DETAILED PROPOSAL OF THE STUDY PROGRAMME

UNDERGRADUATE VOCATIONAL STUDY IN NAVAL ARCHITECTURE

SPLIT, February 2022

1.1. List ofmandatory and elective courses

List ofcourses								
Year of study: 1.								
Semester: II.								
STATUS	CODE	COURSE	HOURS IN SEMESTER					ECTS
			L	S	AE	LE	DE	
	FESR04	Mechanics of Materials	45	0	30	0	0	6
	FEMY02	Applied Mathematics	30	0	30	0	0	5
	L = Lectures, S = Seminar, AE = AuditoryExercises, LE = LaboratoryExercises, DE = Design Exercises							

List ofcourses								
Year of study: 2.								
Semester: III.								
STATUS	CODE	COURSE	HOURS IN SEMESTER					ECTS
			L	S	AE	LE	DE	
Mandatory	FETS01	Manufacturing Processes	45	0	0	30	0	6
	L = Lectures, S = Seminar, AE = AuditoryExercises, LE = LaboratoryExercises, DE = Design Exercises							

List ofcourses								
Year of study: 2.								
Semester: IV.								
STATUS	CODE	COURSE	HOURS IN SEMESTER					ECTS
			L	S	AE	LE	DE	
Mandatory	FESS23	Strength of Ships	45	0	30	0	15	8
	FETS03	Production Preparing and Planning	30	0	15	0	0	4
	L = Lectures, S = Seminar, AE = AuditoryExercises, LE = LaboratoryExercises, DE = Design Exercises							

List ofcourses								
Year of study: 3.								
Semester: V.								
STATUS	CODE	COURSE	HOURS IN SEMESTER					ECTS
			L	S	AE	LE	DE	
Mandatory	FESS36	Project	0	15	0	0	30	7
	FESS15	Computer Graphics in Naval Architecture	30	0	0	0	30	5
	FESS29	Marine Propulsion System	30	0	30	0	0	5
	L = Lectures, S = Seminar, AE = AuditoryExercises, LE = LaboratoryExercises, DE = Design Exercises							

List ofcourses								
Year of study: 3.								
Semester: VI.								
STATUS	CODE	COURSE	HOURS IN SEMESTER					ECTS
			L	S	AE	LE	DE	
	FESS33	Advanced Marine Vehicles	30	0	0	30	0	5
	L = Lectures, S = Seminar, AE = AuditoryExercises, LE = LaboratoryExercises, DE = Design Exercises							

1.2. Course description

NAME OF THE COURSE	MECHANICS OF MATERIALS						
Code	FESR04	Year of study	1.				
Course teacher	Vedrana Cvitanić, Ph. D., Associate Professor	Credits (ECTS)	6				
Associate teachers	Marko Vukasović, Ph. D., Teachingassistant Maja Kovačić, Teachingassistant	Type of instruction (number of hours)	L	S	AE	LE	DE
			45	0	30	0	0
Status of the course	Obligatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Training students for: - understanding and application of basic knowledge of mechanics of solid bodies, - solving problems related to determination of stress and strain distributions for beams under different types of loading (axial, torsion, bending, shear and combined loading).		
Course enrolment requirements and entry competences required for the course	Statics (Technical mechanics 1)		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - explain plane stress state and plane strain state as well as stress-strain relationship (Hooke's law), - analyze plane stress state using Mohr's stress circle, - calculate geometrical properties of beam cross sections, - determine stresses and displacements for beams under tension/compression, torsion loading, bending loading or shear loading, - apply allowable stress and allowable strain design procedures to analyze and design simple structures, - solve statically indeterminate problems by using additional deformation conditions, - analyze beams under combined loading using simple failure theories, - summarize problem of column buckling.		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Introduction to mechanics of materials. Problems and methods of mechanics of materials. Modelling of structures. Stress vector, normal and shear stress. Stress tensor.	3	2
	Stress transformation. Principal stresses. Mohr's circle for plane stress state. Strain. Normal strain, shear strain and dilatation. Strain tensor. Strain transformation. Mohr's circle for plane strain state.	3	2
	Stress-strain relationship. Experimental data for technical materials. Hooke's law for uniaxial stress state. Plane stress state. Relationship between elasticity constants. Relationship between internal force components and stress components.	3	2
	Geometrical properties of beam cross sections. First and second moment of area. Transformation of second moments of area under translation of coordinate system. Transformation of second moments	3	2

