bodies in collision. Calculate the center of impact.		
1.4. Course content		
Dynamics of particle. Newton's laws. Inertial and non-inertial coordinate systems. D'Alembert's principle. Momentum and angular momentum. Mechanical work. Kinetic and potential energy. Power. Dynamics of a system of particles. Inertial forces. D'Alembert's principle. Momentum and angular momentum. Motion of the centre of mass. Momentum conservation. Kinetic energy. Mechanical work. Conservation of energy. Virtual work. Lagrange-d'Alembert's principle. Generalized coordinates and Lagrange's equations of motion of second kind. Rigid body dynamics. Mass moments of inertia. Equations of motion of rigid body. Planar motion of rigid body. Calculation of joint reactions and balancing moments for planar mechanisms. Kinetic energy. Energy conservation. Power. Impulse and momentum. Spatial motion of rigid body. Dynamic reactions for the rotation of a rigid body around the fixed axis. Rotation about fixed point of rigid body. Gyroscopic effect. Introduction in the theory of collision.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		

1.7. Student's obligations

Course attendance, activity, homework, studying.

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, 3 constructional exercises, continuous knowledge testing (three mid-term exams), written and oral exam.

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

Krpan, M., Butković, M., Žigulić, R., Braut, S., Franulović, A., Dynamics – Theory and applicacctions, Faculty of Engineering – University of Rijeka, 2001. (in Croatian)
Jecić, S.: Mechanics (Kinematics and Dynamics), Tehnička knjiga, Zagreb, 1989. (in Croatian)

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

Beer , F., Johnston, E.R., Cornwell, P.: Vector Mechanics for Engineers: Dynamics, Mc.Graw Hill Education, New York, 2012.
Pustaić, D., Wolf, H., Tonković, Z.: Introduction in analytical mechanics with basics of theory of vibrations, Golden marketing / Tehnička knjiga, Zagreb, 2005. (in Croatian)

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

Title	*Number of copies*	*Number of students*
Žigulić, R., Braut, S.: Dynamics – Theory and applications, Faculty of Engineering – University of Rijeka, 2012. (in Croatian)	16	99
Jecić, S.: Mechanics (Kinematics and Dynamics), Tehnička knjiga, Zagreb, 1989. (in Croatian)	3	99

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Elective Project**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	0+45+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Application of acquired knowledge and skills to solve practical problems in the field of associated course from which the project is elected.							
1.2. Course enrolment requirements							
Enrolled course from which the project is elected.							
1.3. Expected course learning outcomes							
Apply the knowledge and skills from professional content of the associated course. Solve practical task. Acquire competence for individually solving specific professional tasks.							
1.4. Course content							
Chosen chapter of associated course from which the project was elected.							
1.5. Teaching methods	☐ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attending the consultation, individually solving task and writing the project report.							
1.8. Evaluation of student's work							
Course attendance		Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project	2	Sustained knowledge check		Report		Practice	
Portfolio		Individual task solving	3				
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							
Assesses and evaluates the accuracy and completeness of the project task solution and its presentation.							
1.10. Assigned reading (at the time of the submission of study programme proposal)							

References listed for the associated course from which the project is elected.

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

References listed for the associated course from which the project is elected.

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

Title	*Number of copies*	*Number of students*

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Electrical Engineering**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Mastering basic concepts, postulates and methods of electrostatics, magnetostatics and electrical circuits. Describing behavior of electromagnetic circuits' main components and analysis of electrical circuits.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Describe and apply basic laws of electrostatics. Define and use basic electric quantities. Apply fundamental laws and methods of DC circuits. Describe and apply basic laws of magnetostatics. Analyse AC circuits. Organize and conduct electric measurements.							
1.4. Course content							
Electrostatics - basic concepts and laws. Basic concepts and laws of DC circuits. DC circuit analysis - methods and theorems. Magnetostatics - basic concepts and laws. Magnetic materials and circuits. Basic concepts and laws of AC circuits. Three-phase electric system – rotating magnetic field.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, homeworks, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							
Course attendance, continuous knowledge testing (homeworks, mid-term exams), written and oral exam.							

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

Pinter, V.: Fundamentals of electrical engineering – part I, Tehnička knjiga, Zagreb, 1994. (in Croatian)
Pinter, V.: Fundamentals of electrical engineering – part II, Tehnička knjiga, Zagreb, 1994. (in Croatian)
Đurović, G.: Electrical engineerging I, Školska knjiga, Zagreb, 2004. (in Croatian)
Đurović, G.: Electrical engineerging II, Školska knjiga, Zagreb, 2004. (in Croatian)

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

Šehović, E., Tkalić, M., Felja, I.: Fundamentals of electrical engineering - collection of examples (part 1), Tehnička knjiga, Zagreb, 1987. (in Croatian)
Felja, I., Koračin, D.: A collection of assignments and solved examples from fundamentals of electrical engineering, part 1. and 2., Školska knjiga, Zagreb, 1991. (in Croatian)

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

Title	*Number of copies*	*Number of students*
Pinter, V.: Fundamentals of electrical engineering - part I, Tehnička knjiga, Zagreb, 1994. (in Croatian)	14	
Pinter, V.: Fundamentals of electrical engineering – part II, Tehnička knjiga, Zagreb, 1994. (in Croatian)	10	
Đurović, G.: Electrical engineerging I, Školska knjiga, Zagreb, 2004. , (in Croatian)	11	
Đurović, G.: Electrical engineerging II, Školska knjiga, Zagreb, 2004. , (in Croatian)	10	

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

Through the Institution’s quality assurance system.

Basic description		
Course title	**Energy Sources**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	45+0+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Obtaining theoretical knowledge in the field of energy engineering. Acquiring the basic knowledge required for attending lectures in the field of thermal and energy engineering.							
1.2. Course enrolment requirements							
Basic knowledge of thermodynamics.							
1.3. Expected course learning outcomes							
Describe the energy conversion and compare conventional energy sources. Describe ways of electricity production. Describe the use of nuclear energy and interpret the operation of nuclear power station. Define and describe the types of renewable energy sources. Describe the basic characteristics of hydro power usage. Describe the basic characteristics and ways to use the solar energy. Describe the basic characteristics of wind energy. Describe the basic characteristics of geothermal energy and biomass energy. Describe and compare ways of using environmental heat by heat pumps. Describe how to obtain and utilize the hydrogen as an energy source. Define and describe the basic principles of energy planning and energy policy.							
1.4. Course content							
World energy consumption. Conventional energy sources: coal, oil, natural gas. Energy conversion. Electrical energy. Nuclear power. Renewable energy sources. Energy from water: rivers and lakes, wave power. Solar energy: solar thermal energy, photovoltaic. Wind power. Geothermal energy. Biomass. Heat of environment - heat pumps as renewable energy systems. Hydrogen and fuel cells: technology and usage. Energy planning. Energy policy.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☒ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course and fieldwork attendance, seminar work, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	0.5	Experimental work	
Written exam		Oral exam	1	Essay		Research	
Project		Sustained knowledge	1	Report		Practice	

		check					
Portfolio		Homework					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course and fieldwork attendance, continuous knowledge testing (two mid-term exams), seminar work, written and oral exam.

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

Udovičić, B.: Energy Engineering, Školska knjiga Zagreb, 1993. (in Croatian)
Knapp, V.: New Energy Sources, Školska knjiga Zagreb, 1993. (in Cropatian)
Several authors: Renewable Energy Sources, Energetika marketing, Zagreb, 2002. (in Croatian)
World Energy Council – World Energy Resources – 2016, www.worldenergy.org/wp-content/uploads/2016/10/World-Energy-Resources-Full-report-2016.10.03.pdf" i „El-Vakil, M.: Power plant technology, Mc Graw Hill Book Company, 1988.

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

Duffie, J.A., Beckmann, W.A.: Solar Engineering of Thermal Processes, John Wiley & Sons, NY, 1991.
Granić, G., ... : National Energy Programme, EIHP, Zagreb, 1998. (in Croatian)

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

Title	*Number of copies*	*Number of students*
Udovičić, B.: Energy Engineering, Školska knjiga Zagreb, 1993. (in Croatian)	1	62
Knapp, V.: New Energy Sources, Školska knjiga Zagreb, 1993. (in Cropatian)	1	62
Several authors: Renewable Energy Sources, Energetika marketing, Zagreb, 2002. (in Croatian)	0	62
World Energy Council – World Energy Resources – 2016, www.worldenergy.org/wp-content/uploads/2016/10/World-Energy-Resources-Full-report-2016.10.03.pdf" i „El-Vakil, M.: Power plant technology, Mc Graw Hill Book Company, 1988.		62

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Engineering Design**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+45+0

1. COURSE DESCRIPTION			
1.1. Course objectives			
Understanding of engineering design and familiarization with 2D and 3D geometrical modelling computer techniques.			
1.2. Course enrolment requirements			
None.			
1.3. Expected course learning outcomes			
Anticipate the process of object modelling in accordance with the design intent. Analyze 2D and 3D computer techniques for 2D and 3D object modelling. Plan and create parametric geometry models. Generate 3D object model database and technical documentation.			
1.4. Course content			
Engineering design and application of CAD techniques in 2D and 3D geometry modelling. Geometrical entities and relations, 3D primitives, transformations. Types of 3D CAD models: wireframe, surface and solid model. Parametric modelling. Application of 3D model database. Merging physical and virtual world – new technologies.			
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☒ multimedia and network ☐ laboratories ☐ mentorship ☐ other	
1.6. Comments	-		
1.7. Student's obligations			
Course attendance and activity (lectures, exercises), constructive work, continuous knowledge testing, studying.			
1.8. Evaluation of student's work			

Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	0.5	Report		Practice	
Portfolio		Constructive work	1.5	Homework			

1.9. Procedure and examples of learning outcome assessment in class and at the final exam
Constructive work, continuous knowledge testing, written exam.

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

M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2016. – Second revised edition

M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2012.

Lecture materials

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

T. Kishore: Learn Autodesk Inventor 2018 Basics, Apress, Berkeley, CA, USA, 2017
Randy H. Shih, Parametric Modeling with Autodesk Inventor 2018, SDC Publications, USA, 2017
Dennis K. Lieu, Sheryl A. Sorby: The Fundamentals of Visualization, Modeling, and Graphics for Engineering Design, Delmar cengage learning, 2009.
James Leake: Engineering Design Graphics: Sketching, modeling and visualization, New York: John Wiley&Sons, Inc., 2008.

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

Title	*Number of copies*	*Number of students*
M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2016. – Second revised edition	3	20
M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2010.	10	20
Lecture materials	web	20

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

Through the Institution´s quality assurance system.

Basic description		
Course title	**Engineering Graphics**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Acquiring knowledge required for the design and interpretation of technical documentation using traditional tools and computer techniques. Developing the ability to visualize and use graphics as a system for engineering communication in which ideas are expressed clearly and in accordance with standards.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define and explain the concept of engineering graphics. Interpret the technical drawing. Select the appropriate shape description method to display the object. Create technical documentation using traditional and CAD techniques in accordance with standards.							
1.4. Course content							
Graphic communications. Traditional and CAD techniques. The role of engineering graphics. Formation of simple geometric bodies and complex objects. Shape description: projection theory, multi-view and cross-sectional drawings, axonometric representations. Standardization and standards. Creation of technical documentation.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance and activity (lectures, exercises), constructive works, continuous knowledge testing.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	0.5	Report		Practice	
Portfolio		Constructive work	1	Homework			
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

Constructive works, continuous knowledge testing, written exam.

