University of Rijeka
Faculty of Engineering

CURRICULUM
UNDERGRADUATE VOCATIONAL STUDY OF NAVAL ARCHITECTURE

Rijeka, March 2015

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	lT	dT	L+T	
	Mathematics I	2	3			5	7
	Mechanics I	3	1		1	5	7
	Materials	2	1	1		4	6
	Fundamentals of Electrical Engineering	2		1		3	5
	Applied Computing VO	1		2		3	5
	TOTAL					20	30

L - lectures, aT – auditory tutorials, lT – laboratory tutorials, dT – design tutorials.

2. semester							
	Subject title	Hours / week					ECTS
		L	aT	lT	dT	L+T	
	Mathematics II	2	3			5	7
	Mechanics II	2	1		1	4	6
	Strength of Materials	2	1	1		4	6
	Technical Drawing	2			2	4	6
	Marine Vessels	2	1			3	5
	TOTAL					20	30

3. semester							
	Subject title	Hours / week					ECTS
		L	aT	lT	dT	L+T	
	Organization and Economics	2	1			3	4
	Fluid Mechanics VO	2	1			3	5
	Thermodynamics	3	1			4	6
	Ship Hull Forms VO	2	1		1	4	7
	Welding Engineering	2		1		3	5
	Foreign Language I[1]	1	1			2	3
	TOTAL					19	30

[1] elective: English or German - free choice

4. semester							
	Subject title	Hours / week					ECTS
		L	aT	lT	dT	L+T	
	Ship Hydrostatics	2	1		1	4	6
	Ship Structure	3			1	4	6
	Shipbuilding Technology I	2		1		3	5
	Machine Elements I NA	2			1	3	5
	Foreign Language II[1]	1	1			2	3
	Professional Practice I						5
	TOTAL					16	30

5. semester							
	Subject title	Hours / week					ECTS
		L	aT	lT	dT	L+T	
	Measuring Technology VO	2			1	3	5
	Shipbuilding Technology II	3		1	1	5	6
	Technological Processes of Ship Production and Repair	3	1		1	5	6
	Ship Construction	1			3	4	6
	Ship Equipment VO	3		1		4	7
	TOTAL					21	30

6. semester							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Small Craft Building and Maintenance	2	1		1	4	5
	Free Elective Subject					4	5
	Professional Practice II						10
	Final Work						10
	TOTAL					8	30

Free Elective Subject							
	Subject title	Hours / week					ECTS
		L	aT	IT	dT	L+T	
	Ship Design	2			2	4	5
	Quality Assurance VO	3			1	4	5
	Hydraulics and Pneumatics	3		1		4	5
	Automation VO	3	1			4	5
	Production Systems	2	1		1	4	5
	Technological Processes in Process Industry	3	1			4	5
	Radio Communications VO	3	1			4	5
	Physical and Health Education[2]			2		2	1

[2] Subject can be enrolled as additional free elective subject

UNDERGRADUATE VOCATIONAL STUDY OF NAVAL ARCHITECTURE TOTAL	Hours	ECTS
	104	180

Basic description		
Course title	Applied Computing VO	
Study programme	Undergraduate Vocational 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)	15+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Obtaining theoretical knowledge and developing skills for active participation in the information society. Acquiring the knowledge required for using operating system for personal computers and using office program, using the internet, creating a website, using mathematical and graphical applications.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Using Microsoft Windows operating system, Microsoft Word, Microsoft Excel, Microsoft Access, Microsoft PowerPoint. Using the internet and electronic mail.Using open source programs Linux and OpenOffice.Using Microsoft Project, Microsoft Visio, Microsoft Frontpage. Using a graphic design software CorelDRAW. Using a raster graphics editor Adobe Photoshop. Using an engineering calculation software PTC Mathcad. Using a programming language Microsoft Visual Basic.

1.4. Course content

The basic concepts of information technology (computer architecture, computer networks). Using personal computers and managing data (Microsoft Windows). Word processing (Microsoft Word). Spreadsheet application (Microsoft Excel). Database management system (Microsoft Access). Slide show presentation program (Microsoft PowerPoint). Accessing the internet (CARNet). Internet research and using electronic mail (Microsoft Internet Explorer, Microsoft Outlook Express). Online data bases. Publishing (Microsoft Publisher). Image editing (Adobe Photoshop). Using Microsoft Project and Microsoft Visio. Create and work with web sites using Microsoft FrontPage. Open source programs (operating system Linux and office program OpenOffice). The basics of mathematical program Mathcad and CorelDRAW fundamentals. The basics of programming language Microsoft Visual Basic.

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

1.6. Comments

1.7. Student's obligations

Attending lectures, control tests.

1.8. Evaluation of student's work

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

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

Attending lectures, sustained knowledge check (control tests), written exam.

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

Grundler, D.: Applied computing, Graphis, Zagreb, 2000.

Grundler, D., Gvozdanović, T., Ikica, Z. and others: Windows 7 Office 7 (ECDL), PRO-MIL, Varaždin, 2011.

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

Tackett, J., Burnett, S.: Linux, Strijelac, Zagreb, 1999.
Petric, D.: Research on Internet, Bug, Zagreb, 2002

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*
Grundler, D.: Applied Computing, Graphis, Zagreb, 2000.	5	100
Grundler, D., Gvozdanović, T., Ikica, Z. and others: Windows 7 Office 7 (ECDL), PRO-MIL, Varaždin, 2011.	2	100

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

Through structured Faculty quality assurance system.

Basic description		
Course title	Automation VO	
Study programme	Undergraduate Vocational 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)	45+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

None.

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

1.9. Assessment and evaluation of student's work during classes and on 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)

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	13
B. Katalinic, Industrieroboter und Flexible Systeme für Drehteile, VDI Verlag, Düsseldorf, 1990.	1	13
B. Katalinic, Intelligent Manufacturing Systems, skripta, Technische Universität Wien	2	13

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	English Language I	
Study programme	Undergraduate Vocational Study of Naval Architecture	
Course status	optional	
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 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). 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 vocational jargon from examples (Tenses; Definite and Indefinite Article, Comparison of Adjectives, Relative Clauses); implement grammatical structures and aspects in written 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; formulate in writing summaries, arguments and definitions.

1.4. Course content

Topics: Engineering Profession. The Atom. Interaction in Atomic Systems. Materials in Electrical Engineering. Magnetic Materials and Electromagnetism. Energy. Characteristics of Capacitance. Lenz`s Law-Inductance. Ohm`s Law-Resistance. The A-C Cycle. Electric Quantities and Units.
Grammatical Structures: Tenses. Definite and Indefinite Article. Comparison of Adjectives. Relative 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 independent learning.

1.8. Evaluation of student's work

Course attendance	1	Activity/Participation		Seminar paper	0.25	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.25	Report		Practice	
Portfolio							

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

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

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

Bartolić Lj.: Technical English in Electronics and Electrical Power Engineering. Školska knjiga Zagreb
Vince, M.: Intermediate Language Practice, Heinemann ELT, Oxford, 1998

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

Selected vocational articles and texts at the upper intermediate level of the Cambridge and Longman University Press.

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*
Bartolić Lj.: Technical English in Electronics and Electrical Power Engineering. Školska knjiga Zagreb		
Vince M.: Intermediate Language Practice, Heinemann Elt, Oxford 1998		

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 Vocational Study of Naval Architecture	
Course status	optional	
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

Attended course English Language I.

1.3. Expected course learning outcomes

Students should be able to use professional jargon like experts in Electrical Engineering who spend the most of their time in the plant, i.e. in the field, and to a lesser extent in the office, at the B2 level of the Common European Framework of Reference for Languages. Students should be able to: recognize and explain grammatical structures typical of the vocational jargon (Passive. Sequence of Tenses. Direct and Indirect Speech. Modals. Compounds. Word Formation. Conditional Clauses. Final Clauses); implement grammatical structures in written exercises; analyse and differentiate terminology and relevant elements in texts; paraphrase certain relevant parts in the text; write summaries of the text, arguments and definitions; analyse and describe complex diagrams, charts, figures, processes, experiments and mathematical formulae; defend orally their own positions as well as critically evaluate individual solutions of a problem.

1.4. Course content

Topics: Introduction to Electric Power Systems. Switches, Circuit Breakers and Fuses. Conduction and Transmission of Electric Current. Transformers. Electric Generators and Motors. Information Age. Introduction to Digital Computers and Microcomputers. Fundamentals of Transistor Physics. Transistors.
Grammatical Structures: Passive. Sequence of Tenses. Direct and Indirect Speech. Modals. Compounds. Word Formation. Conditional Clauses, Final Clauses. Writing Summaries.

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 independent learning.

