## DETAILED PROPOSAL OF THE STUDY PROGRAMME

## GRADUATE UNIVERSITY STUDY NAVAL ARCHITECTURE

SPLIT, February 2022

## 1.1. List of mandatory and elective courses

List of courses								
Year of study: 1								
Semester: 1								
STATUS CODE	CODE	COURSE		HOURS	S IN SEM	1ESTER		ГСТС
	CODE	COURSE	L	S	AE	LE	CE	ECIS
	FESN01	Marine engines	30	0	30	0	0	6
Mandatory	FESL10	Finite element method	30	0	15	0	15	5
	FETN01	Project management	30	0	30	0	0	4
	FESN20	<u>Sailboats</u>	30	0	0	0	15	5
Elective	L = lecture	, S = seminar, AE = auditory exercise, LE = lab	oratory,	CE = cor	nstructiv	e exerci	se	

	List of courses										
Year of study: 2											
Semester: 3											
	CODE	COURSE	HOURS IN SEMESTER								
STATUS		COURSE	L	S	AE	LE	CE	ECIS			
FESN	FESN23	Vibrations and vibration control	30	0	0	30	0	5			
-	L = lecture,	L = lecture, S = seminar, AE = auditory exercise, LE = laboratory, CE = constructive exercise									

## 1.2. Course description

NAME OF THE COURSE	Ξ	Marine engines								
Code	FESN01		Year of study	1						
Course teacher	<u>Gojmir</u>	<u>Radica</u>	Credits (ECTS)	6						
	Dario B	ezmalinović	Turne of instance in a family of	Р	S	AE	LE	CE		
Associate teachers	lvan To Tino Su	ılj ımić	of hours)	30	0	30	0	0		
Status of the course	Elective	2	Percentage of application of e-learning	0						
			COURSE DESCRIPTION							
Course objectives	Studer machir param	nts will gain kno neries and devic eters calculatio	wledge about the basic princip ces, about the methods of thei ns.	ples of m ir applica	arine pro tions, ba	pulsior sic knov	and auxil wledge abo	iary out		
Course enrolment requirements and entry competences required for the course										
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Studer – An – Cri rec – Ch ve	nts will be able t alyze basic prin itically discuss a quested applica oose elements ntilation system	co: ciples of marine propulsion an bout selection of main propul tion, energy demand and acco of propulsion system, fuel, oil, n.	nd auxilia sion engi ording to cooling :	ry machi ne and a rules and systems a	neries a uxiliary I regula and exh	ind device machiner tion, naust and	s, / for		
	Conter	nt					L	AE		
							hours	hours		
Course content	Marine	e propulsion sys	tems development. Steam bo	ilers.			2	2		
broken down in detail	Marine	e steam turbine	S.				2	2		
by weekly class schedule (syllabus)	Marine	e gas turbines.					2	2		
	Marine	e propulsion en	gines.				2	2		
	Engine	combustion.					2	2		
	Scaver	nging and exhau	ist.				2	2		

	Turbochargers.						2	2	
	Main parameter	rs of marin	e engines				2	2	
	Application of m	narine engi	ne. Test bed ar	nd sea trial.	•		2	2	
	Fuel, oil, cooling	systems.					2	2	
	Marine auxiliary	, engines, p	oumps, compre	ssors.			2	2	
	Propeller systen	ns.					2	2	
	Diesel-electric p	ropulsion.	Combined pro	pulsion sys	tems	. IMO regulation.	2	2	
Format of instruction	<ul> <li>☑ lectures</li> <li>□ seminars and</li> <li>☑ exercises</li> <li>□ on line in ention</li> <li>□ partial e-learn</li> <li>□ field work</li> </ul>	workshops rety ing	5	⊠ individu □ multim □ laboratu □ work w □ individu	dual assignments media atory with mentor dual project (other)			1	
Student responsibilities	Class attendanc	lass attendance.							
Screening student work (name the	Class attendance	2	Research			Practical training	5		
proportion of ECTS	Experimental work		Report	Individual work				2,7	
activity so that the	Essay		Seminar essay	,		Lab exercises			
total number of ECTS credits is equal to the	Tests	0,2	Oral exam			(Other)			
ECTS value of the course)	Written exam	0,1	Project			(Other)			
Grading and evaluating student work in class and at the final exam	Continuous asse	essment du	iring class.						
		Titl	e		Nu i	mber of copies n the library	Availabil other m	ity via Iedia	
Required literature (available in the	Radica G. Predav propulzijski susta	vanja iz pre avi	dmeta Brodski				e-learr	ning	
library and via other media)	Grljušić M. Pogo skripta, FESB, 20	nski pomoi 01.	rski sustavi. Int	erna		5			
	Šneller S, Parat Ž Zagrebu, FSB, 19	. Pogon br 99.	oda II. Sveučiliš	śte u		5			