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

M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2016. – Second revised edition
M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2010.
G. Marunić, J. Butorac, S. Troha: Inženjerska grafika, Zbirka zadataka iz opisa oblika, Zigo Rijeka, Rijeka, 2008.
Krautov inženjerski priručnik, SAJEMA, Zagreb, 2009.
Lecture materials

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

D. K. Lieu, S. Sorby: *Visualization, Modelling, and Graphics for Engineering Design*, Delmar Cengage Learning, 2009.
G. R. Bertoline, E. N. Wiebe: *Fundamentals of Graphic Communication*, Mc Graw-Hill, New York, 2005.

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

Title	*Number of copies*	*Number of students*
M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2016. – Second revised edition	3	20
M. Kljajin, M. Opalić: Inženjerska grafika, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 2010.	10	20
G. Marunić, J. Butorac, S. Troha: Inženjerska grafika, Zbirka zadataka iz opisa oblika, Zigo Rijeka, Rijeka, 2008.	10	20
Krautov inženjerski priručnik, SAJEMA, Zagreb, 2009.	6	20
Lecture materials	web	20

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

Through the Institution´s quality assurance system.

Basic description		
Course title	**Engineering Statistics**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	45+15+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Acquiring basic knowledge and skills in probability and statistics needed for solving problems in engineering practice.		
1.2. Course enrolment requirements		
Mathematics I, Mathematics II.		
1.3. Expected course learning outcomes		
Define basic terms in descriptive statistics and perform statistical data analysis. Define and interpret correctly: random, events and probabilities of events. Express and interpret correctly the total probability rule and Bayes theorem. Apply rules for evaluating the probability of intersection and union of events, conditional distributions, total probability and Bayes theorem. Define and interpret correctly random variables, interpret correctly and calculate means and variances. Describe some basic probability distributions, interpret correctly their meaning and use them in typical experiments. Express and understand the central limit theorem. Estimate some parameters of a population or a probability distribution from samples (confidence intervals). Express and interpret correctly basic concept about statistical hypotheses tests, and particularly, explain the concept of goodness of fit test and perform it. Define and interpret correctly basic concepts of random vectors. Determine the linear regression functions for two-dimensional statistical data set and interpret the results correctly.		
1.4. Course content		
Descriptive statistics. Basics of probability theory: events, probability and probability space. Conditional probability. Random variable: probability distribution function, cumulative distribution function, numerical parameters. Standard probability distributions. Central limit theorem. Random vectors. Basics of statistical inference: Estimating parameters. Testing of hypotheses. Goodness of fit test.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		
Course attendance, activity/participation, studying		
1.8. Evaluation of student's work		

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, tests on computer, mid-term exams, tests on computer, written and oral exam

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

Črnjarić-Žic N., Material of course and solved problems in Engineering statistics, Rijeka 2010. (in Croatian)
Elezović, N., Discrete probability; Random variables; Statistics and processes, Biblioteka Bolonja, Element, Zagreb 2007 (in Croatian)

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

J.L.Devore, Probability and statistics for engineering and the sciences, Cengage Learning, 2016,
Pauše, Ž.: Introduction to mathematical statistics, Školska knjiga Zagreb, 1993 (in Croatian)

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

Title	*Number of copies*	*Number of students*
Črnjarić-Žic N., Material of course and solved problems in Engineering statistics, Rijeka 2010.	110	110
Elezović, N.: Discrete probability, Random variables, Statistics and processes, Biblioteka Bolonja, Element, Zagreb 2007.	3	110

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

Through the Institution's quality assurance system.

Basic description		
Course title	**English Language I**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	3
	Number of hours (L+E+S)	15+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Students should be able to use general purpose English as well as technical jargon at the elementary level according to the Common European Framework of Reference for Languages (up to B1 level).							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Students should be able to use general English as well as technical English at the elementary level according to the Common European Framework of Reference for Languages (up to B1 level). They should be able to compare general with technical English on the basis of selected texts and topics. Recognize and explain grammatical structures and principles typical of the professional jargon from selected texts/examples. Implement grammatical structures and aspects in written and oral exercises. Recognize terminology, key words and/or information in selected texts as well as differentiate and analyse relevant elements in them. Describe and interpret accurately simple diagrams, charts, figures and mathematical formulae. Present the advantages and disadvantages in covered units (e.g. engineering profession, information age, renewable and unrenewable energy sources, etc.). Orally define and explain professional terms covered in texts and write summaries.							
1.4. Course content							
Topics: Engineering profession. Mathematical formulae. General principles of dynamics. Energy and forms of energy. Energy efficiency. Renewable and unrenewable energy sources. Heat and temperature. States of the matter. Heat transfer and conduction. Information age. Fluids and Fluid containments. Grammatical and language structures: Tenses. Passive. Modal verbs. Articles. Nouns. Word formation.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☒ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Attendance, activity in class and autonomous learning.							
1.8. Evaluation of student's work							
Course attendance	1	Activity/Participation	0.5	Seminar paper		Experimental work	

Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, activity, continuous evaluation of knowledge (two tests), written exam.

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

Velčić Janjetić, E. & Badurina Filipin, A.: Radni materijal za engleski jezik I – Strojarstvo/Brodogradnja. 2019.

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

Ibbotson, M.: Professional English in Use. Engineering. Cambridge Universtity Press 2009.
Ibbotson, M.: Cambridge English for Engineering. Cambridge University Press 2015.
Dunn, M., Howey, D. & Ilic, A: English for Mechanical Engineering in Higher Education Studies. Garnet Publishing Ltd 2010.
Glendinning, E. H. & Glendinning, N.: Oxford English for Electrical and Mechanical Engineering. Oxford University Press 2001.
Hercezi-Skalicki, M.: Reading Technical English for Academic Purposes, Školska knjiga, Zagreb 1990.
Vince, M.: Intermediate Language Practice. Heinemann ELT. Oxford 1998.
Paterson, K. & Wedge, R.: Oxford Grammar for EAP. Oxford University Press 2013.

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

Title	*Number of copies*	*Number of students*
Velčić Janjetić, E. & Badurina Filipin, A.: Radni materijal za engleski jezik I – Strojarstvo/Brodogradnja. 2019.	35	35

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

Through the Institution`s Quality Assurance System.

Basic description		
Course title	**English Language II**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	3
	Number of hours (L+E+S)	15+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Students should be able to use professional jargon independently, namely communicate with other experts in the field of the engineering profession and in an international environment, at the B2 level of the Common European Framework of Reference for Languages.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Students should be able to use autonomously general English as well as technical English according to the Common European Framework of Reference for Languages (up to B2 level). They should be able to compare general with technical English on the basis of selected texts and topics. Recognize and explain grammatical structures and principles typical of the professional jargon from selected texts/examples. Implement grammatical structures and aspects in written and oral exercises. Recognize terminology, key words and/or information in selected texts as well as differentiate and analyse relevant elements in them. Describe and interpret accurately more complex diagrams, charts, figures and mathematical formulae. Present the advantages and disadvantages in covered units (e.g. materials in engineering, various types of material processing, etc.). Express one's point of view and evaluate solutions of given problems.							
1.4. Course content							
Topics: Materials in engineering (types and properties). Material processing. Heat treatment. Machining. Non-mechanical joints. Engine fundamentals. Cars and new technology. Computer essentials. Electronics and automation. Globalisation. Technology and its influence on society. Grammatical and language structures: Sequence of tenses. Adjectives and comparison of adjectives. Relative Clauses. Participles (-ing/-ed). Gerund and to+infinitive form of the verb. Word formation. Prefixes and suffixes. Conditional clauses.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☒ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attendance, activity in class and autonomous learning.							
1.8. Evaluation of student's work							
Course	1	Activity/Participation	0.5	Seminar paper		Experimental	

attendance						work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1	Report/Presentation		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, activity, continuous evaluation of knowledge (two tests), written exam.

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

Velčić Janjetić, E. & Badurina Filipin, A.: *Radni materijal za Engleski jezik II – Strojarstvo / Brodogradnja* 2020.

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

Ibbotson, M.: Professional English in Use. Engineering. Cambridge Universtity Press 2009.
Ibbotson, M.: Cambridge English for Engineering. Cambridge University Press 2015.
Dunn, M., Howey, D. & Ilic, A: English for Mechanical Engineering in Higher Education Studies. Garnet Publishing Ltd 2010.
Glendinning, E. H. & Glendinning, N.: Oxford English for Electrical and Mechanical Engineering. Oxford University Press 2001.
Hercezi-Skalicki, M.: Reading Technical English for Academic Purposes, Školska knjiga, Zagreb 1990.
Vince, M.: Intermediate Language Practice. Heinemann ELT. Oxford 1998.
Paterson, K. & Wedge, R.: Oxford Grammar for EAP. Oxford University Press 2013.

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

Title	*Number of copies*	*Number of students*
Velčić Janjetić, E. & Badurina Filipin, A.: *Radni materijal za Engleski jezik II – Strojarstvo / Brodogradnja* 2020.	35	35

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

Through the Institution`s Quality Assurance System.

Basic description		
Course title	**Environment Protection**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	45+0+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Define the basic concepts of ecology and environmental protection. To analyze the impact of the technological aspects of the environment. Describe the processes that affect pollution. Compare technologies and their impact. Distinguish the development of sustainable development. Argue the importance of sustainable development. Describe the current problems of global pollution. Distinguishing the basic concepts of ecology and environmental protection. Understanding the impact of technology on the environment.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Analyzing the impact of the different engineering aspects of the environment based on research. Developing the ability to work within an interdisciplinary team and communicating with experts in other fields. Developing the ability to create and project management in the field of environmental protection.							
1.4. Course content							
Introduction to the environment, the subject of ecology. Soil, atmosphere, water and sea. Interaction with the environment. Monitoring of the environment, particularly in the marine environment. Sampling from the environment. Measurement methods of analytical chemistry. Physical methods of measurement. Fluorescent methods. Basics of modeling processes in the environment. Environmental protection. Improving the environment. Ocean Engineering. Marine technology objects and its interaction with the environment. International conventions and norms.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☒ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Attendance, activity, class participation, research and search the literature sources, making self-employment, consulting, independent learning, presentation of work.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	0.5	Oral exam	1	Essay		Research	1
Project		Sustained knowledge check		Report		Practice	
Portfolio		Homework					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, continuous knowledge testing, written and oral exam.

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

Briški, F.: Zaštita okoliša, Fakultet kemijskog inženjerstva i tehnologije, Zagreb, 2016.
Črnjar, M.: Ekonomika i politika zaštite okoliša, Ekonomski fakultet, Rijeka, 2002.