	of area under rotation of coordinate system. Mohr's circle for second moments of area. Radius of gyration.		
	General approach to problems of mechanics of materials. Axialloadingofbeams. Prismatic beams and beams with variable cross sectional area. Displacement diagram. Stress concentration.	3	2
	Torsion loading of circular beams. Assumptions and constraints. Shear stress and strain. Allowable stress design. Bending of beams. Assumptions and constraints.	3	2
	Stress and strain distributions for pure bending. Stress and strain distributions for transverse bending. Allowable stress design. Ideal section modulus.	3	2
	Differential equation of elastic deflection curve. Moment-area method.	3	2
	Stresses and strains for bending of beams with non-uniform cross section. Shear loading. Statically indeterminate problems in axial loading.	3	2
	Thermal effects, setting misfitsand prestrains. Statically indeterminate problems in torsion loading. Statically indeterminate problems in bending.	3	2
	Strain energy. Failure theories.	3	2
	Failure theories for combined loading problems of beams.	3	2
	Buckling of columns. Stable, unstable and indifferent equilibrium state. Buckling of columns in elastic state. Buckling of columns in plastic state. Design formulas for columns.	3	2

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☒ multimedia ☐ laboratory ☐ work with mentor ☐ (other)
Studentresponsibilities	The presence on lectures and exercises in the amount of at least 70 % of the times scheduled.	

Screening student work *(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	2,2	Research		Practical training	
	Experimental work		Report		Individual work	3,5
	Essay		Seminar essay		Laboratory exercises	
	Tests	0,2	Oral exam		Preparation for laboratory exercises	
	Written exam	0,1	Project		(Other)	

Grading and evaluating student work in class and at the final exam	There are two midterm exams during the semester. After semester there are two final exam terms and one corrective exam term according to schedule. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks of lecturing. Each midterm exam is written and test consists of theoretical questions and numerical problems. The requirement for passing grade is 50% points on each midterm exam. In the final exams students that did not pass the midterm exams take part. In the corrective exam students take whole exam. Final number of points is formed according to the formula: Points(%)= (M1 + M2)/2 M1, M2 – points on midexams. Final grade isdeterminedafterthesecondfinalexambyrelative system ofgradingaccording to Regulationsofstudiesandstudy system of University of Split. Based on theachivednumberofpoints students thathavepassedtheexam are distributedintofourgroups: 15% ofthebest students get grade excellent (5), following

<table>
<tr><td></td><td colspan="3">35% students get grade verygood (4), following 35% students get grade good (3) andlast 15% students get grade sufficient (2).

Ifthe total numberof students thathavepassedtheexam at midtermsandfinalexamsislowerthan 30, thefinal grade isdeterminedbyabsolute system ofgrading. In thiscase, thefinal grade isdetermedbytheachivedfinalnumberofpointsinthefollowingmanner: from 50% to 61% - grade sufficient (2), from 62% to 74% - grade good (3), from 75% to 87% - grade verygood (4) andfrom 88% to 100% - grade excellent (5).

Students canaccessthecorrectiveexamtermiftheyhaveachived at least 10% points on midtermexamsorfinalexams.