Optional literature (at the time of submission of study programme proposal)	Harrington, R.L., "Marine Engineering", SNAME, N.J. USA, 1992. Haarlas, M., "Steam and Gas Turbines for Marine Propulsion", Naval Institute Press, Annapolis, Maryland, 1987. Parat, Ž., "Brodski motori s unutarnjim izgaranjem", Sveučilište u Zagrebu, FSB,2005. Ozretić, V., "Brodski pomoćni strojevi i uređaji", Split Ship Management, Split, 2004.								
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student s Self-evaluation of teachers. Feedback from students w relevance of the course content. Occasionally, observation and evaluation of teaching Department.	e annual analysis of examination efficacy. Student survey in order to evaluate teachers. If-evaluation of teachers. Feedback from students who have already graduated from the levance of the course content. ccasionally, observation and evaluation of teaching by the Head of Naval Architecture epartment.							
Other (as the proposer wishes to add)	Available in English language.								

NAME OF THE COURSE Finite Element Method										
Code	FESL10		Year of study	1						
Course teacher	Željan I	<u>Lozina</u>	Credits (ECTS)	5						
Associate teachers	Damir S	Sedlar	Type of instruction (number	Р	S	AE	LE	CE		
	Ivan Tomac		of hours)	30	0	15	0	15		
Status of the course	Manda	tory	Percentage of application of e-learning	0						
			COURSE DESCRIPTION							
Course objectives	The co impler the fie	The course objective is to provide the necessary theoretical and practical background for FEM implementation in engineering practice and additionally support for advanced studies within the field of finite elements and structural mechanics.								
Course enrolment requirements and entry competences required for the course	None									
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Studer – Un – Us – Us	Jents will be able to: Understand the basic theory behind the finite element method a. Strong and weak formulation b. Virtual work and variation formulation c. Basics of the approximate solution of PDE Use the finite element method for the solution of practical engineering problems Use a commercial FE-package								

	<ul> <li>Analyze mor mechanics</li> </ul>	e advance	d topics within	the field o	f fini	te elements and str	uctural		
							L	AE	
	Content						hours	hours	
	Basic concepts, 2	1D. Truss e	element. Direct	approach.			2	2	
	Virtual work and	l problem	formulation (1	D) Discretiz	atior	۱.	2	2	
	Function approx	imation co	oncepts, approx	ximation ba	asis (:	1D). Strong	2	2	
	Week formulation.	on Corrola	tion with virtu	al work (1D	) [[	M discrotization	2	2	
	Internolation fur	nctions in I	FM: manning	isonarame	tric e	elements (1D)	2	2	
Course content	Potential proble	ms in 2D a	nd 3D: Laplace	and Poisso	on eq	uation.	2	2	
broken down in detail	Gauss theorem.	Green eau	ation. Weak fo	ormulation	for p	otential problems	_	_	
by weekly class	and FEM in 2D.						2	2	
schedule (synabus)	Shape function a	and isopara	ametric elemei	nts in 2D.			2	2	
	Theory of elastic	tity in 2D –	overview. Virt	ual work fo	ormu	lation.	2	2	
	Discretization of	weak forr	nulation and co	orrespondi	ng vii	rtual work	2	2	
	formulation, CST						_	_	
	Elasticity in 3D, Termo-elasticity. Axisymmetric problems.							2	
	Selected topics in FEM: Dynamics					2	2		
	Selected topics I							2	
	⊠locturos								
Format of instruction	$\square$ seminars and $\square$	workshons	:	🗵 individu	ual as	signments			
	$\boxtimes$ exercises	workshops	,	□ multim	edia				
	□ <i>on line</i> in entirety								
	□ partial e-learning					ientor			
	$\Box$ field work				iai pr	oject (other)			
Student	Class attendance	e.							
responsibilities	Class								
work (name the	attendance	2	Research	1		Practical training			
proportion of ECTS	Experimental		Report			Individual work		2	
activity so that the	Essay		Seminar essay	/		Lab exercises			
total number of ECTS credits is eaual to the	, Tests		Oral exam	1		(Other)			
ECTS value of the	Written exam		Project			(Other)			
Course) Grading and	Continuous asse	ssment du	ring class Eva	m: individu:	alan	d group Exam: the	theoretica	land	
evaluating student	practical (applica	ation softw	vare). Examina	tion: oral (r	orese	ntation of tasks ass	igned for	i and	
work in class and at	independent wo	ork and dis	cussion about	research re	lated	to the topic of the	tasks).		
the final exam							,		
Required literature		Titl	e		Nu	mber of copies	Availabili	ty via	
(available in the	Ž Lasina, Intradu	etien in fi		ath a da		n the library	otner m	edia	
media)	EFSB (in Croatian	action in fil n)	nite element m	ietnous,			e-iearn	ing	
Ontional literature (at		'/							
the time of	– KJ. Bathe: F	inite Elem	ent Procedure	s, Prentice	Hall	Inc., 1996.			
submission of study	– Thomas J.R.	Hughes: T	he Finite Eleme	ent Method	l, Do	ver Publications Inc.	, 2000.		
programme proposal)									

Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.
Other (as the proposer wishes to add)	Available in English language.

NAME OF THE COURSE	E	Project manag	<u>gement</u>							
Code	FETN01	1	Year of study	1						
Course teacher	Ivica Ve	<u>eža</u>	Credits (ECTS)	4						
	Marka	Madinaa	Type of instruction (number of		S	AE	LE	CE		
Associate teachers			hours)		0	30	0	0		
Status of the course	Elective	9	Percentage of application of e- learning							
			COURSE DESCRIPTION							
Course objectives	Studer – pla – be	nts learn to: an and manage able to calculat	projects e the profitability of the project and	return	on inve	estmen	t (ROI)			
Course enrolment requirements and entry competences required for the course										
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Studer – An – Fo (W – Pla – Pla – Pla sol – Co	<ul> <li>Students will be able to:</li> <li>Analyze the requirements of the customer (VOC)</li> <li>Formulate main objectives of project and rank them</li> <li>Develop the main activities of the project and the structure of the distribution of work - (Work Breakdown Structure)</li> <li>Plan time (to determine the critical path)</li> <li>Plan capacities (specify bottlenecks and balancing activities)</li> <li>Plan costs and risks</li> <li>Apply the acquired knowledge and skills from the contents of the completion of cases to solve a specific task</li> </ul>								
Course content	Contei	nt					L hour s	AE hours		
broken down in detail	Introd	uction and basic	c terms				2	2		
by weekly class	Term a	and definition o	f projects and project management				2	2		
schedule (syllabus)	Projec indust	t - vision, strate ries).	gy, goals (examples - automotive and	l shipb	uilding		2	2		

	The strategy and	gement.	2	2							
	Basics of organiz	ation. Proj	iect organizatio	nal structure.		2	2				
	Phase of the pro	ject (initia	tion of projects	, project selectior	n, project planning,	h	2				
	project manager	nent, proje	ect completion)			Z	2				
	Methods for pro	ject planni	ing.			2	2				
	Quality manager	ment (plan	ning, improven	nent and quality o	control)	2	2				
	Cost manageme	nt. Continu	uous improvem	ent - Kaizen.		2	2				
	Risk managemer	nt.				2	2				
	Psycho-social co	mponent o	of project mana	gement. Project i	manager.	2	2				
	Teamwork.					2	2				
	Communication	and motiv	ation on the te	am. Methods for	enhancing	2	2				
	creativity.										
	⊠ lectures			🛛 individual assig	onments						
	Seminars and	workshops		multimedia	5						
Format of instruction	⊠ exercises										
	□ <i>on line</i> in entir	ety		work with mer	ntor						
	□ partial e-learn	ing		🗆 individual proj	ect (other)						
Student		ield work									
responsibilities		lass attendance.									
Screening student	Class	1	Decemb	0	0 Drastical training						
work (name the	attendance	T	Research	0	Practical training						
proportion of ECTS credits for each	Experimental work		Report		Individual work		1,5				
activity so that the total number of ECTS	Essay		Seminar essay		Lab exercises						
credits is equal to the	Tests		Oral exam	0	(Other)						
course)	Written exam		Project	2,5	(Other)						
Grading and evaluating student work in class and at the final exam	During the semester, students are introduced into the stages of the project management, and parallel on laboratory exercises how to develop their own project. The students will work in teams, with a minimum number of two and maximum number of three students, in which they how to create and manage their own projects. During the course each team determines the content of the project and the main objectives. After that, they develop the main activities of the project and structure of labor division (WBS); plan the time for each of the activities of and determine the critical path; plan capacity and determine bottlenecks and balancing capacity. And finally determine the costs, calculate the profitability of the project (ROI) and analyze risks. At the colloquium and exam students present their works, which are evaluated (grade M). On the other hand, students have colloquium on Technique of network planning (AV) - 1 written colloquium at the end of the semester. • AV - colloquies Technique of network planning • M - points to the project. The final score (in percentage) is formed according to the formula:										
Required literature (available in the	Number of     A       Title     copies in       the library						ty via edia				