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

Dobrinić, J., Bonato, J.: Physics, Pomorski fakultet, Rijeka, 2009. (in Croatian)
Reible, D. D.: Fundamentals of Envirenmental Engineering, Springer, London, 1999.
Matas, M., Simonić, V., Šobot, S.: Protection of the Environment today for tomorrow, Školska knjiga, Zagreb, 1989. (in Croatian)
Pandey, G. N., Carney, G. C.: Envirenmental Engineering, Tata McGraw-Hill, New Delhi, 1989

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

Title	*Number of copies*	*Number of students*
Briški, F.: Zaštita okoliša, Fakultet kemijskog inženjerstva i tehnologije, Zagreb, 2016.	1	
Črnjar, M.: Economics and Environmental Policy, Ekonomski fakultet, Rijeka, 2002. (in Croatian)	1	

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Final Work**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	10
	Number of hours (L+E+S)	-

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
The Final Work is an individual assignment and verification of student expertises, which should show the appropriate level of engineering skills for individually solving specific professional task.							
1.2. Course enrolment requirements							
Enrolled course from which the Final Work is selected.							
1.3. Expected course learning outcomes							
Apply acquired knowledge, expertises and skills of the content of Final Work associated course. Solve practical task. Acquire competence for individually solving specific professional task.							
1.4. Course content							
The content of the Final Work is based on the application of acquired knowledge from educational programs at the undergraduate university studies. Final thesis can be specified from a particular course specific professional content and exceptionally from course that belongs to the group of shared content, when it represents a broader entity with a particular course specific content of the studies. Student enrollers the Final Work by enrolling the last semester. Thesis of the Final Work is establishes by Commission for Final Works, based on suggestion of teacher who will mentor the Final Work.							
1.5. Teaching methods	☐ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☒ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attending the consultation, individually solving task and writing the Final Work report.							
1.8. Evaluation of student's work							
Course attendance		Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio		Individual task solving	8	Final work in written form	2		
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

Assesses and evaluates the accuracy and completeness of a given task solving process, the Final Work written report, and its oral presentation

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

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

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

Title	*Number of copies*	*Number of students*

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Fluid Mechanics**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	45+30+0

1.COURSE DESCRIPTION		
1.1. Course objectives		
Understanding the physical meaning of laws and equations of fluid mechanics and developing students' abilities to solve problems related to the field of fluid mechanics and the development of independent work and projects related to various problems involving fluid mechanics.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Define and describe fluid properties. Define and describe fluid statics: Euler equation of fluid statics, relative fluid movement, stability, fluid pressure on flat and curved surfaces, buoyancy. Define and describe the basic laws of fluid dynamics: Conservation of Mass - The Continuity Equation, The Linear Momentum and Moment of Momentum Equations with the Bernoulli equation, The Energy Equation with the modified Bernoulli equation. Define and describe laminar and turbulent viscous fluid flow. Apply the basic laws of fluid mechanics to calculate the physical values of the fluid flow, orifice flow, flow through the wide openings, Venturi meter and Pitot-Prandtl tube. Calculate fluid flow losses through a complex pipeline system.		
1.4. Course content		
Introduction to Fluid Mechanics. Basic physical values. Fluid properties. Fluid statics. Euler equation of fluid statics with solutions. Pressure measurement devices. Relative fluid motion. Stability. Fluid forces on flat and curved surfaces. Buoyancy. Fluid kinematics. Velocity and acceleration. Circular motion and discharge. Fluid dynamics. Basic laws of fluid dynamics. Conservation of Mass - The Continuity Equation, The Linear Momentum and Moment of Momentum Equations with the Bernoulli equation, The Energy Equation with the modified Bernoulli equation. Euler equation of motion. Application of the Bernoulli equation: orifices, weirs, Pitot tube, Venturi meter. Viscosity and viscosity measurement. Relation between the laminar and turbulent flow. Dimensional analysis. Real fluid flow. Pipe flow losses. Cavitation. Flow around bodies. Introduction to free surface flow. Introduction to compressible flow.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		
Course attendance, activity, homework, studying.		
1.8. Evaluation of student's work		

Course attendance	2.5	Activity/Participation	-	Seminar paper	-	Experimental work	-
Written exam	1	Oral exam	-	Essay	-	Research	-
Homework	-	Sustained knowledge check	1.5	Report	-	Practice	-
Portfolio	-						

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, homework, continuous knowledge testing (two mid-term exams), written exam

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

L. Sopta, L. Kranjčević, Fluid Mechanics, script. Faculty of Engineering, Rijeka, 2004. (in Croatian)
Bruce R. Munson, D. F. Young, T. H. Okiishi, Fundamentals of Fluid Mechanics, 4th Updated Edition, John Wiley and Sons, 2003.
Streeter, V.L, Wylie E.B., Fluid mechanics, 8th edition, McGraw Hill, 1985.

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

Kakac, S., Liu, H.: Heat exchangers, CRC Press, Florida, 2002.
Kays, W.M., London, A.L.: Compact heat exchangers, McGraw-Hill Book Co., NY,1984.
Course handout.

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

Title	*Number of copies*	*Number of students*
L. Sopta, L. Kranjčević, Mehanika fluida, skripta. Tehnički fakultet Rijeka, 2004.	.pdf files – as needed	49
Bruce R. Munson, D. F. Young, T. H. Okiishi, Fundamentals of Fluid Mechanics, 4th Updated Edition, John Wiley and Sons, 2003.	1	49
Streeter, V.L, Wylie E.B., Fluid mechanics, 8th edition, McGraw Hill, 1985.	1	49

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Introduction into Finite Element Method**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	15+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Obtaining theoretical knowledge and develop skills to solve practical problems with the finite element analysis of solids.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define stiffness matrix, load vector and finite element equation for basic types of finite elements. To assembly global stiffness matrix, displacement vector and load vector. To apply boundary conditions on the global stiffness matrix. Discretize structure for practical problems. Using finite element method calculate displacement and stress fields for linear structures, planar structures and solids. To asses validity of obtained results.							
1.4. Course content							
Introduction. Application of FEM in solid mechanics. Introduction to the forming of finite element stiffness matrix, load vector and finite element equation. Local and global coordinate systems. Boundary conditions. Structure equation. Basic application in rods, beams, trusses, frames, plates and bodies.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other			
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, activity, homework, seminar paper, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	1	Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio		Homework	0.5				
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

Course attendance, activity, homework, seminar paper), written exam.

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

Brnić, J., Čanađija, M.: "Finite element analysis of solids", Fintrade, Rijeka, 2009. (in Croatian)
Brnić, J.: "Elastomechanics and plastomechanics", Školska knjiga, Zagreb, 1996. (in Croatian)

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

Bathe, K. J.: "Finite Element Procedures", Prentice Hall, Englewood Cliffs, 1996.
Zienkiewicz, O. C., Taylor, R. L.: "The Finite Element Method", Vol. 1, Butterworth-Heinemann, 2000.
Cook, R. D., Malkus, D. S., Plesha, M. E., Witt, R. J.: "Concepts and Applications of Finite Element Analysis", John Wiley & Sons, 2001.

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

Title	*Number of copies*	*Number of students*
Brnić, J., Čanađija, M.: "Finite element analysis of solids", Fintrade, Rijeka, 2009. (in Croatian)	10	1
Brnić, J.: "Elastomechanics and plastomechanics ", Školska knjiga, Zagreb, 1996. (in Croatian)	13	1

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Introduction to Guidance and Control of Marine Vehicles**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Mastering the methods and techniques of mathematical modelling and computer simulation of various technical processes. Modelling and simulation for guidance and control of marine vehicles.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
To adopt the basic principles of creating mathematical models of various dynamic systems. To master basic use of Matlab & Simulink simulation software for model creation, simulation and system analysis. To model the system using differential equations and transfer functions. To transform the mathematical model of the system into a graphical representation using block diagrams. To transform the system using the state space representation. To linearize nonlinear systems. To distinguish reference frames for marine vehicle control. To model kinematics and dynamics of marine vehicles. To model environmental loads. To model thrusters for control purposes. To explain principles of guidance, navigation and control of marine vehicles. Do design simple controllers and observers. To simulate created models and interpret the results.							
1.4. Course content							
Introduction to modelling. The types and properties of models. Methods of determining the mathematical models of the systems. Time and frequency domain. First principle system modelling with differential equations. Transfer functions. State space representation. Simulation and system response. Numerical integration methods for systems' simulations. Data driven modelling and empirical models. Types of marine vehicles from a modelling and control point of view. Degrees of freedom. Reference frames. Kinematics and dynamics of marine vehicles. Environmental loads. Thrusters. Guidance and control systems. Sensors. Filtering and estimation. Autopilots. Dynamic positioning systems.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, work on laboratory exercises, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, work on laboratory exercises, continuous knowledge testing (three mid-term exams), written and oral exam.

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

D.J. Cloud: Applied Modelling and Simulation: An Integrated Approach to Development and Operation, McGraw-Hill, 1998.
N.M.Karayanakis: Advanced System Modelling and Simulation With Block Diagram Languages, CRS Press, 1995.
Kluever, C.A. (2016). Dynamic Systems: Modeling, Simulation, and Control. John Wiley & Sons, Ltd., UK.
Fossen, T.I. (2011). Handbook of Marine Craft Hydrodynamics and Motion Control. John Wiley & Sons, Ltd., UK.

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

A.Cavallo, R. Sctola, F. Vasca: Using Matlab, Simulink and Control System Tool Box: A Practical Approach, Prentice Hall, 1996.
de Silva, C.W. (2018). Modeling of Dynamic Systems with Engineering Applications. CRC Press, USA.
Klee, H., Allen, R. (2017). Simulation of Dynamic Systems with MATLAB and Simulink. 3rd Ed. CRC Press, USA.
Perez, T. (2005). Ship Motion Control - Course Keeping and Roll Stabilisation Using Rudder and Fins. Springer, Germany.

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

Title	*Number of copies*	*Number of students*
D.J. Cloud: Applied Modelling and Simulation: An Integrated Approach to Development and Operation	-	20
N.M.Karayanakis: Advanced System Modelling and Simulation With Block Diagram Languages	-	20
Kluever, C.A. (2016). Dynamic Systems: Modeling, Simulation, and Control. John Wiley & Sons, Ltd., UK.	1	20
Fossen, T.I. (2011). Handbook of Marine Craft Hydrodynamics and Motion Control. John Wiley & Sons, Ltd., UK.	1	20

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Introduction to Marine Vessels**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Within this course students learn a basic knowledge about characteristics and systematization of vessels in accordance with course defined learning outcomes.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Use basic terminology and professional terms regarding vessels. Explain and interpret the basic characteristics and specifications of vessels. Describe and present parts of the ship hull, superstructure and ship equipment. Define basic types, dimensions and characteristics of the hip hull form. Distinguish and present the main elements of the ship hull structure. Explain and interpret the fundamentals of statics and dynamics of vessels. Explain and distinguish elements and configurations of ship main engine and propulsion. Systematize and classify vessels according to their purpose, type of cargo, type of main engine, type of propulsion, hull construction method, size, area of navigation and materials for the construction of the hull. Use IMO conventions, classification rules, guidelines, regulations and standards. Basic use of shipbuilding software.		
1.4. Course content		
Marine vessels development. Vessels, definitions. Basic characteristics of vessels. Selection and specification of the ship. Vessels types regarding its structural characteristics. Hull, superstructure, equipment. General plan of the ship. Hull form and dimensions. Ship structure. Characteristics, terms and professional terminology. Ship basic stability and dynamics. Exploitation functionality of vessels. Ship main engine and propulsion. Systematization of vessels according to: purpose, main engine type, method of hull construction, size, area of navigation, hull construction material, type of operation, type of propulsion. Basics of ship design and construction procedure. Classification. Conventions, rules, guidelines and recommendations. Regulations and standards. Software.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		
Course attendance, activity, sustained knowledge check, studying.		
1.8. Evaluation of student's work		

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, sustained knowledge check (two mid-term exams), written and oral exam or their combination.