1.8. Evaluation of student's work

Course attendance	1	Activity/Participation		Seminar paper	0.25	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.25	Report		Practice	
Portfolio							

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

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

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

Bartolić Lj.: Technical English in Electronics and Electrical Power Engineering. Školska knjiga Zagreb
Vince M.: Intermediate Language Practice, Heinemann ELT, Oxford 1998

Murphy R.: English Grammar in Use. Cambridge University Press, 1994

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

Selected vocational articles and texts at the upper intermediate level of the Cambridge and Longman University Press.

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*
Bartolić Lj.: Technical English in Electronics and Electrical Power Engineering. Školska knjiga Zagreb		
Vince M.: Intermediate Language Practice, Heinemann Elt, Oxford 1998		
Murphy R.: English Grammar in Use. Cambridge University Press, 1994		

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 Vocational 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 vocational knowledge, which should show the appropriate level of engineering skills for individually solving specific professional tasks.

1.2. Course enrolment requirements

Enrolled course from which the Final Work is selected.

1.3. Expected course learning outcomes

Apply acquired knowledge and skills of the vocational content of Final Work 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 vocational studies. Final thesis can be specified from a particular course specific vocational content and exceptionally from course that belongs to the group of shared vocational content, when it represents a broader entity with a particular course specific vocational 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. Assessment and evaluation of student's work during classes and on 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 VO	
Study programme	Undergraduate Vocational 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

Obtaining theoretical knowledge and develop skills to solve practical problems in the field of fluid mechanics.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Define and describe fluid properties such as density, pressure, viscosity, surface tension. Describe and apply the Euler equation of fluid statics. Analyse and describe various pressure measurement devices. Analyse and describe relative fluid movement under constant linear and rotational acceleration. Describe and apply fluid pressure on flat surfaces Describe and analyse buoyancy and stability. Define and describe the following equations: 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 analyse velocity and streamlines, streaklines and pathlines. Describe control volume and control surface. Define and describe laminar and turbulent flow, transition from laminar to turbulent flow, turbulent velocity profile, Reynolds number (Moody Chart) and other numbers important for Fluid Mechanics. Analyse pipe flow with minor and friction loses using Darcy Weisbach equation, parallel pipes, pipes in series.

1.4. Course content

Introduction to Fluid Mechanics, basic physical values. Continuum, vapour pressure. Fluid properties – density, surface tension, viscosity. Viscosity measurement. SAE oil classification. Fluid statics, Pascal's law. Pressure, Compressibility, Bulk Modulus of Elasticity, Speed of sound. Euler equation of fluid statics. Application of Pascal's law in hydraulic machinery. Euler equation of fluid statics. Relative fluid movement. Pressure measurement devices. Fluid forces on flat surfaces. Buoyancy and stability. Fluid kinematics, velocity and acceleration. 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. Steady closed conduit flow. Cavitation. Reynolds number (Moody Chart) and other numbers important for Fluid Mechanics. Transition from laminar to turbulent flow. Turbulence – velocity profile, turbulence modelling. Minor and friction loses. Pipes systems – parallel pipes and pipes in series.

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

1.6. Comments

1.7. Student's obligations

Course attendance, activity, homework, 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	-
Homework	-	Sustained knowledge check	2.5	Report	-	Practice	-
Portfolio	-						

1.9. Assessment and evaluation of student's work during classes and on 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)

Kranjčević, L., Fluid mechanics lectures
Kranjčević, L., Fluid mechanics solved problems

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

Cengel at. al., Fluid Mechanics, ata McGraw Hill Education Private, 2010.
Munson at al., Fundamentals of Fluid Mechanics, John Wiley and Sons, 2002.
Evett, J.B., at all, Scaums's 2500 Solved problems in Fluid Mechanics and Hydraulics, McGraw-Hill, 1988.

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*
Kranjčević, L., Fluid mechanics lectures	.pdf files – as needed	30
Kranjčević, L., Fluid mechanics solved problems	.pdf files – as needed	30
Cengel at. al., Fluid Mechanics, ata McGraw Hill Education Private, 2010.	2	30
Munson at al., Fundamentals of Fluid Mechanics, John Wiley and Sons. 2002	2	30
Evett, J.B., at all, Scaums's 2500 Solved problems in Fluid Mechanics and Hydraulics, McGraw-Hill, 1988.	30	30

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	Fundamentals of Electrical Engineering	
Study programme	Undergraduate Vocational 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

Understanding the relationship between electrical quantities. Measurements of basic electrical quantities. Knowledge of the basic principles of electrical machines and electronic components.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Explain the basic physical phenomena, quantities and laws in the field of electricity and magnetism. Define and explain the terms, determine the quantitative relationship between the basic electric quantities of DC and AC circuits. Define and explain the terms, determine the quantitative relationship between the basic quantities of the magnetic circuits. Explain the basic principles of basic electrical devices and machines. Explain and apply basic measurement of electrical quantities and methods of measurement.

1.4. Course content

The structure of matter. Electric charge. Electric field, potential. Electrical capacity. Direct current. Circuits. Ohm's law and Kirchhoff's laws. DC energy and power. The magnetic field. Magnetic flux. Induction. A current in a magnetic field. Electromagnetic induction. Self-induction, mutual-induction. Magnetic properties of matter. The magnetization curve. The magnetic circuit. Alternating current. Frequency, phase relations, and the mean and effective values. AC circuit with R, L, C elements. Power and energy of alternating current. Symmetrical three-phase system. Transformer. Synchronous and asynchronous motor. DC machines.

1.5. Teaching methods		
	☒ lectures	☐ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☒ exercises	☒ laboratories
	☐ long distance education	☐ mentorship
	☐ fieldwork	☐ 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		Experimental work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	0.5
Portfolio							

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

Course attendance, laboratory exercises, continuous knowledge testing (homeworks, tests, 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., 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	German Language I	
Study programme	Undergraduate Vocational Study of Naval Architecture	
Course status	optional	
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 German 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 purpose German as well as technical jargon 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 German on the basis of selected texts and topics from the field of mechanical engineering, naval architecture and electrical engineering; recognize and explain grammatical structures and principles typical of the vocational jargon from examples (Tenses; Modals, Compounds, Word Formation, Dependent Clauses, Relative Clauses, Passive); implement grammatical structures and aspects in written exercises; recognize 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.

1.4. Course content

Topics: Development and Manufacture of Technical Products. Basics of Mechanics. Basics of Thermodynamics. Basics of Fluids. Basics of Electrical Engineering. Energy. Electrical Energy. Current Circuit. Conductors and Insulators. Electricity in Households. Materials in Mechanical Engineering and Naval Architecture. Metal Forming. Tools and Machinery. Fittings. Grammatical Structures: Tenses. Modals. Compounds. Word Formation. Dependent Clauses. Relative Clauses. Passive.

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, independent learning.

1.8. Evaluation of student's work

Course attendance	1	Activity/Participation		Seminar paper	0.25	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.25	Report		Practice	
Portfolio							

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

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

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

Grujoski / Kovačić: Texts, exercises ans assignments in German language for electrical engineering. Školska knjiga Zagreb. (in Croatian)

Lardšnajder, R.: Texts, exercises ans assignments in German language for mechanical engineering. Školska knjiga, Zagreb. (in Croatian)
Štambuk / Marinić: Deutsch und Technik. Školska knjiga 1993.

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

Zettl / Jansen / Müller: Aus moderner Technik und Naturwissenschaft. Hueber 2003.
Selected texts.

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*
Grujoski / Kovačić: Texts, exercises ans assignments in German language for electrical engineering. Školska knjiga Zagreb. (in Croatian).	1	
Lardšnajder, R.: Texts, exercises ans assignments in German language for mechanical engineering. Školska knjiga, Zagreb. (in Croatian).	0	
Štambuk / Marinić: Deutsch und Technik. Školska knjiga 1993	0	

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	German Language II	
Study programme	Undergraduate Vocational Study of Naval Architecture	
Course status	optional	
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

Attended course German Language I.

1.3. Expected course learning outcomes

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. They should be able to: recognize and explain grammatical structures typical of the vocational jargon (Conditional Clauses. Infinitive Forms. Present and Past Participle. Comparison of Adjectives); implement grammatical structures in written exercises; differentiate and analyse relevant elements in the text; paraphrase certain relevant parts in the text; write summaries of the text; analyse and describe complex diagrams, charts, figures, processes and mathematical formulae; defend orally their own positions as well as critically evaluate individual solutions of a problem.

1.4. Course content

Topics: Sources of Energy and Environment Protection. Information Technology. Data Processing. Computer and Microcomputer. Generators and Motors. Semiconductors. Transistors. Electromagnetic Waves. Internal Combustion Engines. Diesel Engines Grammatical Structures: Conditional Clauses. Infinitive Forms. Present and Past Participle. Comparison of Adjectives. Specific vocabulary, grammatical and communication structures of German technical jargon.

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, independent learning.