According to Article 71 ofFaculty Statue, students are obligate to contributeinalleducationactivitiesand to attend at least 70% oflectureandexerciselessons. Aboveconditions are necessary to accessmidtermandfinalexams.</td></tr>
<tr><td rowspan="5">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>Alfirević, I., „Nauka o čvrstoći I“, Tehnička knjiga, Zagreb, 1989.</td><td></td><td></td></tr>
<tr><td>Matoković, A., Plazibat, B., „Nauka o čvrstoći 1 – zbirka zadataka“, FESB.</td><td></td><td></td></tr>
<tr><td>Cvitanić, V., „Predavanja iz kolegija Mehanika materijala“, FESB.</td><td></td><td>e-learning portal</td></tr>
<tr><td>Vlak, F., Jurjević, D., „Nauka o čvrstoći 1 – zbirka zadataka“, FESB.</td><td></td><td>e-learning portal</td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">Craig, R., R.: MechanicsofMaterals, John Wiley&Sons, New York, 2000.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">- recording student’s presence on lessons
- evaluation of results in accordance with the above learning outcomes
- feedback from students via surveys
- self-evaluation of teachers
- institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="7">APPLIED MATHEMATICS</td></tr>
<tr><td>Code</td><td>FEMY02</td><td>Year of study</td><td colspan="5">1</td></tr>
<tr><td>Course teacher</td><td>Ivančica Mirošević, Lecturer</td><td>Credits (ECTS)</td><td colspan="5">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Lea Dujić, Teachingassistant</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>30</td><td>0</td><td>30</td><td>0</td><td>0</td></tr>
<tr><td>Status of the course</td><td>obligatory</td><td>Percentage of application of e-learning</td><td colspan="5">10</td></tr>
<tr><td colspan="8">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="7">Training students for:
- applicationofmathematicalconceptsandtoolsfromtheareaofordinarydifferentialequations, numericalmathematics, statisticsandprobability to analyzeandsolveengineeringproblems.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="7">GoodknowledgeofHighSchoolmathematicsandpassed State ExaminMathematics.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="7">Students will be able to:

- state definitions and theorems from the entire course,
- illustrate theorems with examples,
- solve some first and second order differential equations,
- apply Laplace transform to linear differential equations
- find approximate solution of a nonlinear equation
- approximate function with Lagrange interpolation polynomial
- approximate empirical data with constant, linear or quadratic function
- solve definite integral and Cauchy problem of the first order approximately
- use statistical techniques in data analysis
- find probability distributions of random variables in random experiments</td></tr>
<tr><td rowspan="10">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">Course content</td><td>L or S hours</td><td>AE hours</td></tr>
<tr><td colspan="5">1. Introduction to DifferentialEquations. Basicconceptsanddefinitions. Equationswithseparablevariables.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">2. Homogeneousdifferentialequations. Lineardifferentialequationsofthefirstorder.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">3. Differentialequationsof ¸thesecondorder. Lineardifferentialequationsofthesecondorderwithconstantcoefficients.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">4. Laplacetransform – definitionandbasicproperties. InverseLaplacetransformandbasicproperties.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">5. Solvinglineardifferentialequationswithwithconstantcoefficientsusing Laplacetransform.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">6. Introduction to Numericalmathematics. Solvingnonlinearequations. Graphicalmethod. Bisectionmethod. Iterativemethod.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">7. Lagrange interpolation polynomial</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">8. Leastsquaremethod. Approximating empirical data with constant, linear or quadratic function.</td><td>2</td><td>2</td></tr>
<tr><td colspan="5">9. Numericalintegration. Trapezoidalrule. Simpson'srule. Euler'smethod for Cauchyproblems.</td><td>2</td><td>2</td></tr>
</table>

	10. Descriptivestatistics. Discrete data andcontinuous data. Numericalcharacteristics.	2	2
	11. Introduction to Probabilitytheory. Elementaryoutcomes. BasicsofCombinatorics.	2	2
	12. Discreterandomvariable. Expectationandvariance. Binomialdistribution. Poissondistribution.	2	2
	13. Continuousrandomvariable. Expectationandvariance. Normaldistribution.	2	2
	List oflaboratoryor design exercises		LE or DE hours

Format of instruction	☒lectures ☐seminars and workshops ☒exercises ☐*on line*in entirety ☐partial e-learning ☐field work	☒independent assignments ☐multimedia ☐laboratory ☐work with mentor ☐ (other)
Studentresponsibilities	Regularattendence to andactiveparticipationinlecturesandexcercises.	