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

Class teacher learning material: "Introduction to Marine Vessels"
Furlan, Z. i dr.: Basics of Shipbuilding, Školska knjiga, Zagreb, 1989.
Klaas van Dokkum : Ship Knowledge: Ship Design, Construction, DOKMAR, Netherland, 2011

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

Rhinoceros 4 Nurbs modeling for Windows, Manual Level 1, Robert McNee
Tupper, E.: Introduction to Naval Architecture, Butterworth-Heinemenn, Oxford, 2013
Reeds Vol 5:Ship Construction for Marine Engineers 2016
D.J.Eyres: Ship Construction, 2012.

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

Title	*Number of copies*	*Number of students*
Class teacher learning material: „Introduction to Marine Vessels"	Pdf.	25
Furlan, Z. i dr.: Osnove brodogradnje, Školska knjiga, Zagreb, 1989.	10	25
Klaas van Dokkum : Ship Knowledge: Ship Design, Construction, DOKMAR, Netherland, 2011.	3	25

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Kinematics**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	45+30+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Obtaining theoretical knowledge and develop skills for determination of kinematic characteristics of motion of particles and rigid body. Capability of qualitative and quantitative analysis of basic characteristics of motion as trajectory, displacement, velocity and acceleration.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define the spatial motion of material particles in Descartes, cylindrical, spherical and natural coordinate system. Calculate the trajectory and components of the velocity and acceleration in different coordinate systems. Transform the velocity and acceleration from one coordinate system to another. Define the degrees of freedom of motion and types of motion of a rigid body. Calculate the velocity and acceleration of translation and rotation about a fixed axis of a rigid body. Calculate the velocity and acceleration of the plane motion of a rigid body by applying analytical and grafoanalytical methods. To analyze the motion of planar mechanisms. Calculate the angular velocity and angular acceleration as well as speed and acceleration in the case of motion of a rigid body about a fixed point. To analyze the general case of motion of a rigid body.							
1.4. Course content							
Kinematics of particles. Position, displacement, velocity and acceleration vectors. Distance vs. time equation. Linear motion. Harmonic and damped oscillation. Dependent motion of the particles. Curvilinear motion. Spatial motion of particles in Descartes, cylindrical, spherical and natural coordinate system. The transformation of velocity and acceleration from one to another coordinate system. Complex motion of particles. Kinematics of rigid bodies. Degrees of freedom. Translational motion. Rotation about a fixed axis. Planar motion of the rigid body. Determination of velocity and acceleration of planar mechanisms. Motion of a rigid body about a fixed point. The general case of motion. Complex motion of a rigid body.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, homework, studying.							
1.8. Evaluation of student's work							
Course	2.5	Activity/Participation		Seminar paper		Experimental	

attendance						work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, 3 constructional exercises, continuous knowledge testing (three mid-term exams), written and oral exam.

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

Žigulić, R., Braut, S.: Kinematics, Faculty of Engineering – University of Rijeka, 2012. (in Croatian)
Jecić, S.: Mechanics (Kinematics and Dynamics), Tehnička knjiga, Zagreb, 1989. (in Croatian)

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

Beer , F., Johnston, E.R., Cornwell, P.: Vector Mechanics for Engineers: Dynamics, Mc.Graw Hill Education, New York, 2012.

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

Title	*Number of copies*	*Number of students*
Žigulić, R., Braut, S.: Kinematics, Faculty of Engineering – University of Rijeka, 2012. (in Croatian)	10	142
Jecić, S.: Mechanics (Kinematics and Dynamics), Tehnička knjiga, Zagreb, 1989. (in Croatian)	10	142

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Marine Auxiliary Machinery**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Obtaining theoretical knowledge and develop skills to solve practical problems in the field of marine auxiliary machinery.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define elements of ship pipelines and pumps. Analyze pumps in serial or parallel connection and NPSH value. Describe parts and working principle of centrifugal separators. Describe and compare filtering equipment. Describe and compare ship fresh water generators. Describe and compare types of heat exchangers on ships. Describe and compare hydraulic steering gears. Describe parts and design of ship shaft lines. Desribe parts and working principle of marine incinerator.							
1.4. Course content							
Generally on marine auxiliary machinery. Rules for design and maintenance of marine auxiliary machinery. Ship pumps. Heavy fuel oil and lubricating oil centrifugal separators. Filters. Fresh water generators. Marine heat exchangers. Compressors. Types of ship propulsion plants, application and arrangement on ships. Marine steering gears. Shaft line. Marine reduction gears and propulsors.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☒ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, homework, studying.							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam	1	Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

Course attendance, continuous knowledge testing (two mid-term exams), oral or written exam.

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

Ozretić, V.: Marine Auxiliary Machines and Devices, Dalmacijapapir, Split, 1996. (in Croatian)
Martinović, D.: Marine Machinery Systems, Digital point, Rijeka, 2005. (in Croatian)

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

Smith, D. W.: Marine Auxiliary Machinery, Butterworths, London, 1988.
Knak, C.: Diesel Motor Ships, Engines and Machinery, Institute of Marine Engineers, 1990.

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

Title	*Number of copies*	*Number of students*
Ozretić, V.: Marine Auxiliary Machines and Devices, Dalmacijapapir, Split, 1996. (in Croatian)	8	40
Martinović, D.: Marine Machinery Systems, Digital point, Rijeka, 2005. (in Croatian)	3	40

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Marine Hydrodynamics I**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	8
	Number of hours (L+E+S)	45+45+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Understanding the problems of ship resistance and propulsion. Understanding the procedures of ship and propeller model tests associated with resistance and propulsion. Ability to solve a given problem in order to determine the interaction of the ship, propulsion engine and propeller.							
1.2. Course enrolment requirements							
Dynamics and Fluid mechanics.							
1.3. Expected course learning outcomes							
Describe the phenomena in the water flow around the ship's hull. Distinguish components of ship resistance and explain the methods used to determine the ship resistance. Describe the main characteristics of screw propellers and explain the theory of propeller action. Describe the procedure of ship and propeller model tests associated with the ship resistance and propulsion. Explain the interaction of the main engine and propeller, and explain the relations between resistance and propulsion of the ship. Calculate and analyze the ship resistance and the characteristics of propellers. Describe the impact of hydrodynamic characteristics of the ship effect on the energy effieciency requirements.							
1.4. Course content							
Ship resistance. Flow past ship hulls. Components of ship resistance. Resistance in shallow water. Determination of ship resistance. Model tests. Traditional and standard series. Regression based methods. Effects of the hull form to resistance. Ship propulsion. Propulsion devices. Ship screw propeller. Geometry of the ship screw propeller. Theory of propeller action. Interaction between hull and propeller. Propulsive coefficients. Propeller model tests. Propeller cavitation. Propulsive engine-propeller matching. Propeller design. Propeller manufacturing. Special types of propellers: ducted propellers, controllable pitch propellers, contra-rotating propellers. Other types of propulsion devices: vertical-axis propellers, waterjets, transverse and azimuthing thrusters, podded propellers. Ship trials. Energy efficiency of the ship.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☒ fieldwork		☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Class attendance, class activity, report of laboratory exercises, individual learning.							
1.8. Evaluation of student's work							
Course	3	Activity/Participation	0.5	Seminar paper		Experimental	

attendance						work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project	1.5	Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Class attendance, class activity, report of laboratory exercises, continuous knowledge assessment (mid-term exams), written and oral exam.

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

Lewis, E. V., (ed.), Principles of Naval Architecture, Vol. II - Resistance, Propulsion and Vibration, The Society of Naval Architects and Marine Engineers, Jersey City, 1988.
Birk, L., Funfdamentasls of Ship Hydrodynamics: Fluid Mechanics, Ship Resistance and Propulsion, John Wiley & Sons Ltd., Hoboken, 2019.
Molland, A.F., Turnock, S.R., Hudson, D.A., Ship Resistance and Propulsion - Practical Estimation of Propulsive Power, Cambrodge University Press, New York, 2011.
Carlton, J. S., Marine Propellers and Propulsion, Butterworth - Heinemann, Oxford, 2007.

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

Harvald, Sv. Aa., Resistance and Propulsion of Ships, John Wiley & Sons, New York, 1983.
Sentić, A., Fancev, M., Ship Resistance and Propulsion Problems, Brodogradnja, Zagreb, 1956. (in Croatian)

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

Title	*Number of copies*	*Number of students*
Lewis, E. V., (ed.), Principles of Naval Architecture, Vol. II - Resistance, Propulsion and Vibration, The Society of Naval Architects and Marine Engineers, Jersey City, 1988.	1	15
Birk, L., Funfdamentasls of Ship Hydrodynamics: Fluid Mechanics, Ship Resistance and Propulsion, John Wiley & Sons Ltd., Hoboken, 2019.	1	15
Molland, A.F., Turnock, S.R., Hudson, D.A., Ship Resistance and Propulsion - Practical Estimation of Propulsive Power, Cambrodge University Press, New York, 2011.	1	15
Carlton, J. S., Marine Propellers and Propulsion, Butterworth - Heinemann, Oxford, 2007.	1	15

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

Through the Institution’s quality assurance system.

Basic description		
Course title	**Materials I**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+30+0

1.COURSE DESCRIPTION		
1.1. Course objectives		
Introduction of different types of materials, their structure, properties and specificities and their application in the engineering.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Define and analyze types of interatomic and intermolecular bonds and their influence on material properties. Define and analyze the ideal and the real structure of the materials. Explain the influence of crystal structure imperfections on material properties in production and application. Draw and analyze equilibrium two-component phase diagrams and apply them in determination of phase composition and phase amount. Define and explain polymers, polymerization reactions and different classifications of polymer materials. Explain the structure of macromolecules and basic properties and typical application of thermoplastics, thermosets and elastomers. Define ceramic materials and their classification into traditional and technical ceramics. Explain the structure, properties and application of ceramics. Define composite materials and their clasiffication according to the type of reinforcement or type of matrix. Explain the properties and application of polymer-matrix, metal-matrix and ceramic-matrix composites.		
1.4. Course content		
Definition and clasiffication of materials. Trends in the application of technical materials. Structure of matter. Interatomic and intermolecular bonding and properties of materials. Amorphous and crystal structure. Crystal systems. Directional indices and Miller indices. Crystal imperfections. Solid solutions. Intermetallic compound. Metal solidification. Diffusion. Phase diagrams. Cooling curves. Phase transformations. Equilibrium two-component diagrams. Clasiffication of polymer materials. Polymerization. Structure of macromolecules, properties and application of thermoplastics, thermosets and elastomers. Ceramic materials in the engineering. Structure, properties and processing of ceramic materials. Classification, structure, properties and application of composite materials in engineering.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments	-	
1.7. Student's obligations		
Course attendance, participation in teaching, studying.		

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, homework, continuous knowledge testing, written exam.