1.8. Evaluation of student's work

Course attendance	1	Activity/Participation		Seminar paper	0.25	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.25	Report		Practice	
Portfolio							

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

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

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

Grujoski / Kovačić: Texts, exercises ans assignments in German language for electrical engineering. Školska knjiga Zagreb. (in Croatian)
Lardšnajder, R.: Texts, exercises ans assignments in German language for mechanical engineering. Školska knjiga,

Zagreb. (in Croatian)
Štambuk / Marinić: Deutsch und Technik. Školska knjiga 1993.

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

Zettl / Jansen / Müller: Aus moderner Technik und Naturwissenschaft. Hueber 2003.
Selected texts.

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*
Grujoski / Kovačić: Texts, exercises ans assignments in German language for electrical engineering. Školska knjiga Zagreb. (in Croatian).	1	
Lardšnajder, R.: Texts, exercises ans assignments in German language for mechanical engineering. Školska knjiga, Zagreb. (in Croatian).	0	
Štambuk / Marinić: Deutsch und Technik. Školska knjiga 1993	0	

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	Hydraulics and Pneumatics	
Study programme	Undergraduate Vocational 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)	45+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Mastering the basics of hydrostatic and pneumatic power transmissions, the application of knowledge to assemble circuits and simulations on commercial computer program.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Explain the mode of power transmission in hydraulic and pneumatic systems. Define sources of hydraulic and compressed air energy. Distinguish components for control in hydraulic and pneumatic systems. Describe auxiliary devices in hydraulic and pneumatic systems. Define logic circuits and types of control. Connect hydraulic and pneumatic components into simple systems. To implement the acquired knowledge in complex hydraulic and pneumatic systems.

1.4. Course content

Development and application of hydraulic and pneumatic equipment and systems. Standardized symbols of hydraulic and pneumatic components. Working fluids. Energy and power in hydraulic and pneumatic systems. Sources of the hydraulic energy and compressed air (pumps and compressors). Actuators (motors and cylinders). Control components of hydraulic and pneumatic systems (valves, pressure valves, flow control valves). Auxiliary devices for the transmission of energy (pipelines, fittings, filters, tanks, hydro accumulators, devices for maintaining the temperature of the fluid, the elements of air treatment, contact-free sensors, pneumatic gates and reflex nozzles, switches, indicators, signal converters, silencers). Hydro-pneumatic devices. Vacuum devices. Pneumatic logic circuits. Designing of the fluid power 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, laboratory work, the application of knowledge to a specific system for fluid power transmission through an essay.

1.8. Evaluation of student's work

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

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

Course attendance, activity, assembling circuits in laboratory, continuous knowledge testing (two mid-term exams), essay, written and oral exam.

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

Siminiati, D.: Oil Hydraulics, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2012. (in Croatian)
Bauer, G.: Ölhydraulik, B. G. Teubner, Stuttgart, 1992.
Nikolić. J.: Pneumatic Control, Zagreb, 1976. (in Croatian)

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

Krist, T.: Hydraulik, Fluidtechnik, Vogel Buchverlag, 1997.
Haug, R.: Pneumatische Steuerungstechik, Teubner, Stuttgart, 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*
Siminiati, D.: Oil Hydraulics, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2012. (in Croatian)	10	8
Nikolić. J.: Pneumatic Control, Zagreb, 1976. (in Croatian)	3	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	Machine Elements I NA	
Study programme	Undergraduate Vocational 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

Acquiring knowledge and skills about topics related to machine elements. The development of the ability to calculate, design and apply machine elements in industrial praxis, using modern materials and taking into consideration demands regarding reliability, safety, quality, cost, ecology, ergonomics, engineering ethics, etc.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Explain term, classification and application of machine elements. Explain selection of materials. Differentiate machine elements. Explain standardization of machine elements. Define and select machine elements using standards. Explain and define the design process. Explain and define types of loads and stresses. Define formulae for the calculation of stresses and allowable stresses. Explain and define joints of machine elements, shafts and axles, sliding contact bearings, rolling contact bearings, couplings, springs, pipe-lines and involute gearing. Understand the importance of using ecology and engineering ethics in design and application of machine elements. Apply acquired knowledge in design and application of machine elements.

1.4. Course content

Fundamentals of the machine elements - principal features, types, purpose. Criteria of operating capacity and calculation of machine elements. Strength of machine elements. Rigidity of machine elements. Resistance to vibration of machine elements. Heating of machine elements. Selection of materials. Standardization of machine elements. Joints of machine elements: riveted joints, welded joints, soldered joints, adhesive joints, joints formed by interference fits, threaded joints, cottered fastenings, key joints.Shafts and axles, sliding contact bearings, rolling contact bearings, couplings, springs, pipe-lines. Gearing: the fundamentals of the theory and operation of involute gears, materials, calculation and design of the pinion and the wheel, accuracy of gears, lubrication, efficiency. Application of commercial software solutions and/or own software solutions for calculation, analysis and optimization of machine elements. Analysis of the importance of using ecology and engineering ethics in design and application of machine elements.

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, solving assigned project work, studying.

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	1.5	Sustained knowledge check	1.5	Report		Practice	
Portfolio		Homework					

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

Course attendance, 2 mid-term exams, project work, final written exam.

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.: Machine Elements, Golden marketing-Tehnička knjiga, Zagreb, 2006. (in Croatian)
Kraut's Mechanical Engineering Handbook, Sajema, Zagreb, 2009. (in Croatian)

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

Orlić, Ž., Orlić, G.: Axles and Shafts, Zigo, Rijeka, 2004. (in Croatian)
Orlić, Ž., Orlić, G.: Metal Springs, Zigo, Rijeka, 2004. (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)	14	12
Decker, K.H.: Machine Elements, Golden marketing-Tehnička knjiga, Zagreb, 2006. (in Croatian)	7	12
Kraut's Mechanical Engineering Manual, Sajema, Zagreb, 2009. (in Croatian)	30	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	Marine Vessels	
Study programme	Undergraduate Vocational 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

Within this course students learn a basic knowledge about properties 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 concepts and terminology of vessels. Explain and interpret the basic properties and specifications of vessels. Describe and present parts of the ship hull, superstructure and equipment. Define basic types, dimensions and characteristics of the ship hull form. Distinguish and present the main elements of the ship hull structure for different types of ships. Analyze and describe the general plan and the characteristics of different types of ships. Explain and interpret the fundamentals of statics and dynamics of vessels. Distinguish and organize elements and configurations of ship main engine and propulsion systems. 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.

1.4. Course content

Vessels, definitions. Characteristics of vessels. Selection and specification of the ship. Basic structural characteristics of certain types of ships. Parts of the steel vessel. General plan of the ship. Hull form and dimensions. Characteristics, terms and professional terminology. Flotation and stability of the ship. Ship resistance and manoeuvrability. Ship propulsion. Ship main engine and systems. 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. Classification. Conventions, rules, guidelines and recommendations. Regulations and standards.

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

1.6. Comments

1.7. Student's obligations

Course attendance, activity, sustained knowledge check.

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	2.5	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on 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)

Furlan, Z. i dr.: Basics of Shipbuilding, Školska knjiga, Zagreb, 1989. (in Croatian)
Tupper, E.: Introduction to Naval Architecture, Butterworth-Heinemenn, Oxford, 1996.

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

Zubaly, B.R.: Applied Naval Architecture, Cornell Maritime Press Inc., Centreville, Maryland, 1996.
Kemp. J.F. & Young, P.: Ship Construction, Sketches & Notes, Heinemann Newnes, Oxford, 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*
Furlan, Z. i dr.: Basics of Shipbuilding, Školska knjiga, Zagreb, 1989. (in Croatian)	10	20
Tupper, E.: Introduction to Naval Architecture, Butterworth-Heinemenn, Oxford, 1996.	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	Materials	
Study programme	Undergraduate Vocational 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)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Student will be informed with the fundamentals of material science. In engineering practice student will be skilled for appropriate materials selection. Moreover, student will acquire basic methods of heat treatment and surface engineering.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Define the relationship between microstructure and properties of materials. Analyse the methods of materials testing. Analyse the application of phase diagram. Define equilibrium and non-equilibrium microstructure transformations in steel. Define the basic processes of heat treatment of steel and cast iron.

1.4. Course content

Definition and classification of technical materials. Trends of materials application in engineering. Microstructures of alloys. Phase composition of alloys. Solid solutions. Intermediate phases. Crystal imperfections. Diffusion. Phase diagrams of alloys. Metallographic analysis of the structure. Structure and properties of polymers. Thermoplastics and thermosets. Elastomers. Structure and properties of ceramics. Structure and properties of composite materials. Mechanical properties of materials. Basic destructive testing of materials. Basic non-destructive testing of materials. Special mechanical properties of polymers and ceramics and their evaluation. Electrical properties of materials. Heat treatment of steel. Fe-Fe_3C diagram, equilibrium and non-equilibrium microstructure transformations in steel. TTT-diagrams and their application. The basic processes of heat treatment of steel. Heat treatment of cast iron. Heat treatment of other alloys. Thermal treatment of other alloys. Possibility of application of certain materials in engineering.