library and via other media)	Veža, I., Bilić, B., Gjeldum, N., Mladineo, M., "Upravljanje projektima", FESB, Split, 2011.	e-learning portal							
	Majstorović, V. Projektni menadžment, Sveučilište u Mostaru, Mostar, 2010.	5							
	Omazić, M.A. Projektni menadžment, Sinergija, Zagreb, 2005.	5							
Optional literature (at the time of submission of study programme proposal)	<ul> <li>A Guide to the Project Management Body of Knowledg Management Institute, Newtown Square, 2004.</li> <li>Wysocki RK, McGary R. Effective Project Management: Extreme. John Wiley &amp; Sons, 2003.</li> </ul>	<ul> <li>A Guide to the Project Management Body of Knowledge. PMBOK Guide, Project Management Institute, Newtown Square, 2004.</li> <li>Wysocki RK, McGary R. Effective Project Management: Traditional, Adaptive, And Extreme, John Wiley &amp; Sons, 2003.</li> </ul>							
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficiency. Student's su Self-evaluation of teachers. Feedback from students who h relevance of the course content.	ne annual analysis of examination efficiency. Student's survey in order to evaluate teachers. Elf-evaluation of teachers. Feedback from students who have already graduated about the Elevance of the course content.							
Other (as the proposer wishes to add)	Available in English language.								

NAME OF THE COURSE	Ξ	Sailboats								
Code	FESN20	)	Year of study	1						
Course teacher	<u>Branko</u>	<u>Blagojević</u>	Credits (ECTS)	5						
Associate teachers	Klement Jadrešić		Type of instruction (number	Р	S	AE	LE	CE		
			of nours)	30	0	0	0	15		
Status of the course	Elective	2	Percentage of application of e-learning	0						
	•		COURSE DESCRIPTION	-						
Course objectives	Under: and pe	standing fundar erformance asse	nental principles of sailing. Un essment.	iderstand	ding the p	process	of sailboat	t design		
Course enrolment requirements and entry competences required for the course										

Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	<ul> <li>Students will be able to:</li> <li>Explain the fundamental concept of sailing.</li> <li>Describe various sources of hull resistance and estimate resistance and speed using specific software.</li> <li>Optimize sailing performance within defined limits.</li> <li>Calculate the strength of a mast.</li> </ul>						
	Content	lecture	hours				
	The fundamental concept of sailing. Ove sailboat performanc	hours 2					
	Sailboat hull form.	2					
	Forces and moments. Loads.	2					
	Stability.	2					
	Design methods.	2					
	Hull materials. Structural design.	2					
Course content broken down in detail by weekly class schedule (syllabus)	Hydrdodynamics: visocus resistance, fric	2					
	Roughness, added resistance on waves, o	2					
	Seakeeping.	2					
	Sails. Aerodynamic forces.	2					
	Masts.	2					
	Interaction of masts and sails in weak an	2					
	Assessment of performance. VPP progra	2					
	Field work on a sailboat.	2					
	Visit to shipyards.	2					
	Work on the project with assistance (in t		15				
Format of instruction	<ul> <li>☑ lectures</li> <li>☑ seminars and workshops</li> <li>☑ exercises</li> <li>□ on line in entirety</li> <li>□ partial e-learning</li> <li>☑ field work</li> </ul>	<ul> <li>☐ individual assignments</li> <li>☐ multimedia</li> <li>☐ laboratory</li> <li>☐ work with mentor</li> <li>⊠ individual project (other)</li> </ul>					