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

Smokvina Hanza, S., E-Lectures: Materials I, RITEH, Rijeka, 2020. (in Croatian)
Katavić, I., Introduction to materials, Sveučilište u Rijeci, 1997. (in Croatian)
Filetin, T., Kovačiček, F., Indolf, J., Properties and application of materials, FSB, Zagreb, 2011. (in Croatian)

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

Askeland, D. R., Wright, W. J., The science and engineering of materials, Boston [etc.]: Cengage Learning, cop. 2016.
Callister, W. D., Jr., Materials science and engineering: An Introduction, John Wiley & Sons, New York, Chichester, etc., 1996.
Raos, P., Šercer, M., Theoretical bases of polymer production, Strojarski fakultet, Slavonski Brod, 2010. (in Croatian)
Filetin, T., Kramer, I., Technical ceramics, FSB, Zagreb, 2005. (in Croatian)

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

Title	*Number of copies*	*Number of students*
Katavić, I., Introduction to materials, Sveučilište u Rijeci, 1997. (in Croatian)	22	
Filetin, T., Kovačiček, F., Indolf, J., Properties and application of materials, FSB, Zagreb, 2011. (in Croatian)	5	
Smokvina Hanza, S., E-Lectures: Materials I, RITEH, Rijeka, 2020. (in Croatian)	available on Merlin	

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Materials II**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Student will be informed with production of materials and material properties, same as microstructure characterization. Moreover, student will acquire basic modification methods of alloy properties.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Analyse the application of equilibrium diagrams. Define the relation between microstructure and material properties. Describe the basic properties of materials. Analyse the methods of materials testing. Define the mechanisms and methods of material properties modification.							
1.4. Course content							
Production of metals and alloys. Iron - carbon diagram. Non-ferrous phase diagrams of metals. Microstructure characterisation. Optical microscopy. Electron microscopy. Microstructure and properties of materials. Theoretical and real strength of materials. Basic mechanical properties of materials. Tensile strength test results. Engineering and true stress-strain curve. Ultimate tensile strength. Yield strength. Modulus of elasticity. Hardness. Tribological properties of materials. Mechanisms and methods of alloy properties modification. Corrosion properties of materials. Electrical properties of materials. Magnetic properties of materials. Permanent and non-permanent magnets.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Course attendance, homework preparation, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, homework, sustained knowledge check, written exam.

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

Katavić, I., Introduction to materials, RITEH, Rijeka, 2008. (in Croatian)
Schumann, H., Metallographie, VEB Deutscher Verlag fuer Grundstoffindustrie, Leipzig, 1967. (in German)
Franz, M., Mechanical properties of materials, FSB, Zagreb, 1998. (in Croatian)
Ivušić, V., Tribology, Croatian society for materials and tribology, Zagreb, 2002. (in Croatian)
Filetin, T., Kovačiček, F., Indof, J., Properties and application of materials, FSB, Zagreb, 2011. (in Croatian)
Stupnišek, M., Cajner, F., Fundamentals of heat treatment of metals, FSB, Zagreb, 2001. (in Croatian)

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

Askeland, D. R., Wright, W. J., The science and engineering of materials, Cengage Learning, cop., Boston, etc., 2016.
Callister, W. D., Jr., Materials science and engineering: An Introduction, John Wiley & Sons, New York, Chichester, etc., 1996.
Nondestructive Evaluation and Quality Control, ASM Handbook Vol. 17, ASM International, Materials Park, OH, 1991.

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

Title	*Number of copies*	*Number of students*
Katavić, I., Introduction to materials, RITEH, Rijeka, 2008. (in Croatian)	22	142
Schumann, H., Metallographie, VEB Deutscher Verlag fuer Grundstoffindustrie, Leipzig, 1967. (in German)	3	142
Franz, M., Mechanical properties of materials, FSB, Zagreb, 1998. (in Croatian)	3	142
Ivušić, V., Tribology, Croatian society for materials and tribology, Zagreb, 2002. (in Croatian)	12	142
Filetin, T., Kovačiček, F., Indof, J., Properties and application of materials, FSB, Zagreb, 2011. (in Croatian)	5	142
Stupnišek, M., Cajner, F., Fundamentals of heat treatment of metals, FSB, Zagreb, 2001. (in Croatian)	2	142

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Mathematics I**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**1**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+45+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Acquiring basic knowledge and skills in linear algebra and calculus.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Define and correctly interpret basic notions in linear algebra, single-variable functions, and single-variable calculus. State and correctly interpret basic results in linear algebra and single-variable calculus. Carry out basic computations with matrices, vectors, determinants; determine solutions of systems of linear equations. Apply vector operations to compute some areas, volumes; determine equations of planes and lines. Compute limit values and derivatives of single-variable functions. Apply integration rules and evaluate indefinite and definite integrals of some function.							
1.4. Course content							
Solving systems of linear equations. Matrices. Determinants. Vectors and analytical geometry in space. Single-variable functions. Limit values and continuous functions. Elementary functions. Derivatives. Indefinite and definite integrals.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, activity/participation, studying.							
1.8. Evaluation of student's work							
Course attendance	3	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2.5	Report		Practice	
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							

Course attendance, activity/participation, sustained knowledge check (mid-term exams, tests), and written exam.

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

Slapničar I.: Mathematics 1, Sveučilište u Splitu FESB, Split 2002, online book (in Croatian)
Slapničar I.: Mathematocs 1 – Workbook, Sveučilište u Splitu FESB, Split 2010, online book , (in Croatian)
Jurasić, K.-Dražić, I.: Mathematics I, Workbook, Tehnički fakultet, Rijeka, 2008. (in Croatian)
Štefan Trubić M., Sopta L., Črnjarić-Žic N., Maćešić S.: Mathematics, a collection of tasks: integrals, ordinary differential equations, functions of several variables, Rijeka 2012, (in Croatian)

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

Elezović N., Aglić A., Linear algebra - a collection of tasks, Element, Zagreb 1999 (in Croatian)
Zill D., Wright W., Calculus: early transendentals, 4th edition, Jones and Bartlett publishers, 2011.

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

Title	*Number of copies*	*Number of students*
Slapničar I.: Mathematics 1, Sveučilište u Splitu FESB, Split 2002, online book (in Croatian)	37	37
Slapničar I.: Mathematocs 1 – Workbook, Sveučilište u Splitu FESB, Split 2010, online book , (in Croatian)	37	37
Jurasić, K.-Dražić, I.: Mathematics I, Workbook, Tehnički fakultet, Rijeka, 2008. (in Croatian)	18	37
Štefan Trubić M., Sopta L., Črnjarić-Žic N., Maćešić S.: Mathematics, a collection of tasks: integrals, ordinary differential equations, functions of several variables, Rijeka 2012, (in Croatian)	20	37

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Mathematics II**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**1**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+45+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Acquiring basic knowledge and skills in application of calculus for single-variable functions, calculus for multi-variable functions, and ordinary differential equations.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Correctly interpret and apply single-variable calculus. Define and correctly interpret basic notions of multi-variable calculus and ordinary differential equations (ODE). Compute derivatives and some integrals of multi-variable functions, and solutions of some ODE. Compute polynomial approximations; find local extremes of single-variable and multi-variable functions by applying differential calculus. Compute some lengths, areas, and volumes by applying integral calculus. Model vibrations in simple mechanical and electrical systems by applying ODE.							
1.4. Course content							
Applications of single-variable calculus. Multi-variable functions. Partial derivatives, differential calculus for two-variable functions and applications (approximations, local extremes, optimal control problems). Double integral and applications. First order ODE. Higher order ODE. Systems of ODE. Applications of ODE.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, activity/participation, studying.							
1.8. Evaluation of student's work							
Course attendance	3	Activity/Participation		Seminar paper		Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity/participation, sustained knowledge check (mid-term exams, tests), and written exam.

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

Slapničar I.: Mathematics 2, Sveučilište u Splitu FESB, Split 2002, online book, (in Croatian)
Štefan Trubić M., Sopta L., Črnjarić-Žic N., Maćešić S.: Mathematics, a collection of tasks: integrals, ordinary differential equations, functions of several variables, Rijeka 2012, (in Croatian)

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

Kreyszig E., Advanced Engineering Mathematics, John Wiley & Sons, Inc., 1993
Zill D., Wright W., Calculus: early transendentals, 4th edition, Jones and Bartlett publishers, 2011.

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

Title	*Number of copies*	*Number of students*
Slapničar I.: Mathematics 2, Sveučilište u Splitu FESB, Split 2002, online book, (in Croatian)	37	37
Štefan Trubić M., Sopta L., Črnjarić-Žic N., Maćešić S.: Mathematics, a collection of tasks: integrals, ordinary differential equations, functions of several variables, Rijeka 2012, (in Croatian)	20	37

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Organization of Business Systems**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Acquiring theoretical concepts and knowledge of the organization and business economics.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Explain the concept of a business system and raising the business system. Define the basic principles of organization. Define the manageability of systems and information in a business system. Distinguish organizational forms of business systems. Analyze the types of organizational structures. Analyze job evaluation. Distinguish ownership, management and leadership. Distinguish formal from the informal organization. Define the principles of management and leadership. Analyze teamwork. Define business policy. Describe the principles and methods of planning. Define long-term and short-term plans. Define the factory as an economic system. Analyze income and expenses. Know the basic financial statements. Define business effects. Explain the resources of the organization and analyze competitiveness.							
1.4. Course content							
Definition and evolution of business system organization. Organizational forms of business systems. Building a business system. Basic principles of organization. System manageability. Formal and informal organization. Information in the business system. The behavioural approach in organizational theory. Types of organizational structures. Designing a business system organization. Organizational changes. Job evaluation. Property. Management. Leadership. Teamwork. Business politics. Planning. Long-term and short-term business system plans. Factory as an economic system. Revenues and expenses. Profitability threshold. Finance reports. Business effects. Organizational resources and competitiveness.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Attendance, class participation, independent learning.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	1	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, class activity, continuous assessment, written exam.

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

T. Mikac, M. Ikonić.: Organizacija poslovnih sustava, Tehnički fakultet Sveučilišta u Rijeci, online script in Croatian, Rijeka, 2011.

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

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

Title	*Number of copies*	*Number of students*

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Processes of Heat Treatment**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. COURSE DESCRIPTION							
1.1. Course objectives							
Student will be familiar with the processes of heat treatment and surface engineering.							
1.2. Course enrolment requirements							
Attended course Materials II.							
1.3. Expected course learning outcomes							
Analyse the basic knowledge related to the heat treatment. Analyse the transformations and basic processes of heat treatment of steel. Analyse the basic processes of heat treatment of non-ferrous metals. Analyse the surface heat treatment processes of alloys. Analyse the processes of surface engineering. Define the processes of heat treatment and surface engineering on the basis of construction and technological requirements.							
1.4. Course content							
Heat treatment of steel: hardening, stress relief, tempering, normalizing. Surface hardening processes: induction (high frequency) hardening, flame hardening. Diffusion treatments: carburizing, nitriding, boronizing. Isothermal tempering of ductile iron. Heat treatment of non-ferrous metal alloys. Nitriding. Plasma carburising, ion carburising. Surface engineering processes. Chemical vapor deposition (CVD). Physical vapor deposition (PVD). Methods for the application of thin layers by spraying technologies: thermal, electric arc, plasma, explosion.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, homework preparation, preparation for participation in teaching, studying.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	0.5	Experimental work	
Written exam	1	Oral exam		Essay		Research	

Project		Sustained knowledge check	1	Report		Practice	
Portfolio		Homework					

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, sustained knowledge check, preparation of seminars, written exam.

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

Smoljan, B., Heat treatment of steel, gray and ductile iron castings, Zagreb: Hrvatsko društvo za toplinsku obradbu i inženjerstvo površina, Udžbenici Sveučilišta u Rijeci, 1999. (in Croatian)
Smoljan, B., Fundamentals of heat treatment of steel, Rijeka: Sveučilište u Rijeci, Pedagoški fakultet, 1997. (in Croatian)
Krumes, D., Heat treatment, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod 2000. (in Croatian)

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

Heat Treating, ASM Handbook Vol. 4, ASM International, Materials Park, OH, 1991.