1.5. Teaching methods		
	☒ lectures	☐ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☒ exercises	☒ laboratories
	☐ long distance education	☐ mentorship
	☐ fieldwork	☐ 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	1	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework	0.5				

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

Course attendance, participation in teaching, homework, sustained knowledge check (two mid-term exams), written exam.

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

Smoljan, B., Fundamentals of heat treatment of steel, Rijeka: Sveučilište u Rijeci, Pedagoški fakultet, 1997. (in Croatian)
Katavić , I.: Introduction to materials, Tehnički fakultet Rijeka, Rijeka, 1997. (in Croatian)

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

Pirš, J.: Materials technology, The science of metals I, II, III, IV i V part, Pedag. servis, Rijeka, 1965. (in Croatian)
Group of authors: Materials in mechanical engineering, Hrvatsko društvo za materijale i tribologiju, 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*
Smoljan, B., Fundamentals of heat treatment of steel, Rijeka: Sveučilište u Rijeci, Pedagoški fakultet, 1997. (in Croatian)	6	85
Katavić , I.: Introduction to materials, Tehnički fakultet Rijeka, Rijeka, 1997. (in Croatian)	19	85

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 Vocational 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)	30+45+0

1. COURSE DESCRIPTION

1.1. Course objectives

Understanding the basic concepts of linear algebra and differential calculus. Acquiring knowledge and skills necessary to develop the ability to solve mathematical problems set.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Describe and define basic mathematical operations with matrices and determinants. Describe the methods of solving systems of linear equations to solve the system and discuss the resulting solutions. Define the vector and arithmetic operations with vectors and correctly applied to calculate the sum of vectors, scalar and vector product of the concrete examples. Define the function, explain the basic concepts of functions of one variable (definition, parity, periodicity, the limit value, continuity) and define, draw and correctly interpret the elementary functions. Define the derivative of functions of one variable to calculate the derivatives of elementary and some complex functions. Apply derivatives in optimization and analysis of complex functions and draw their graphs.

1.4. Course content

Matrices. Determinants. Solving systems of linear equations. Vector in the plane and in the space. The functions of one variable. Limits and continuity of functions. Elementary functions (properties and graphs). The definition of derivation and their properties. Derivatives of elementary and complex functions. Taylor's theorem. Application of derivatives (linear approximation, the determination of extremes, flow testing functions, optimization).

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, studying, activity, homework, control tasks and tests.

1.8. Evaluation of student's work

Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.75	Oral exam	0.75	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework	1				

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

Course attendance, homework assignments, continuous knowledge testing, written and oral exam.

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

Štambuk, Lj.: Mathematics I, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2002. (in Croatian)
Jurasić, K.-Dražić, I.: Mathematics I, Workbook, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2008. (in Croatian)
Demidovič, B. P.: Tasks and solved examples from mathematics, Tehnička knjiga, Zagreb, sva izdanja, (in Croatian)

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

Slapničar I.: Mathematics 1, Sveučilište u Splitu FESB, Split 2002, online textbook
Finney, R. L., Thomas, G. B..: Calculus, Addison-Wesley Publishing Company, New York, 1992.

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*
Štambuk, Lj.: Mathematics I, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2002. (in Croatian)	14	
Jurasić, K.-Dražić, I.: Mathematics I, Workbook, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2008. (in Croatian)	5	
Demidovič, B. P.: Tasks and solved examples from mathematics, Tehnička knjiga, Zagreb, sva izdanja, (in Croatian)	6	
Slapničar I.: Mathematics 1, Sveučilište u Splitu FESB, Split 2002, online textbook	6	

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 Vocational 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)	30+45+0

1. COURSE DESCRIPTION

1.1. Course objectives

Understanding the basic concepts of integral calculus, differential equations, Laplace transform, and Taylor and Fourier polynomials. Acquiring knowledge and skills necessary to develop the ability to solve mathematical problems.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Define and correctly interpret the fundamental concepts of integral calculus of functions of one variable, show the basic properties of indefinite and definite integrals of functions of one variable. Calculate some integrals of functions of one variable. Explain and apply the numerical method for compute integrals. Apply the definite integral to calculate the area of plane figures, arc length, volume and area of the rotation body. Define and correctly interpret the fundamental concepts of ordinary differential equations of first and second order. Calculate general and individual solution of some ordinary differential equations of the first and linear differential equations of second order. Define the fundamental concepts of the Laplace transform and express the basic properties of Laplace transform. Calculate the Laplace transform of simple functions and determine the solutions of differential equations using Laplace transform. Explain the idea of some numerical methods for solving differential equations of the first order and properly apply them. Define and correctly interpret the fundamental concepts of function approximation by Taylor and Fourier polynomial, and applied in individual cases.

1.4. Course content

Indefinite Integral. Definite integral and its applications. Numerical methods of computing integrals. Ordinary differential equations of the first order. Linear differential equations of second order. Laplace transform. Application Laplace transform to solve differential equations. Numerical methods for solving differential equations of the first order. Taylor approximation of functions and Fourier polynomial.

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, studying, activity, homework, control tasks and tests.

1.8. Evaluation of student's work

Course attendance	2.5	Activity/Participation		Seminar paper		Experimental work	
Written exam	0.75	Oral exam	0.75	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework	1				

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

Course attendance, homework assignments, continuous knowledge testing, written and oral 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)
Demidovič, B. P. : Tasks and solved examples from mathematics, Tehnička knjiga, Zagreb, (in Croatian)
Kreyszig, E.: Advanced Engineering Mathematics, John Wiley&Sons, Inc.1993.

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

Sopta, L.: Mathematics 2, Tehnički fakultet Sveučilišta u Rijeci, Rijeka,1995.
Kamenarović, I.: Matrhematics for engineers I, Tehnički fakultet Sveučilišta u Rijeci, Rijeka,1997, udžbenik

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)	-	
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)	15	
Demidovič, B. P. : Tasks and solved examples from mathematics, Tehnička knjiga, Zagreb, (in Croatian)	6	
Kreyszig, E.: Advanced Engineering Mathematics, John Wiley&Sons, Inc.1993.	4	

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	Measuring Technology VO	
Study programme	Undergraduate Vocational Study of Naval Architecture	
Course status	compulsory	
Year	3.	
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

Understanding the basis of measurements and quality control. The acquisition of specific skills in methods and techniques of metrology and control. Understanding trends in the development of measurement in production and science.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Interpret basic metrological concepts. Conduct basic measurements in the field of industrial metrology. Error sources in dimensional measurements and calculation uncertainty of measurement results. Analyze, compare and validate the test results. Explain the basic principles of optical measurement techniques and 3D measurement systems.

1.4. Course content

Development and application of measurement. International System of Units. Base, derived and Non-SI units accepted for use with SI. Anglo-Saxon system of units. Metrology (scientific, technical and legal). Metrological conditions. Geometrical, mechanical and thermal effects on measurement results. Measurement error and uncertainty. Accuracy. Measuring procedure. Design of experiments in measurement. Measurement and measuring devices: shape, position, contour, pressure, temperature, force, hardness, roughness, speed, noise, electrical and magnetic quantities. Optical and opto-electronic measuring devices. Computer aided measurement and software for measurement. Interferometry. Measurement of the chemical composition materials. Measurement of layer thickness. Coordinate Measuring Machines and non contact three dimensional scanning metrology. Measuring system in machining. Calibration.

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, homework 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		Report	3	Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on 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)

Jay L. Bucher: The Metrology Handbook, ASQ Quality Press, 2004.
Graham T. Smith: Industrial Metrology, Springer, 2002.

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	Mechanics I	
Study programme	Undergraduate Vocational 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+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. Draw free body diagram for a planar and a spatial system of forces. Determine equilibrium equations and reaction forces. Analyse equilibrium problems that involve friction on the slope, screw, wedge and bearing, friction on belts and brakes and rolling friction. Define bending moment, shear force and axial force. Determine distribution of internal forces in trusses, beams and frames. Determine location of centroids of lines, areas and bodies.

1.4. Course content

Introduction. Terms and axioms of statics. Reactions. Planar systems of forces. Colinear, concurrent, parallel and general systems of forces. Moment of a force about a point. Determination of resultant of forces and equilibrium conditions for all systems of forces. Resolution of force into two and three components. Spatial systems of forces. Concurrent, parallel and general systems of forces. Moment of a force about a given axis. Centroids. Lines, areas and volumes. Pappus-Guldin theorems. Types of equilibrium. Trusses, beams and frames. Friction. Sliding: slope, screws, wedges, brakes, belt systems, bearings. Rolling friction.

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

1.9. Assessment and evaluation of student's work during classes and on 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)

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.
Das, M. B., Kasimali, A., Sami, S.: "Engineering Mechanics, Statics", Irwin, Boston, 1994.