Student responsibilities	Class attendance. Finished project task.								
Screening student work (name the	Class attendance	1	Research			Practical training			
proportion of ECTS credits for each activity so that the	Experimental work		Report		Individual wor			1	
	Essay		Seminar essay			Lab exercises			
total number of ECTS credits is equal to the	Tests		Oral exam	1					
ECTS value of the course)	Written exam		Project	2	(Other)				
Grading and evaluating student work in class and at the final exam	Continuous assessment is carried out during lectures, seminars and through consultations with regard to resolving project issues. The project task, preliminary sailboat design, is submitted in digital form. Examination: oral presentation of the project.								
Required literature (available in the library and via other media)	Title			Number of copies in the library		Availability via other media			
	Hamlin C. Preliminary Design of Boats and Ships. Cornell Maritime Press, 1989.				1				
	Larsson L, Eliasson ER. Principles of Yacht Design. Adlard Coles Nautical, 2000. ISBN 0-7136-5181-4.				2				
Optional literature (at the time of submission of study programme proposal)	<ul> <li>Fossati F. Aero-hydrodynamics and the Performance of Sailing Yachts: The Science Behind Sailing Yachts and Their Design. Adlard Coles Nautical, 2009. ISBN-10: 1408113384.</li> <li>Doane CJ. The Modern Cruising Sailboat: A Complete Guide to Its Design, Construction and Outfitting. McGraw-Hill, 2009. ISBN 978-0-07-147810-6.</li> <li>Estes C.W. 3D modeling for the Marine industry.</li> <li>Spectre P.H. 100 boats design reviewed.</li> </ul>								
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content.								
	Department.								
Other (as the proposer wishes to add)	Available in English language.								

NAME OF THE COURSE		Vibrations and vibration control								
Code	FESN23		Year of study	2						
Course teacher	Željan l	<u>Lozina</u>	Credits (ECTS)	5						
Associate teachers	Damir Sedlar		Type of instruction (number	Р	S	AE	LE	CE		
	Ivan Tomac		of hours)	30	0	30	0	0		
Status of the course	Elective		Percentage of application of	0			•			
			e-learning							
Course objectives	and im	and implementation of electromechanical systems.								
Course enrolment requirements and entry competences required for the course	None	None								
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	<ul> <li>Students will be able to:</li> <li>explain basics and apply basic signal processing</li> <li>Explain and apply sensors of position, displacement, velocity acceleration and force.</li> <li>Explain basics and practically implement electro mechanic actuators and motors.</li> <li>analyze electromechanical system with negative loopback</li> <li>implement model of electromechanical system in time and frequency domain as well as in state space</li> <li>perform simple identification of the system</li> <li>perform measurement using software for measurement (LabVIEW)</li> <li>analyze and apply simple control system (PD controller)</li> </ul>									
	Content						L hours	AE hours		
Course content broken down in detail by weekly class schedule (syllabus)	Signal processing basics.						2	2		
	Sensors od position, displacement, velocity, acceleration and force (LVDTs, encoders, velometers, accelerometers, eddy current sensors and switches,						2	2		
	Electrodynamic actuators and motors and control of actuators and motors.						2	2		
	Model of electromechanical system in time.						2	2		
	Analytical mechanics approach.						2	2		
	Lagrange equations.						2	2		
	Concept of direct, indirect and inverse analysis.						2	2		
	State space.						2	2		
	Systems with negative loopback. Analysis of accuracy and stability.						2	2		
	System Identification.						2	2		
	Frequency domain analysis.					2	2			
	Concept of direct indirect and inverse analysis.						2	2		
	Analysis of selected system.						2	2		

Format of instruction	<ul> <li>☑ lectures</li> <li>□ seminars and workshops</li> <li>☑ exercises</li> <li>□ on line in entirety</li> <li>□ partial e-learning</li> <li>□ field work</li> </ul>			<ul> <li>☑ individual assignments</li> <li>□ multimedia</li> <li>□ laboratory</li> <li>□ work with mentor</li> <li>□ individual project (other)</li> </ul>				
Student responsibilities	Class attendance.							
Screening student work (name the	Class attendance	2	Research	1	Practical trainir		Ig	
proportion of ECTS credits for each	Experimental work		Report			Individual work		2
activity so that the total number of FCTS	Essay		Seminar essay			Lab exercises		
credits is equal to the	Tests		Oral exam	1	(Other)			
ECTS value of the course)	Written exam		Project			(Other)		
Grading and evaluating student work in class and at the final exam	Continuous assessment during class. Exam: individual and group. Exam: the theoretical and practical (application software). Examination: oral (presentation of tasks assigned for independent work and discussion about research related to the topic of the tasks).							
Described literature	Title				Number of copies in the library		Availability via other media	
(available in the	Handouts						e-learr	ning
library and via other	e-learning portal							
media)								
Optional literature (at the time of submission of study programme proposal)	<ul> <li>S. Cetinkunt: Mechatronics, John Wiley and Sons, 2007.</li> </ul>							
Quality assurance methods that ensure the acquisition of exit competences	The annual analysis of examination efficacy. Student survey in order to evaluate teachers. Self-evaluation of teachers. Feedback from students who have already graduated from the relevance of the course content. Occasionally, observation and evaluation of teaching by the Head of Naval Architecture Department.							
other (as the proposer wishes to add)	Available in English language.							