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

Title	*Number of copies*	*Number of students*
Smoljan, B., Heat treatment of steel, gray and ductile iron castings, Zagreb: Hrvatsko društvo za toplinsku obradbu i inženjerstvo površina, Udžbenici Sveučilišta u Rijeci, 1999. (in Croatian)	4	46
Smoljan, B., Fundamentals of heat treatment of steel, Rijeka: Sveučilište u Rijeci, Pedagoški fakultet, 1997. (in Croatian)	6	46
Krumes, D., Heat treatment, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod 2000. (in Croatian)	1	46

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Professional Practice I**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	5
	Number of hours (L+E+S)	-

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Student verifies and complements his own expertise, along with a comprehensive view of the work process.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Apply acquired knowledge and skills from studied courses professional content. Gain working process experience. Develop and further improve competence for solving specific professional engineering problems.							
1.4. Course content							
Industrial practice within Undergraduate University Study of Naval Architecture is carried out individually in work organization that is engaged in the student's field of study, and with activities in accordance with the Industrial Practice Rules and Study Program curriculum. Within such practice, student is familiarized with the corresponding jobs that are studied through programs of education, with the task of verifying and complementing their own expertise, along with a comprehensive view of the work process.							
1.5. Teaching methods	☐ lectures ☐ seminars and workshops ☐ exercises ☐ long distance education ☒ fieldwork		☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Conducting professional practice in duration of 15 working days, or 120 hours, and writing the corresponding report.							
1.8. Evaluation of student's work							
Course attendance		Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Sustained knowledge check		Report	1	Practice	4
Portfolio							
1.9. Procedure and examples of learning outcome assessment in class and at the final exam							
Assesses and evaluates student work and dedication, and written report.							

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

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

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

Title	*Number of copies*	*Number of students*

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Quality Assurance**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
The course is designed to provide the student with basic knowledge in quality assurance topics. Through exercises students are introduced with practical application of several course objectives.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
To interpret the meaning and importance of quality assurance. Explain the basic concepts of quality assurance and quality control. Classify quality characteristics of products, processes and services. Quality cost analysis. Interpret basic requirements of ISO 9001 standard. Apply basic quality tools. Assess results of statistical process control. Analyse R%R of measurement system. Measure process reliability and select acceptance sampling.							
1.4. Course content							
Definitions of quality. Quality of products, processes and services. Quality costs. Economical level of quality. Optimal quality. Quality inspection. Quality assurance. International quality standards ISO 9000. Quality management. Total quality. Planning for quality. Quality improvement. Quality engineering. Method and tools for quality assurance and improvement. Cause-and-effect relationships. Causes of quality variability. Statistical process control methods. Common probability distributions. Control charts. Products and processes quality assessment methods. Quality of measurement system. Acceptance sampling. Reliability.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Course attendance, active participation in the course, attendance at laboratory exercises and independent learning.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper		Experimental work	

Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Sustained knowledge check and final written exam.

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

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

Juran, J. M., Gryna, F. M.: Planiranje i analiza kvalitete, Mate, Zagreb, 1999.
Montgomery, D.C., Jennings, C. L., Pfund, M. E.: Managing, controlling, and improving quality, John Wiley & Sons Wiley, 2011.
Bilić, B.: Kvaliteta-planiranje, analiza i upravljanje, FESB, 2016.
Kondić, Ž., Maglić, L., Pavletić, D.: Kvaliteta 1, 2, 3, Sveučilište Sjever, Strojarski fakultet Slavonski Brod, Tehnički fakultet Sveučilišta u Rijeci, 2018

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

Title	*Number of copies*	*Number of students*

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

Through the Institution’s quality assurance system.

Basic description		
Course title	**Seaworthiness and Stability of the Ship**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+45+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Creating a foundation for independent and physically based understanding of buoyancy concepts, stability (static and dynamic), flooding, grounding, docking, launching and basic calculations in that regard.		
1.2. Course enrolment requirements		
Passed course "Ship Hull Forms"		
1.3. Expected course learning outcomes		
Indicate weight, and describe the concepts of gravity, buoyancy and centre of gravity. Define a static balance of the vessel and specify and analyse the conditions of navigability. Define metacentric radius and metacentric height. Analyse the parameters of the diagrammatic sheet and list of non-dimensional diagrammatic sheet and trim diagrams. Identify and analyse the static stability (levers, moments). Specify and analyse the elements that affect the stability (free surface, wind, loading and unloading cargo, shape of form, ice, rotation). Identify and analyse the flooding concept and the statistical method of subdivision. Define the concept of dynamic stability (energy pathways). Indicate and describe the docking procedures, grounding, towing and launching. Analyse and compare the international rules and regulations of classification societies related to ship hydrostatics. Analyse computer processing of hydrostatics in exploitation.		
1.4. Course content		
Weight and center of gravity. The buoyancy and center of buoyancy. The static equilibrium of the vessel. Terms of navigability. Metacentric radius and metacentric height. Calculation methods of buoyancy. Calculation of surface water line features. Diagrammatic sheet. Dimensionless diagrammatic sheet. Trim diagrams. Static stability (transverse, longitudinal): initial, for higher angles, special cases of stability. Leverage and torque for static stability. Unit immersion and unit moment to change trim. The influence of the free surface stability. Influence of form on the metacentric curve. Unsinkability, immersion boundaries, water penetration, bulkhead rearrangement, metacentric curve, symmetric and asymmetric flooding. Dynamic stability (energy pathways). Docking, grounding-towing, launching. Flotation and stability in operation of the vessel: the impact of loading / unloading and / or transfer of cargo. Computer processing of hydrostatics in the project stage and exploitation (load master).		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		

Attendance, exams, project.

1.8. Evaluation of student's work

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

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, continuous assessment (2 mid-term exams), the project, written examination, oral examination, or any combination of these forms.

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

Uršić, J.: Ship Seaworthiness, script, Fakultet strojarstva i brodogradnje, Zagreb, 1991. (in Croatian)
Uršić, .J.: Ship Stability, part I i II, script, Fakultet strojarstva i brodogradnje, Zagreb, 1964. (in Croatian)
Moore, C. S.: Principles of Naval Architecture Series: Intact Stability. The Society of Naval Architects & Marine Engineers (www.sname.org), 2010.
Biran, A. B.: Ship hydrostatics and stability, 2006.
Van Dokkum. K.: Ship stability, Dokmar Maritime Publishers; 4th edition including CD ROM, 2013

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

Manual for the software program to create a marine form which is the subject to hydrostatics calculations (buoyancy, stability, flooding, etc.).
Parts of the regulations of classification societies: CRS (Croatian Register of Shipping).

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

Title	*Number of copies*	*Number of students*
Uršić, J.: Ship Seaworthiness, script, Fakultet strojarstva i brodogradnje, Zagreb, 1991. (in Croatian)	4	18
Uršić, .J.: Ship Stability, part I i II, script, Fakultet strojarstva i brodogradnje, Zagreb, 1964. (in Croatian)	8	18
Moore, C. S.: Principles of Naval Architecture Series: Intact Stability. The Society of Naval Architects & Marine Engineers (www.sname.org), 2010	1	18
Biran, A. B.: Ship hydrostatics and stability, 2006.	1	18
Van Dokkum. K.: Ship stability, Dokmar Maritime Publishers; 4th edition including CD ROM, 2013	1	18

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

Through a structured system of quality assurance of the Faculty.

Basic description		
Course title	**Ship Construction**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	15+45+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Obtaining theoretical knowledge in the field of structural elements of displacement single hull ship with significant dimension in length. Develop skills to solve practical problems within empirical approach in scantling determination.							
1.2. Course enrolment requirements							
Ship Structure Elements							
1.3. Expected course learning outcomes							
Specify particularities of structures in the area of the bow and stern. Describe the importance of continuity of structural elements (on specific structural units). Apply the rules and regulations of classification societies in the dimensioning of ship hull structure elements. Calculate the structural dimensions on some position of a merchant type ship under the rules and regulations of a classification society. Analyze the calculation results in respect to the criteria for dimensioning by classification societies. Link individual structural elements in a functional unit. Analyze the different topology solutions of basic structure. List the capabilities of modern software for structure design, scantlings check and development of technical documentation.							
1.4. Course content							
Rules and regulations of classification societies, nomenclature and application. Dimensioning of elements of the structure of the double bottom, outer shell, decks, bulkheads, pillars and superstructure. The structure relationship to molded lines. The alignment and continuity of structural elements. The choice of topology for midship construction. Special reinforcements of ship structures. Specificity and choice of design solutions in the area of cargo space, engine room, bow and aft peak. Capabilities of software application in scantling determination and the development of technical documentation.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork		☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, activity, homework, studying							
1.8. Evaluation of student's work							
Course attendance	2	Activity/Participation		Seminar paper		Experimental work	

Written exam		Oral exam	0.5	Essay		Research	
Project	2.5	Sustained knowledge check	1	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, continuous knowledge testing (one mid-term exams), project work, written and oral exam

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

Zamarin, A.:Konstrukcija broda II, internal script, available over web page of the Chair for construction of floating objects
Eyres, D.J.: Ship Construction, Butterworth-Heinemann, Oxford 2012.
Dvornik, J.: Brodske konstrukcije, Sveučilište u Splitu, 2013.

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

Taggart, R.: Ships Design and Construction, SNAME, New York 1980.
..., Rules end regulations for the classification of ships; IACS-CSR, LR, DNV-GL, ABS, BV, HRB.
O.F.Hughes, J.K. Paik: Ship Structural Analysis and Design, SNAME, N.Y., 2010

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

Title	*Number of copies*	*Number of students*
Zamarin, A.:Ship Construction II, internal script. (in Croatian)	20	20
Eyres, D.J.: Ship Construction, Butterworth-Heinemann, Oxford 1994, 2012.	2	20
Dvornik, J.: Brodske konstrukcije, Sveučilište u Splitu, 2013.	1	20

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Ship Equipment**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	45+15+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
In this course students receive a basic knowledge of the ships equipment , elements and outfitting systems related to defined learning outcomes.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Apply technical requirements, conventions, regulations and standards. Define and describe the equipment for anchoring, mooring and towing. Describe and distinguish between the rudder and steering gear. Describe and specify equipment for safety. Describe and specify the equipment to move, place and protect cargo. Describe and differentiate the hatches, hatches, covers, skylights, doors, windows and panes. Describe the equipment to move the crew and passengers. Distinguish gear wheel, navigation and communication, navigation lights and signalling devices. Deploy troops and equipment to describe the systems to protect troops. Describe and display elements and the performance of heating, ventilation and air conditioning. Describe and display elements and the performance of heating, ventilation and air conditioning. Describe and show ways of insulation and covering floors, walls and ceilings.		
1.4. Course content		
Technical requirements, conventions, regulations, standards. Equipment troops. Restraints troops. Equipment for cargo. Hatches and lids. Cargo doors. Equipment and devices for moving cargo. Special equipment to move the cargo. Equipment for stitching and protect cargo. Containers for cargo. Ventilation, insulation and cladding warehouses. Rescue equipment and safety. Funding for rescue. Equipment for fire protection. Equipment accommodation and special rooms. Isolation quarters. Partitions, doors, windows, windows and skylights. Deck coverings, walls and ceilings. Railings, bridges, ladders. Staircases, platforms, flooring, elevators. Furniture and other equipment. Tools and equipment for maintenance of working conditions on board. Arrangements for the stability of the ship. Equipment for steering, navigation and communication. Lights and signalling devices. Equipment for anchoring, mooring and towing. Equipment for the operation of the machines. Special equipment.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☒ fieldwork	☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		

Course attendance, activity, homework, studying.