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	117
Brnić, J.: "Mechanics and structural elements", Školska knjiga, Zagreb, 1996. (in Croatian)	14	117

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	Mechanics II	
Study programme	Undergraduate Vocational 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)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Obtaining theoretical and practical knowledge to solve problems in the field of kinematic of particle and rigid body. Ability to analyze basic motion characteristics like trajectory, displacement, velocity and acceleration. Development of theoretical and practical knowledge in the field of dynamics of a particle. Systems of particles and rigid body.

1.2. Course enrolment requirements

None

1.3. Expected course learning outcomes

Define motion of a particle in a Cartesian (rectangular) and cylindrical coordinate system. Determine the equation of a trajectory on the basis of the equations of motion for the case of planar motion of particles. Analyze the translational and rotational motion about a fixed axis of a rigid body. Calculate the gear ratio for a given configuration of power transmissions. Define and explain Newton's laws and the concept of inertial forces. For a given instances of motion of particles one should apply; Principle of linear impulse and momentum and the law of conservation of mechanical energy. Identify the work and the power due to the force or torque on the particle. Define the axial moments of inertia of simple bodies. Apply paralel–axis theorem. Analyze the planar motion of a rigid body by the action of forces and moments. Analyze the free and forced vibration of single degree of freedom.

1.4. Course content

Kinematics of particles. Coordinate systems. Graphs of motion. Rectilinear motion. Velocity and acceleration. Constant velocity and constant acceleration motion. Harmonic oscillations. Curvilinear motion of particles. Position, velocity and acceleration of a particle in different coordinate systems. Motion along circular path. Relative motion. Kinematics of a rigid body: translational, rotational and planar motion. Velocities of a body in planar motion. Relative motion analysis: velocity.. Relative motion analysis: acceleration. Three dimensional kinematics. Dynamics of a particle. Newton's laws. Inertial force. D'Alembert's principle. Linear momentum. Work of a force. Angular momentum. Potential and Kinetic energy. Power and efficiency. Dynamics of a rigid body. Translation. Rotation about fixed axis. Moments of inertia. Planar motion.

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, project assignments, 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		Project assignments	1				

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

Course attendance, activity, project assignments, written exam

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

Žigulić, R, Braut, S.: Kinematics, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2012. (in Croatian)
Krpan, M., Butković, M,, Žigulić, R., Braut, S., Franulović, A.: Dynamics, TFR, Rijeka, 2001. (in Croatian)
Jecić, S.: Mechanics II (Kinematics and Dynamics), Tehnička knjiga, Zagreb, 1989. (in Croatian)

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

Beer , F.P., Johnston, E.R.: Vector Mechanics for Engineers – Dynamics, Mc.Graw Hill, New York, 1988.
Pustaić, D., Wolf, H., Tonković, Z.: Introduction to analytical mechanics with basics of theory of vibration, 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.: Kinematics, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, 2012. (in Croatian)	10	107
Krpan, M., Butković, M,, Žigulić, R., Braut, S., Franulović, A.: Dynamics, TFR, Rijeka, 2001. (in Croatian)	17	107
Jecić, S.: Mechanics II (Kinematics and Dynamics), Tehnička knjiga, Zagreb, 1989. (in Croatian)	3	107

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 and Economics	
Study programme	Undergraduate Vocational Study of Naval Architecture	
Course status	compulsory	
Year	2.	
ECTS credits and teaching	ECTS student 's workload coefficient	4
	Number of hours (L+E+S)	30+15+0

1. COURSE DESCRIPTION

1.14. Course objectives

Assuming theoretical concepts and knowledge of the organization and business economics.

1.1. Course enrolment requirements

None.

1.2. Expected course learning outcomes

Explain the concept of business systems and building the business system. Define the basic principles of the organization. Define the management of systems and information in the enterprise. Analyze the types of organizational structures. Analyze the evaluation of jobs. Distinguish the ownership, the management and the leadership. Define the principles of management and leadership. Analyze the teamwork. Define the business policies. Describe the principles and methods of planning. Define the long-term and operational plans. Analyze network planning technique. Define the plant as an economic system. Analyze income and expenses. Distinguish the Income Statement and Balance Sheet. Define the effects of the business.

1.3. Course content

The definition of a business system. The evolution of the business system. Factory as a business system. Building the business system. The basic principles of the organization. Definition and managing of business system. The information in the enterprise. Types of organizational structures. Design of the business system. Evaluation of jobs. Ownership. Management. Leadership. The principles of management and leadership. Teamwork. Business policy. Planning. Principles and methods of planning. Network planning techniques. Plans of the business system. Long-term and operational plans. Using of computers in planning. Factory as an economic system. Income and expenses. Types of costs. Break even. Income Statement. Balance Sheet. Effects of business.

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

1.6. Student's obligations

Attendance, class participation, independent learning.

1.7. 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							

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

Attendance, class participation, continuous assessment (two mid-term exams), written exam.

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

Mikac, T., Ikonić, M.: Organization of Business Systems, Tehnički fakultet Sveučilišta u Rijeci, 2008. (in Croatian)

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

Novak, M., Sikavica, P.: Business Organization, Informator, Zagreb, 1999. (in Croatian)

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

Title	*Number of copies*	*Number of students*
Mikac, T., Ikonić, M.: Organization of Business Systems, Tehnički fakultet Sveučilišta u Rijeci, 2008. (in Croatian)	2	100

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

Through the Institution's quality assurance system.

Basic description		
Course title	Physical and Health Education	
Study programme	Undergraduate Vocational Study of Naval Architecture	
Course status	optional	
Year	3.	
ECTS credits and teaching	ECTS student 's workload coefficient	1
	Number of hours (L+E+S)	0+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

The general objective of the educational field of Physical and Health Education is to satisfy man`s biosocial need for movement through appropriate kinetic activities, thus satisfying this general need by increasing the adaptive and creative capabilities in contemporary life and work conditions.

1.2. Course enrolment requirements

None

1.3. Expected course learning outcomes

Through appropriate kinetic activities satisfy man`s biosocial need for movement.

1.4. Course content

The course content of the educational field of Physical and Health Education shall be implemented through regular (field athletics, football, basketball, volleyball, handball, swimming and water- polo, fitness) and optional (skiing, sailing, rowing, trekking, tennis and rafting) programmes.

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.

1.8. Evaluation of student's work

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

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

Regular course attendance.

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

Medved, R.: Sports medicine, Medicinska knjiga, Zagreb. (in Croatian)
Tuka, K.:Physiology of sport, Sportska tribina, Zagreb. (in Croatian)

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*
Medved, R.: Sports medicine, Medicinska knjiga, Zagreb. (in Croatian)	1	

Tuka, K.:Physiology of sport, Sportska tribina, Zagreb. (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	Production Systems	
Study programme	Undergraduate Vocational 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)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Qualified for the design of production systems. Ability to analyze models of production structures. Understanding the principles of grouping the articles.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Define the production system. Describe the characteristics of the production program. Explain the production availability of equipment and manpower. Analyze capacity utilization and system: technical and economic. Distinguish the models the flow of material and processing workflows. Define the correlation coefficient of operations and equipment. Explain the handling and transport of the workpiece, the input, between operations and exit transport. Define the processing cycle: explain the processing time, time of transport and waiting. Explain the models of production systems, a single or multi-workpiece lines, serial and flexible systems. Explain the organization of the work flow through the production system. Explain the method of grouping articles. Describe the layout of the plant, equipment and organization of the warehouse. Develop the project of production system: the task, analysis the variables, the concept of the project, plans of processing, optimization solutions, and the choice of the production model (lines, serial or flexible system). Choose of the transportation system.

1.4. Course content

Definition of the production system. Characteristics of the production program. Production availability of equipment and manpower. Capacity and systems utilization: technical and economic. Models flow of material: current, wavy, linear, and flexible. Workflow processing: one-way, two-way. The correlation coefficient of operations and equipment. Handling and transport of the workpiece. Input, between operations and exit transport. The level of automation of transport. Workpiece processing cycle: during processing, time of transport and waiting. Models of production systems. Single or multi-workpiece line, serial and flexible systems. The organization of the work flow through the production system. Methods of grouping of workpieces. The process of designing production systems: the task, analysis of variables, the concept of the project, plans processing, optimization solutions, the choice of the production model (lines, serial or flexible system). Choosing of the transportation system.

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

1.6. Comments

1.7. Student's obligations

Attendance and activity on class, seminar work.

1.8. Evaluation of student's work

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

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

Attendance, class participation, seminar work, written exam.

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

Mikac, T., Ikonić, M.: Organization of Business Systems, Graphic, Zagreb, 2008. (in Croatian)
Mikac, T.: Optimization of the Concept of Production System, disertation, Tehnički fakultet Rijeka, 1994. (in Croatian)

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

Veža, J.: Designing the Production Systems, Fakultet elektrotehnike, strojarstva i brodogradnje, Split, 1994. (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*
Mikac, T., Ikonić, M.: Organization of Business Systems, Graphic, Zagreb, 2008. (in Croatian)	2	16
Mikac, T.: Optimization of the Concept of Production System, disertation, Tehnički fakultet Rijeka, 1994. (in Croatian)	1	16

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 Vocational 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 professional knowledge, along with a comprehensive view of the work process.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Apply acquired professional knowledge and skills from studied courses. Gain working process experience. Develop and further improve competence for solving practical engineering problems.