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper	1	Experimental work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, continuous knowledge testing (two mid-term exams), Seminar paper, written exam, oral exam.

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

Matulja, T.: Teaching material published on e-learning course Oprema broda, 2017.
Buxton, I. L.: Cargo Access Equipment for Merchant Ships, MacGregor Publications Ltd., 2014.
House, D.J.: Cargo Work, Elsevier Butterworth-Heinemann, Oxford, 2005.
House, D.J.: Seamanship Techniques, Elsevier, 2005.

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

Bosnić, A., Vukičević, M., Ship Equipment, Fakultet strojarstva i brodogradnje, Zagreb, 1983. (in Croatian)
Ozretić V., Ship Auxiliary Devices, Liburnija, Rijeka, 1996. (in Croatian)
Cowley, J., Fire Safety at Sea, MEP Series, Volume 1, Part 5. IMAREST, London, 2004.
Boisson, P., Safety at Sea, BV Paris, 1999.

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

Title	*Number of copies*	*Number of students*
Buxton, I. L., Cargo Access Equipment for Merchant Ships, MacGregor Publications Ltd., 2014.	2	20
House, D.J., Cargo Work, Elsevier Butterworth-Heinemann, Oxford, 2005.	2	20
House, D.J., Seamanship Techniques, Elsevier, 2005.	2	20

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Ship Hull Forms**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	30+45+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Developing a sense of spatial shaping of the vessels form. Creating a sense of the smoothness of ships lines and surfaces.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Describe and define ship hull geometry for the displacement, semi-displacement ships and powerboats. Describe and distinguish between forms of special types of ships. Define and describe the geometric representation of ship form using ship lines. Define the basic dimensions of the ship and analyze and explain the coefficients of marine forms. Define the freeboard and its corrections, and describe and distinguish the markings on the hull of the ship. Describe numerical integration methods. Distinguish and explain the numerical description of ship form using computer software. Define and describe the form of appendages. Analyze the similarity of marine forms and describe the variation of ship forms.							
1.4. Course content							
General information about the hull of ships and boats (review of technical requirements - the design and operation of the vessel). Ship geometry of displacement, semi-displacement ships and powerboats. Forms of special types of ships: ships underwater wings, SWATH vessels, air cushion, underwater objects, etc. Special forms of marine forms at the bow and stern. Forms of multihull boats. Geometric representation of ship form using ship lines (3D curved surfaces, 2D and 3D curves). Coefficients of marine forms. Geometrical characteristics of ship forms. Numerical integration methods. Numerical description of ship forms using computer software. Geometry of appendages (propeller, rudder, keel, bilge keel, planking, underwater wings, etc.). The similarities in vessels shape. Varying the ship hull.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Attendance, exams, project.							
1.8. Evaluation of student's work							
Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	

Written exam		Oral exam	1	Essay		Research	
Project	1	Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance, continuous assessment (2 mid-term exams), the project, written examination, oral examination, or any combination of these forms.

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

Bernardi, T.: Ship Lines (script), Fakultet strojarstva i brodogradnje, Zagreb, 1969. (in Croatian)
Furlan, Z., Lučin, N., Pavelić, A.: Basics of Shipbuilding, Školska knjiga, Zagreb, 1989. (in Croatian)
Letcher, J.: Principles of Naval Architecture Series: The Geometry of Ships The Society of Naval Architects & Marine Engineers (www.sname.org), 2009
Grubišić I.: Ship Geometry, Digital script.

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

Classification society rules: HRB, especially regarding the definition of the basic dimensions, concepts and expressions and section to explain freeboard of the ship.
Manual for the software program to create 3D marine forms.
Biran, A. B.: Ship hydrostatics and stability, 2006.

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

Title	*Number of copies*	*Number of students*
Bernardi, T.: Ship Lines (script), Fakultet strojarstva i brodogradnje, Zagreb, 1969. (in Croatian)	9	19
Furlan, Z., Lučin, N., Pavelić, A.: Basics of Shipbuilding, Školska knjiga, Zagreb, 1989. (in Croatian)	10	19
Letcher, J.: Principles of Naval Architecture Series: The Geometry of Ships The Society of Naval Architects & Marine Engineers (www.sname.org), 2009	1	19

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

Through a structured system of quality assurance of the Faculty.

Basic description		
Course title	**Ship Structure Elements**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	45+15+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Within the course students will gather basic knowledge about structural elements of displacement single hull ship with significant dimension in length, suitable for carrying commercial cargo and for ocean service.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Specify and properly interpreted the type of ship structural load. Distinguish materials for the hull construction by mechanical characteristics. Define the purpose and phases of the ship longitudinal strength calculation. Compare the basic features of the transversal, longitudinal and mixed system of hull construction. Enumerate specific structural hull units and define their functions. Enumerate specific structural elements within the structural unit and explain ways of connection. Distinguish between primary and secondary elements of ship structure. Identify and define the parameters necessary for the dimensioning of a structural element (primary or secondary). Outline solutions of certain marine structural units for different types of merchant ships. Apply the rules and regulations of classification societies to define the criteria for dimensioning of ship hull structure elements.		
1.4. Course content		
Introduction in marine structures. Ship types development and development of application of construction materials; steel and aluminium. Review of the load and structural principles according to strength basics and modes of loading. Fundamentals in the ship longitudinal strength calculation. Plates and profiles as basic construction parts of ship structure. Basic characteristics of longitudinal, transversal and mixed hull construction system. Basic ship hull structural elements. Keel and stems. Single bottom elements. Double bottom elements. Double bottom in engine room, engine seats. Side shell, frames, web frames, longitudinals, stringers. Deck, deck beams, longitudinal under deck girder, pillars. Openings in deck, hatch, hatch covers and hatch coamings. Bulkheads, structural tanks, Superstructure and deckhouses. Fore end structure, stem, bulbous bow, fore peak. Aft end structure, stern, after peak tank. Rudders, struts and shaft bossing.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		
1.7. Student's obligations		

Course attendance, activity, homework, studying

1.8. Evaluation of student's work

Course attendance	2	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam	1	Essay		Research	
Project		Sustained knowledge check	3	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, continuous knowledge testing (two mid-term exams), understanding of ship classification and technology drawings/documentation, written and oral exam

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

Zamarin, A.:Konstrukcija broda I, internal script, available over web page of the Chair for construction of floating objects
Eyres, D.J.: Ship Construction, Butterworth-Heinemann, Oxford 2012.
Dvornik, J.: Brodske konstrukcije, Sveučilište u Splitu, 2013.

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

Taggart, R.: Ships Design and Construction, SNAME, New York 1980.
..., Rules and regulations for the classification of ships; IACS-CSR, LR, DNV-GL, ABS, BV, HRB.
O.F.Hughes, J.K. Paik: Ship Structural Analysis and Design, SNAME, N.Y., 2010

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

Title	*Number of copies*	*Number of students*
Zamarin, A.: Ship Construction I, internal script, available over web page of the Chair for construction of floating objects. (in Croatian)	12	12
Eyres, D.J.: Ship Construction, Butterworth-Heinemann, Oxford 1994.	2	12
Dvornik, J.: Brodske konstrukcije, Sveučilište u Splitu, 2013.		12

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Shipbuilding Technology**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	30+30+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Students gain basic knowledge about ship production, ship launching process and relevant documentation according to defined learning outcomes.							
1.2. Course enrolment requirements							
Basics of Ship Production and Ship Structure Elements							
1.3. Expected course learning outcomes							
Classification and differentiation between various types of ship and other offshore objects building berths. Explain and analyze building berth preparation works for ship construction. Describe contemporary methods of building berth ship erection, order of ship erection and outfitting. Analyze and describe activities for joining and welding ship blocks on the building berth, and automation of such activities and ship launching. Define and describe the procedures for inspecting and testing of hull construction. Analyze and compare the systems of ship launching or vice versa. Define and describe the process of ship launching. Analyze and describe the design and layout of ship supporting blocks, rake pillars, launching triggers, sliding ways and ground ways. Analyze and define longitudinally launching. Analyze and define works after launching and during ship exploitation.							
1.4. Course content							
Berths for ship erecting. Berths equipment. Berth preparation for ship construction. Ship positioning at the berth. Modern shipbuilding methods, erecting time schedule and outfitting on berth and after ship launching. Ship blocks joining at the berth. Automation of assembly works. Hull construction inspection and testing. Systems for ship launching. Comparative analysis of launching systems. Launching process. Construction and arrangement of slipway blocks, rake pillars, launching triggers, sliding ways and ground ways. Mechanics of longitudinal launching. Works after launching and during ship exploitation. Ship structure and technology data modelling in specialised shipbuilding softwer.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☒ fieldwork		☒ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other				
1.6. Comments							
1.7. Student's obligations							
Course attendance, sustained knowledge check, project task.							
1.8. Evaluation of student's work							
Course	2	Activity/Participation		Seminar paper		Experimental	

attendance						work	
Written exam	1	Oral exam	0.5	Essay		Research	
Project	1.5	Sustained knowledge check	1	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, sustained knowledge check (two mid-term exams), project task, written and oral exam or their combination.

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

Class learning material: „Shipbuilding Technology
Furlan, Z. i dr.: Shipbuilding Technology, Školska knjiga, Zagreb, 1986.

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

D.J.Eyres: Ship Construction, 2012.
David J. House: Dry Docking and Shipboard Maintenance, Witherby & Co. Ltd, London, 2003
Klaas van Dokkum : Ship Knowledge: Ship Design, Construction, DOKMAR, Netherland, 2011.

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

Title	*Number of copies*	*Number of students*
Class learning material: „Shipbuilding Technology	Pdf.	20
Furlan, Z. i dr.: Shipbuilding Technology, Školska knjiga, Zagreb, 1986.	10	20

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

Through the Institution’s quality assurance system.

Basic description		
Course title	**Small Craft Building and Maintenance UN**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	optional	
Year	**3.**	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
The acquisition of specific competencies dealing with the small craft building and maintenance. Acquiring the skills of independent work and developing the ability to present the achieved results.							
1.2. Course enrolment requirements							
None.							
1.3. Expected course learning outcomes							
Distinguish materials for the building of small crafts. Describe the methods for building small crafts of wood and wooden materials, plastics and metals. Describe the installation of propulsion engine with associated systems. Describe the work on the interior and exterior outfitting of small crafts. Describe the works on maintenance and repair of small crafts. Describe the places for building, maintenance and winter storage of small crafts and facilities for retrieving, lifting/launching and hauling of small crafts.							
1.4. Course content							
Materials for building the small crafts: wood, wooden laminate, single-skin FRP laminate, cored FRP laminate, steel, aluminum alloys, other materials. Durability and protection of materials. Building of traditional wooden small crafts. Building of plywood small crafts. Building of small crafts using the WEST technique. Building of FRP small crafts. Building of steel small crafts. Building of aluminum small crafts. Building small crafts of other materials. Installation of engines and related systems. Small craft interior and exterior outfitting. Sailboat rigging. Maintenance and repair of small crafts. Places for building, maintenance and winter storage of small crafts. Facilities for retrieving, lifting/launching and hauling of small crafts.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☒ fieldwork			☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other			
1.6. Comments							
1.7. Student's obligations							
Attendance at lectures, seminar work with presentation, self learning.							
1.8. Evaluation of student's work							
Course attendance	1.5	Activity/Participation		Seminar paper	2	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge		Report		Practice	

		check					
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Attendance at lectures, seminar work with presentation, written examination.