1.4. Course content

Professional practice within Undergraduate Vocational 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 Professional Practice Rules and with Study Program curriculum. Within professional practice, student meets 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. Assessment and evaluation of student's work during classes and on 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	Professional Practice II	
Study programme	Undergraduate Vocational 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

Student verifies and complements his own professional knowledge, along with a comprehensive view of the work process.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Apply acquired professional knowledge and skills from studied courses. Gain working process experience. Develop and further improve competence for solving practical engineering problems.

1.4. Course content

Professional practice within Undergraduate Vocational 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 Professional Practice Rules and with Study Program curriculum. Within professional practice, student meets 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 30 working days, or 240 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	9
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on 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 VO	
Study programme	Undergraduate Vocational 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)	45+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. Pareto principle. 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. Specification limits and tolerances.
Products and processes quality assessment methods. Demerit method. Quality of measurement system.
Acceptance sampling. Reliability.

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

1.6. Comments

1.7. Student's obligations

Course attendance, active participation in the course, attendance at laboratory exercises, homework and independent learning.

1.8. Evaluation of student's work

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

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

Sustained knowledge check (three midterm exams) 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)

Montgomery, D.C., Jennings, C. L., Pfund, M. E.: Managing, controlling, and improving quality, John Wiley & Sons Wiley, 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*

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	Radiocommunications VO	
Study programme	Undergraduate Vocational 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)	45+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Students will acquire knowledge of the nature of radio-wave communications and major components of radiocommunication systems, from the source to a receiver. The course will provide the knowledge of key principles, phenomena, techniques, and components of the system.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Apply decibels and nepers. Distinguish the characteristics and implement key relations to analyze the wave propagation through an unguided medium. Explain the wave behavior on the boundary of two media. Apply the basics of wave propagation over a transmission line. Apply the Smith chart. Design a quarter-wavelength and binomial impedance transformer. Distinguish and apply the most used antenna parameters. State the propagation effects in a communication channel. Analyze simple RF link budgets. Evaluate frequency up- and down- conversion and image frequency.

1.4. Course content

Electromagnetic spectrum. Types of electromagnetic waves. A basic scheme of a radiocommunication system. Decibels and nepers. Plane wave in various media. Perpendicular and oblique wave incidence on media boundary. Transmission line model. The Smith chart. Quarter-wave impedance transformer. Binomial transformer. Fundamental antenna parameters. Communication channel and effects on the wave propagation. RF link budget. A brief overview of propagation models for field prediction. Intermodulation products. Frequency conversion. Image frequency.

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, literature reading, class preparation, and continuous studying.

1.8. Evaluation of student's work

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

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

Continuous knowledge examination (midterms) and final exam.

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

D. M. Pozar, *Microwave Engineering*, 3rd ed., Wiley, 2005.

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

J. D. Parsons, *The Mobile Radio Propagation Channel*, 2nd ed, Wiley, 2000.
C. A. Balanis, Antenna Theory: Analysis and Design, 3rd ed, Wiley-Interscience, 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*
D. M. Pozar, *Microwave Engineering*, 3rd ed., Wiley, 2005.	-	10
J. D. Parsons, *The Mobile Radio Propagation Channel*, 2nd ed, Wiley, 2000.	-	10
C. A. Balanis, Antenna Theory: Analysis and Design, 3rd ed, Wiley-Interscience, 2005.	-	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	Ship Construction	
Study programme	Undergraduate Vocational 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

None.

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 matching and continuity of structural elements. The choice of topology for midship construction. Elements of the construction of the bow and stern. Rudder, struts and boss. Special reinforcements of ship structures. Specificity and choice of design solutions in the area of cargo space, engine room, bow and aft peak. Possibilities 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. Assessment and evaluation of student's work during classes and on 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.:Ship Construction II, internal script, aviliable over web page of the Chair for construction of floating objects (in Croatian)

Eyres, D.J.: Ship Construction, Butterworth-Heinemann, Oxford 1994.
Grubišić, M.: Ship Structures, Viša pomorska škola – Split, 1974. (in Croatian)

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; IACS-CSR, LR, DNV, ABS, BV, GL, HRB.

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)	10	10
Eyres, D.J.: Ship Construction, Butterworth-Heinemann, Oxford 1994	2	10
Grubišić, M.: Ship Structures, Viša pomorska škola – Split, 1974. (in Croatian)	1	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	Ship Design	
Study programme	Undergraduate Vocational 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)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Creating a sense of the complexity of ship design. Based on the basic knowledge of the technical requirements, and its application, achieving compliance with the general basis for the understanding of the important factors in designing vessels.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Describe the process of the design of the vessel and to analyze the phases of design. Define and describe the concept of design requirements and conceptual and preliminary project. Specify and analyze methods of preparing a preliminary project, and to determine the main characteristics of the ship. Define buoyancy, elements of form and execute verification of the buoyancy and stability in the intact and damaged condition. Analyze the rationality of subdivision (subdivision of marine spaces and tanks) and unsinkability. Make a preliminary calculation of propulsion and prognostic charts. Define specific weights iteratively in various stages of design. Make a general plan, technical description and learn about the classification documentation. Analyze and explain the application of computers for basic calculations in the design of the vessels. Acquaint yourself with the delivery documentation and delivery testing programs.

1.4. Course content

Introduction to the design of the vessel. Design phases of the vessel. Project application. The conceptual design. Preliminary project. Methods of preparing a preliminary project. Determination of the main characteristics of the ship. Determination of buoyancy, elements of ship form and checking buoyancy and stability in the intact and damaged condition. Subdivision and unsinkability. The choice of form and ship lines. Determination of power and choice of main propulsion machinery. Preparation of the general plan of the ship. Determination of marine spaces and tanks. Preliminary determination of weight. The final project. Technical description. Classification documentation. International regulations, standards and conventions and rules of classification societies related to the design of the vessel. Use of computers for basic design calculations. Delivery documentation and acceptance tests.

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

1.6. Comments

1.7. Student's obligations

Attendance, class participation, 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	1	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on 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)

Watson, D.: Practical Ship Design, Elsevier Science Ltd., Oxford, 1998.
Schneekluth, H., Bertram, V.: Ship Design for Efficiency & Economy, Butterworth Heinemann, Oxford, 1998.
Letcher, J.: Principles of Naval Architecture Series: The Geometry of Ships The Society of Naval Architects & Marine Engineers (www.sname.org), 2009.

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

Belamarić, I.: Ship and Entropy, Književni krug, Split, 1998. (in Croatian)
Rules for Ship Technical Survey, Part 1.-8., Hrvatski registar brodova, Split, 1999. (in Croatian)
Rawson, K.J., Tupper, A.C.: Basic ship theory, Volume 1 & 2, 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*
Watson, D.: Practical Ship Design, Elsevier Science Ltd., Oxford, 1998.	1	6
Schneekluth, H., Bertram, V.: Ship Design for Efficiency & Economy, Butterworth Heinemann, Oxford, 1998.	1	6
Letcher, J.: Principles of Naval Architecture Series: The Geometry of Ships The Society of Naval Architects	1	6

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 Equipment VO	
Study programme	Undergraduate Vocational 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+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	2	Experimental work	
Written exam	1.5	Oral exam		Essay		Research	
Project		Sustained knowledge check	1.5	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on 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)

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 main and auxiliary engine and device, 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 VO	
Study programme	Undergraduate Vocational 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)	30+30+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 a 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 analyse 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. Distinguish and explain the numerical description of ship form using computer software. Define and describe the form of appendages. Analyse 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. Dimensionless representation of marine forms. 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	Activity/Participation		Seminar paper		Experimental work	
Written exam	2	Oral exam		Essay		Research	
Project	1	Sustained knowledge check	2	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on 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, 1982. (in Croatian)

Grubišić, I.: Ship Geometry, Digital script. (in Croatian)

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.

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	12
Furlan, Z., Lučin, N., Pavelić, A.: Basics of Shipbuilding, Školska knjiga, Zagreb, 1982. (in Croatian)	10	12
Grubišić, I.: Ship Geometry, Digital script. (in Croatian)		12

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 Hydrostatics	
Study programme	Undergraduate Vocational 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+30+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

Attended course Ship Hull Forms VO

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

1.9. Assessment and evaluation of student's work during classes and on 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)
Rawson, K.J., Tupper, A.C.: Basic ship theory, Volume 1, 2001.