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

du Plessis, H.: Fibreglass Boats, International Marine, Camden, 1996.
..., The Gougeon Brothers on Boat Construction-Wood and WEST System Materials, The McKay Press, Inc., Midland, 1985.
Pollard, S.F., Boatbuilding with Aluminum, International Marine, Camden, 1993.

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

Calder, N. *Boatowner's Mechanical and Electrical Manual*, International Marine, Camden, 1996.
Warren, N., *Metal Corrosion in Boats*, Adlard Coles Nautical, London, 1998.

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

Title	*Number of copies*	*Number of students*
du Plessis, H.: Fibreglass Boats, International Marine, Camden, 1996.	1	19
..., The Gougeon Brothers on Boat Construction-Wood and WEST System Materials, The McKay Press, Inc., Midland, 1985.	1	19
Pollard, S.F., Boatbuilding with Aluminum, International Marine, Camden, 1993.	1	19

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

Through the Institution’s quality assurance system.

Basic description		
Course title	**Statics**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	6
	Number of hours (L+E+S)	45+30+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Obtaining theoretical knowledge and develop skills to solve practical problems in the field of statics.		
1.2. Course enrolment requirements		
None.		
1.3. Expected course learning outcomes		
Define force, moment for a point and an axis, couple of forces and resultant of a force system. Solve problem of system of forces in a plane and space: colinear, concurrent and general systems. To simplify system of forces in a plane. Determine equilibrium conditions. Decomposition of forces in a plane. Determine the central axis of force system in space. Determine centroids of lines, areas and bodies. Apply Pappus-Guldin theorems. Define various types of beams, possible loads and internal forces. To solve trusses. To solve beams, frames and curved beams: equilibrium and internal forces diagrams. Solve problems that include sliding and rolling friction. Solve statics problems by the application of the virtual work principle.		
1.4. Course content		
Colinear system of forces. Concurrent, parallel and general system of forces in a plane. Determination of resultant of forces and equilibrium conditions in a plane. Moment of a force about a point. Varignon's theorem. Couple of forces and properties. Separation of a force into three components. Concurrent, parallel and arbitrary system of forces in a space. Determination of resultant of forces and equilibrium conditions in a space. Separation of force into three noncoplanar components. Moment of a force about a given axis. Reduction of arbitrary spatial system of forces. Axis of wrench. Centres of gravity: lines, surfaces, bodies. Pappus-Guldin theorems. Types of equilibrium. Trusses, beams, frames and curved beams. Sliding friction and rolling friction. Virtual work in statics.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☐ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments	-	
1.7. Student's obligations		
Course attendance, activity, homework, studying.		

1.8. Evaluation of student's work

Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	1	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, homework, continuous knowledge testing (three mid-term exams), written and oral exam.

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

Brnić, J.: "Statics", Sveučilište u Rijeci, Tehnički fakultet, Rijeka, 2004. (in Croatian)
Brnić, J.: "Mechanics and structural elements ", Školska knjiga, Zagreb, 1996. (in Croatian)

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

Matejiček, F., Semenski, D., Vnučec, Z.: "Introduction to Statics", Golden Marketing, Zagreb, 1999.(in Croatian)
Beer, F. P., Johnston, E.R., Eisenberg, E.R.:"Vector Mechanics for Engineers: Statics", McGraw-Hill, 2003.
Gross, D., Hauger, W., Schröder, J., Wall, W.A., Rajapakse, N.: Engineering Mechanics 1 – Statics, Springer, 2013

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

Title	*Number of copies*	*Number of students*
Brnić, J.: "Statics", Sveučilište u Rijeci, Tehnički fakultet, Rijeka, 2004. (in Croatian)	12	11
Brnić, J.: "Mechanics and structural elements", Školska knjiga, Zagreb, 1996. (in Croatian)	14	11

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Strength of Materials**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**1.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+45+0

1. **COURSE DESCRIPTION**							
1.1. Course objectives							
Developing knowledge and skills for autonomous stress and strain analyses and determining dimensions and materials of load carrying structures and their components.							
1.2. Course enrolment requirements							
Basic knowledge of statics of rigid bodies.							
1.3. Expected course learning outcomes							
Define the basic assumptions and notions in structural mechanics. Recognize loading types of structural elements. Define notions of stress and strains. Define the concept of stress and strain. Determine Cauchy's stress equations. Explain tensile test and define Hooke's lawCalculate extreme normal and shear stresses at uniaxial and planar stress states. Determine Mohr's stress and strain circles. Define Hooke's law for planar stress conditions. Determine membrane stresses in thin-walled pressure vessels. Calculate the strain and stress in structural elements subjected to axial loading, direct shear and torsion. Calculate the cross-section properties and determine Mohr's circle of inertia. Explain theories of failure. Determine equivalent stress for biaxial and triaxial stress conditions. Define types of bending of straight beams, analyze shearing force and bending moment diagrams, determine strains and stresses. Determine deflection line of straight beams. Explain three-moment equation for continuous beams. Determine and analyse distribution of internal forces at continuous beams. Calculate strains and stresses of structural members subjected to combined loadings. Determine buckling loads of elastic and inelastic columns.							
1.4. Course content							
Introduction. Simple and combined loadings. Axial loading. Direct shear. Stress and strain. Torsion. Geometric properties. Theories of failure. Bending of beams. Deflection curves. Continuous beams. Unsymmetric bending. Eccentric loading. Bending and torsion. Buckling of columns.							
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork			☐ individual assignment ☐ multimedia and network ☒ laboratories ☐ mentorship ☐ other			
1.6. Comments	-						
1.7. Student's obligations							
Course attendance, laboratory exercises, final exam, self-studying.							
1.8. Evaluation of student's work							
Course attendance	3	Activity/Participation		Seminar paper		Experimental work	0.5

Written exam	1.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance. Continuous knowledge testing. Laboratory exercises. Written and oral exam.

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

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

Brnić, J., Turkalj, G.: "Strength of Materials I" (in Croatian), University of Rijeka, Faculty of Engineering, Rijeka, 2004.
Brnić, J., Turkalj, G.: "Strength of Materials II" (in Croatian), Zigo, Rijeka, 2006.
Alfirević, I.: "Strength of Materials I" (in Croatian), Tehnička knjiga, Zagreb, 1995.
Šimić, V.: "Strength of Materials I" (in Croatian), Školska knjiga, Zagreb, 1992.
Gross, D., Hauger, W., Schröder, J., Wall, W.A., Bonet, J.: "Engineering Mechanics 2", Springer, 2011.
Gere, J. M.: "Mechanics of Materials", Brooks/Cole – Thomson Learning, Belmont, CA, 2004.

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

Title	*Number of copies*	*Number of students*
-	-	-
-	-	-

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

Through the Institution's quality assurance system.

Basic description		
Course title	**Thermodynamics NA**	
Study programme	**Undergraduate University Study of Naval Architecture**	
Course status	compulsory	
Year	**2.**	
ECTS credits and teaching	ECTS student 's workload coefficient	7
	Number of hours (L+E+S)	45+30+0

1. **COURSE DESCRIPTION**		
1.1. Course objectives		
Obtaining theoretical knowledge and develop skills to solve practical problems in the field of thermodynamics. Acquiring the knowledge required for attending lectures in the field of thermal and energy engineering.		
1.2. Course enrolment requirements		
Attended courses Mathematics I and Mathematics II.		
1.3. Expected course learning outcomes		
Define and describe the first and second laws of thermodynamics as well as the concept of thermal conditions. Define and describe the equation of state of an ideal gas and gas mixtures. Describe the ideal gas state changes. Describe and compare the thermal cycles. Compare and analyze the reversible and irreversible processes and define work losses due to the irreversibility. Describe and compare the processes of internal combustion engines. Describe state changes during evaporation and condensation. Describe, compare and analyze processes of steam plants. Describe and analyze the thermal behaviour during combustion. Describe and analyze the exchange of energy in the flow through the nozzle. Define, describe and compare basic types of heat transfer and describe the heat transfer within the heat exchanger. Describe and analyze the humid air changes of state. Apply acquired knowledge to solve thermodynamic tasks (practical problems).		
1.4. Course content		
Thermal state and thermal equilibrium postulates. The first law of thermodynamics. Ideal gas equation of state. Work and pV-diagram. Specific heat capacity. Gas mixtures. Ideal gas state changes. Thermodynamic cycles. Carnot cycle. Reversible and irreversible processes. Irreversibility and work. Entropy and irreversibility. The second law of thermodynamics. Technical work. Maximum work. Damping. Enthalpy. Mixing of gases. Mixing of gases irreversibility. Losses due to the irreversibility. Processes of internal combustion engines. Evaporation and condensation. The heat exchange during evaporation. State changes of saturated steam. Superheated steam. Processes of steam plants. Mollier hs-diagram. Exergy. Combustion. Thermal phenomena during combustion. Energy exchange in the flow. De Laval nozzle. Fundamentals of heat transfer. Heat conduction. Heat transfer by convection. Heat transfer by radiation. Overall heat transfer coefficient. Heat exchangers. Humid air. Mollier hx-diagram. Humid air changes of state.		
1.5. Teaching methods	☒ lectures ☐ seminars and workshops ☒ exercises ☐ long distance education ☐ fieldwork	☒ individual assignment ☐ multimedia and network ☐ laboratories ☐ mentorship ☐ other
1.6. Comments		

1.7. Student's obligations

Course attendance, activity, homework, studying.

1.8. Evaluation of student's work

Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam		Oral exam	2	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework	0.5				

1.9. Procedure and examples of learning outcome assessment in class and at the final exam

Course attendance, activity, homework, continuous knowledge testing (three mid-term exams), written and oral exam.

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

Bošnjaković, F.: Thermodynamics, Vol. I, II and III (reprint editions of 1978, 1976 and 1986), Graphis d.o.o., Zagreb, 2012. (in Croatian)
Halasz, B, Galović, A., Tadić, M.: Collections of exercises in Thermodynamics, part I, part II, Sveučilišna tiskara, Zagreb, 1993. and 1996. (in Croatian)

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

Galović, A.: Termodynamics I, (book), Fakultet strojarstva i brodogradnje, Zagreb, 2007. (in Croatian)
Galović, A.: Termodynamics II, (book), Fakultet strojarstva i brodogradnje, Zagreb, 2007. (in Croatian)

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

Title	*Number of copies*	*Number of students*
Bošnjaković, F.: Thermodynamics, Vol. I, II and III (reprint editions of 1978, 1976 and 1986), Graphis d.o.o., Zagreb, 2012. (in Croatian)	38	40
Halasz, B, Galović, A., Tadić, M.: Collections of exercises in Thermodynamics, part I, part II, Sveučilišna tiskara, Zagreb, 1993. and 1996. (in Croatian)	19	40

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

Through the Institution's quality assurance system.