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)	9	12
Uršić, .J.: Ship Stability, part I i II, script, Fakultet strojarstva i brodogradnje, Zagreb, 1964. (in Croatian)	2	12
Rawson, K.J., Tupper, A.C.: Basic ship theory, Volume 1, 2001.	1	12

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	
Study programme	Undergraduate Vocational 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 aluminum. 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. Shell, frames, web frames, longitudinals, stringers. Deck, deck beams, longitudinal under deck girder, pillars. Openings in deck, hatch, hatch covers and hatch coamings. Bulkhead, structural tanks, Superstructure and deckhouses.

1.5. Teaching methods		
	☒ lectures	☒ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☒ exercises	☐ laboratories
	☐ long distance education	☐ mentorship
	☐ fieldwork	☐ 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	0.5	Sustained knowledge check	2.5	Report		Practice	
Portfolio							

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

Course attendance, activity, continuous knowledge testing (two 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 I, internal script, available over web page of the Chair for construction of floating objects
Eyres, D.J.: Ship Construction, Butterworth-Heinemann, Oxford 1994.
Grubišić, M.: Brodske konstrukcije, Viša pomorska škola – Split, 1974

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

Taggart, R.: Ships Design and Construction, SNAME, New York 1980.
..., Pravila i propisi klasifikacijskih društava; IACS-CSR, LR, DNV, ABS, BV, GL, HRB.

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 (In Croatian)	10	10
Eyres, D.J.: Ship Construction, Butterworth-Heinemann, Oxford 1994	2	10
Grubišić, M.: Brodske konstrukcije, Viša pomorska škola – Split, 1974	1	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	Shipbuilding Technology I	
Study programme	Undergraduate Vocational 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 shipbuilding production process, from steel stockyard stage to the ship assembly on building berth stage, according to defined learning outcomes.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Interpret the development and characteristics of the shipbuilding production process. Describe the storage and preparation of materials for hull structure. Describe the prefabrication phase of plates and profiles. Explain how to reproduce specific shapes and dimensions, marking and fabrication of ship structure elements. Identify procedures, machines and devices for steel cutting. Explain procedures for forming metal plates and profiles and describe relevant forming machines. Identify phases of shipbuilding process and material flow. Explain ship outfitting process and transport of ship building blocks. Distinguish automated lines for ship blocks fabrication and assembly. Interpret fabrication and assembly process of ship elements, two-dimensional and three-dimensional ship blocks. Explain using software support in ship design and ship production.

1.4. Course content

The basic principles of shipbuilding technology, the development specific characteristics of shipbuilding production process. Materials in shipbuilding. Ship structure material storage and preparation. Plates and profiles prefabrication. Reproduction of dimensions and forms, marking and fabrication of ship structure elements. Mechanical and thermal cutting. Machines and tools for cutting. Plasma cutting Laser cutting. Plates and profiles forming and forming machines. Material flow. Ship production process phases. Automated lines for fabrication, assembly and transportation. Working areas for ship blocks preassembly and assembly. Structure preassembly. Fabrication of small interim products, panels, two-dimensional, three-dimensional i and block section of ship. Blocks. Outfitting and transport of ship section. Application of software solutions as support to ship design and ship production.

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.

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	2.5	Report		Practice	
Portfolio							

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

Course attendance, 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)

Storch, R. L. at al: Ship Production, 2nd edition, SNAME, 2007.

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

Furlan, Z., Lučin, N., Pavelić, A.: Shipbuilding Technology, Školska knjiga, Zagreb, 1986. (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*
Storch, R. L. at al: Ship Production, 2nd edition, SNAME, 2007.	2	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 II	
Study programme	Undergraduate Vocational 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+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Students gain knowledge within the area of ship production from hull erection on building berth towards final ship delivery according to defined learning outcomes.

1.2. Course enrolment requirements

Attended course Shipbuilding Technology I

1.3. Expected course learning outcomes

Describe and differentiate between various types of ship and other offshore objects building berths. Describe equipment and machinery of the shipyards. Explain and analyze slipway preparation works for ship construction. Analyze and describe the design and layout of ship supporting blocks, rake pillars, trigger mechanism, stoppers, sliding ways and ground ways, and release mechanisms. Classifications of shipbuilding methods on slipway, determine the order of ship blocks erection and outfitting, and to explain location of temporary openings and ventilation. Define and describe the ship launching procedure. Define and describe the final works for ship hull finalisation and ship outfitting after launching. Describe the installation of machinery and equipment, shafting, propulsion and rudders. Describe and differentiate ship equipping process with pipes, hardware, insulating, carpentry and electrical equipment. Describe and differentiate corrosion works, control works and testing of ship systems and devices. Describe the sea trials, ship delivery, and warranty period and docking.

1.4. Course content

Types of building berths for ships and other offshore objects: slipways, syncrolifts, docks, horizontal building slipways. Shipyard equipment and machine tools. Ship position on slipway. Construction arrangement of support blocks, spurs, stopper release mechanisms. Launching equipment: runners and moving slips. Ship erection and outfitting methods and sequences. Launching. Hull and outfitting finalization works. Equipping the piping systems, electrical cables and electrical equipment. Main engine and machinery installation, installation of shafting, propulsion and rudder. Painting. Checking and testing of equipment and ships systems. Sea trials. Delivery and guarantee works. Ship docking. Temporary openings, ventilation. Scaffolding.

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, seminar paper.

1.8. Evaluation of student's work

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

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

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

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

Storch, R. L. at al: Ship Production, 2nd edition, SNAME, 2007.

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

Furlan, Z., Lučin, N., Pavelić, A.: Shipbuilding Technology, Školska knjiga, Zagreb, 1986.(in Croatian)
Marušić, I., Piping in Shipbuilding, Školska knjiga, Zagreb, 1983. (in Croatian)
Čujić, M., Bravarski i limarski radovi u brodogradnji, Školska knjiga, Zagreb, 1984.

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*
Storch, R. L. at al: Ship Production, 2nd edition, SNAME, 2007.	2	6

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	
Study programme	Undergraduate Vocational Study of Naval Architecture	
Course status	compulsory	
Year	3.	
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

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. Rigging and sails outfitting of sailing boat. 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	2	Activity/Participation		Seminar paper	2.5	Experimental work	
Written exam	0.5	Oral exam		Essay		Research	
Project		Sustained knowledge check		Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on 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	Strength of Materials	
Study programme	Undergraduate Vocational 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)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Obtaining theoretical knowledge and develop skills to solve practical problems in the field of structural analysis and structural design.

1.2. Course enrolment requirements

Basic knowledge of rigid body static.

1.3. Expected course learning outcomes

Define basic assumptions and terms in solid mechanics. Define strain and stress. Determine extreme stress values. Differentiate simple and compound stress states. Define Hooke's law. Differentiate simple and compound loading cases. Calculate strains and stresses at axial loading, shear and torsion. Calculate cross-section propreties. Calculate strains and stresses at bending of beams. Define deflection lines of beams. Calculate critical buckling loads of columns. Calculate strains and stresses at compound loadings.

1.4. Course content

Introduction. Strains. Stress. Hooke's law. Axial loading. Shear. Torsion. Theories of strength. Cross-sectional properties of areas. Bending of beams. Deflection of beams in bending. Buckling of bars. Biaxial bending. Eccentric loading. Combined bending and torsion. Springs.

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

1.6. Comments

1.7. Student's obligations

Course attendance, laboratory experimental work, studying.

1.8. Evaluation of student's work

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

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

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

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

Brnić, J., Turkalj, G.: "Strength of Materials I", Sveučilište u Rijeci, Tehnički fakultet, Rijeka, 2004. (in Croatian)
Brnić, J., Turkalj, G.: "Strength of MaterialsII", Zigo, Rijeka, 2006. (in Croatian)

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

Alfirević, I.: "Strength of Materials I", Tehnička knjiga, Zagreb, 1995. (in Croatian)
Šimić, V.: "Strength of Materials I", Školska knjiga, Zagreb, 1992. (in Croatian)
Seed, G.M.: "Strenght of Materials ", Saxe-Coburg Publications, Edinburgh, UK, 2000. (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*
Brnić, J., Turkalj, G.: "Strength of Materials I", Sveučilište u Rijeci, Tehnički fakultet, Rijeka, 2004. (in Croatian)	15	155
Brnić, J., Turkalj, G.: "Strength of Materials II", Zigo, Rijeka, 2006. (in Croatian)	7	155

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	Technical Drawing	
Study programme	Undergraduate Vocational 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)	30+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

The achievement of the proficiency in the development of 2D geometrical models of 3D objects and implementation of traditional and computer techniques for geometrical modelling. The development of the ability to communicate design ideas using technical drawings in standard drafting formats.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Interpret and apply traditional and CAD techniques for the development of 2D geometrical model. Compare and distinguish the methods of shape description. Compare 3D primitives and interpret the emergence of complex objects. Interpret and apply ISO code system for linear size tolerances, fits, geometrical tolerances and surface texture. Note the role of standardization and standards. Interpret engineering graphics. Organize engineering documentation in accordance with standards. Estimate personal contribution and the contribution of lecturer to the acquisition of contents.

1.4. Course content

Graphical communications. The design process and the role of the design model. Traditional, 2D and 3D CAD techniques for the development of models. The shape description: projection theory, multi-view drawings, sectional views, pictorial representations. Standardization and standards. Technical documentation graphics: size description, tolerances and fits, texture of technical surfaces.

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, homework, studying.

1.8. Evaluation of student's work

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

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

Course attendance, homework, 2 constructive works, continuous knowledge testing (2 exams), written exam.

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

M. Kljajin, M. Opalić: *Engineering Graphics,* Strojarski fakultet u Slavonskom Brodu,Slavonski Brod, 2010. (in Croatian)
G. Marunić, J. Butorac, S. Troha: *Engineering Graphics, Collection of Shape Description Problems*, Zigo Rijeka, Rijeka, 2008. (in Croatian)
Kraut` s Engineering Manual, SAJEMA, Zagreb, 2009. (in Croatian)

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*
M. Kljajin, M. Opalić: *Engineering Graphics,* Strojarski fakultet u Slavonskom Brodu,Slavonski Brod, 2010. (in Croatian)	10	82 / 27
G. Marunić, J. Butorac, S. Troha: *Engineering Graphics, Collection of Shape Description Problems*, Zigo Rijeka, Rijeka, 2008. (in Croatian)	10	82 / 27
Kraut` s Engineering Manual, SAJEMA, Zagreb, 2009. *(in Croatian)*	10	82 / 27

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	Technological Processes of Ship Production and Repair	
Study programme	Undergraduate Vocational 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+30+0

1. COURSE DESCRIPTION

1.1. Course objectives

Within this course student gain knowledge about technological processes of ship production and ship repair in accordance with defined learning outcomes.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Define the shipbuilding business and manufacturing system and the ship characteristics as a final product. Distinguish differences between ship production ship repair processes. Describe the basic processes of the preparatory phase of ship production and ship repair. Interpret ship production breakdown. Distinguish documentation for the ship production and repair of the ship. Apply study of work and time, and define work normative. Distinguish between capacity and throughput of ship production process phases. Describe the characteristics of the ship repair process. Explain types of cooperation in shipbuilding. Interpret organizational models of ship production. Analyze business performance indicators, development and improvement of the ship production and ship repair processes.

1.4. Course content

Introduction. Definition of the shipbuilding business and manufacturing systems. Characteristics of the ship as a final product. Types and definitions of process. Characteristics of ship production and repair processes. Ship production breakdown. Preparing phases of ship production and repair processes. Basic processes of preparing phase of ship production and repair. Methods for processes and procedure presentation. Ship production and repair documentation, types and division. Technical, technological, work calculation and planning documentation. Study of work and time. Work normative. General plan and operating plans of ship production and ship repair. Preparation of work documentation, materials and production resources. Ship repair process characteristics. Capacity and throughput of main processes of ship production. Cooperation in shipbuilding. Organizational models of ship production. Shipyard business results indicators. The development and improvement of the ship production and repair processes.

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, seminar paper.

1.8. Evaluation of student's work

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

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

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

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

Furlan, Z., Lučin, N., Pavelić, A.: Shipbuilding Technology, Školska knjiga, Zagreb, 1986. (in Croatian)
Butler, D.: Guide to Ship Repair Estimates, Butterworth Heinemann, 2000.

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

Marušić, I.: Piping in Shipbuilding, Školska knjiga, Zagreb, 1983. (in Croatian)
Čujić, M.: Metalworks in Shipbuilding, Školska knjiga, Zagreb, 1984. (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*
Furlan, Z., Lučin, N., Pavelić, A.: Shipbuilding Technology, Školska knjiga, Zagreb, 1986. (in Croatian)	20	6
Butler, D.: Guide to Ship Repair Estimates, Butterworth Heinemann, 2000.	2	6

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	Technological Processes in Process Industry	
Study programme	Undergraduate Vocational 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)	45+15+0

1. COURSE DESCRIPTION

1.1. Course objectives

Developing skills and competencies involvement in technical issues and solving them during the design, construction and operation. Developing the capacity to identify technical problems, analyzing and making proposals for technical improvements.

1.2. Course enrolment requirements

None

1.3. Expected course learning outcomes

Describe the technological processes in the process industry. Define and explain the main operating parameters of technological processes in the process industry. Develop and explain the basic scheme of technological process. Analyze and explain the factors influencing the efficiency of technological processes. Define and describe the main equipment of process plants. Calculate the main dimensions and operational parameters of equipment, machinery and devices in process plants. To analyze the economic size of technological processes in the process industry. Define and explain the safety requirements of process plants.

1.4. Course content

The introduction of technological processes in the process industry. Basic technological processes (physical and chemical): filtration, separation, aeration, degassing, degasification, evaporation, adsorption, desorption, extraction, neutralization, ion exchange, distillation, fractionation, rectification, thermal cracking, catalytic cracking, hydrocracking, reforming, hydrogenation. Biological processes. Technological installations in the oil industry, the petrochemical industry, the chemical industry and in other process industries. Automation of technological processes. Optimization. Advanced management, monitoring and analysis of technological process control, product quality, operating costs. The economic analysis of technological processes.

1.5. Teaching methods	X lectures ☐ seminars and workshops X exercises ☐ long distance education X fieldwork	X 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	2	Activity/Participation		Seminar paper	1	Experimental work	
Written exam	0.5	Oral exam	0.5	Essay		Research	
Project		Sustained knowledge check	1	Report		Practice	
Portfolio							

1.9. Assessment and evaluation of student's work during classes and on 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)

Prelec, Z.: Energetics in Process Industry, Školska knjiga, Zagreb, 1994. (in Croatian)

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

El-Wakil M. M: Powerplant Technology; Mc Graw Hill Book Company, 1988.
Reis, A., Smith I.: Energy Economic and Management in Industry, Vol. 1 , Vol. 2, Pergamon Press, 1984.

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*
Prelec, Z.: Energetics in Process Industry, Školska knjiga, Zagreb, 1994. (in Croatian)	2	

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

Through the Institution's system of quality control

Basic description		
Course title	Thermodynamics	
Study programme	Undergraduate Vocational 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

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 state changes during evaporation and condensation. Describe, compare and analyze processes of steam plants. Describe and analyze the thermal behaviour during combustion. Describe and compare the processes of internal combustion engines. 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 changes and processes with humid air. Apply acquired knowledge to solve thermodynamic tasks (practical problems).

1.4. Course content

The historical development of energy use. Thermal state. The first law of thermodynamics. Ideal and real gas. Equation of state. Work. 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. 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. Processes of internal combustion engines. Energy exchange in the flow. De Laval nozzle. 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 state changes.

1.5. Teaching methods		
	☒ lectures	☒ individual assignment
	☐ seminars and workshops	☐ multimedia and network
	☒ exercises	☐ laboratories
	☐ long distance education	☐ mentorship
	☐ fieldwork	☐ 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	1.5	Essay		Research	
Project		Sustained knowledge check	2	Report		Practice	
Portfolio		Homework	0.5				

1.9. Assessment and evaluation of student's work during classes and on 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.

Basic description		
Course title	Welding Engineering	
Study programme	Undergraduate Vocational 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

The course is designed to provide the student with basic knowledge in welding engineering topics. Student is introduced with practical application of several welding processes.

1.2. Course enrolment requirements

None.

1.3. Expected course learning outcomes

Describe the basic welding processes and classify welding power sources. Interpret characteristics of arc and mechanisms of formation of the welded joint. Explain weldability and describe the specifics of welding alloy steel, cast iron, aluminum and copper alloys. Classify welding consumables and types of welds. Calculate power requirements for welding and consumption of welding consumables for arch welding. Classify errors in welding and describe methods for quality assurance of welding.

1.4. Course content

Historical development of welding processes. Pressure welding processes. Fusion welding processes. Arc welding. Arc characteristics. Heat input. Static characteristic of an electric arc. Classification of power sources. Welding parameters. Power source equipment. Welding metallurgy. Metal transfer in arc welding. Microstructure of welded joints. Heat affected zone. Weldability. Welding cracks. Preheating. Alloys welding. Design of welded joints. Terms and definitions. Welding symbols. Welding consumables. Classification, characteristics and designation of covered electrodes. Electrodes selection. Energy consumption. Productivity indices. Quality of welds. Welds imperfections. Inspections of welds. Welding procedures.

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 on-site training, homework and 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	2	Report		Practice	
Portfolio			0.5				

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

Sustained knowledge check (three midterm exams) 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)

Connor, L.P., ed.: *Welding Handbook, Vol. 1, Welding Technology*, AWS, Miami, 1989.
O'Brien, R.L., ed.: *Welding Handbook, Vol. 2, Welding Processes*, AWS, Miami, 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*

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

Through the Institution's quality assurance system.