Screening student work *(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	2	Research		Practical training	
	Experimental work		Report		Selfstudy	2.6
	Essay		Seminar essay		(Other)	
	Tests	0.2	Oral exam		(Other)	
	Written exam	0.2	Project		(Other)	

Grading and evaluating student work in class and at the final exam	Duringsemestertwomid-termexams are held. Thefirstexamisscheduledafter 7 weeksoflectures, andthesecondintheweekfollowingthelectures. At eachmid-termexam students canget 40 points, whiletheremaining 20 points are attainedthroughassignementsduringlecturesandexcercises. Thecondition for passingthecourseis minimum 20 points on eachmid-termexamsand a total of at least 50 points. Aftersemester, twofinalexamsand a correctionexam are held. Students whichdidnotpass one mid-termexam, can take onlythispartoftheexamduringfinalexams. Students whichdidnotpassanymid-termexam, take thefinalexamwithcomprehensivecoursecontent. In thatcase, maximumnumbersofavailablepointsis 80. Thecondition for passingthecourseis minimum 40 pointsinthefinalexamand a total of at least 50 points. The grade isformedafterthesecondfinalexamaccording to article 75 ofthe Statute of FESB: 15% ofthebest students getthemarkexcellent (5), next 35% students getthemarkverygood (4), next 35% students getthemarkgood (3), andthelast 15% students getthetmarksufficient (2). Students whodidnotpassthecourseafterfinalexams, andhaveobtained total of at least 10 points, canattendthecorrectionexam. On thecorrectionexammaximalnumberofpointsis 100, andthe minimum requirement for a passing grade is 50 points. Mid-termexams, finalexamsandcorrectionexams are heldaccording to theexamschedule.

	Title	Number of copies in the library	Availability via other media
Required literature (available in the library and via other media)	Lecturematerials on FESB e-learning portal.		https://elearning.fesb.hr/
Optional literature (at the time of submission of study programme proposal)	T. Bradić, J. Pečarić, R. Roki, M. Strunje: Matematika za tehnološke fakultete, Element, Zagreb, 1998. B. P. Demidovič: Zbirka zadataka iz više matematike, Školska knjiga, Zagreb 1998. Ivo Pavlić, Statisticka teorija i primjena, Zagreb, 1971		
Quality assurance methods that ensure the acquisition of exit competences	- homework - short tests - quizzes - mid-termexams - finalexam - student questionnaires		
Other (as the proposer wishes to add)			

<table>
<tr><td>NAME OF THE COURSE</td><td colspan="6">MANUFACTURING PROCESSES</td></tr>
<tr><td>Code</td><td>FETS01</td><td>Year of study</td><td colspan="4">2</td></tr>
<tr><td>Course teacher</td><td>Dražen Bajić, Ph. D., FullProfessor
Branimir Lela, Ph. D., AssistantProfessor</td><td>Credits (ECTS)</td><td colspan="4">6</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Sonja Jozić, Ph. D., Assistantprofessor
Jure Krolo, Teachingassistant, Mario Veić, Teachingassistant</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>AE</td><td>LE</td><td>DE</td></tr>
<tr><td>45</td><td>0</td><td>0</td><td>30</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="4">10%</td></tr>
<tr><td colspan="7">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="6">Training students for:
- acquisition of basic knowledge of connection between construction, materials and manufacturing processes necessary for successful production in the filed of mechanical engineering and naval architecture
- acquisition of knowledge about the basic technologies: casting, forming by deformation and machining and the possibilities of application ofthesetechnologiesintheproduction.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="6">None.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="6">Students will be able to:

- classify manufacturing engineering technologies,
- clasify casting, metal forming and machining processes,
- explain the importance and characteristics of individual mechanical technologies.
- describe the machines and equipment for particular processes.
- present methods of making models, cores and moulds for casting.
- introduce of determining fluidity alloys and the theoretical foundations of casting solidification.
- discuss about forces, stresses, strains and strain rate in metal forming processes
- describe and explain material flow, friction coeficient, flow stress, work and power in metal formin processes
- comment expressions to calculate the cutting speed, material removal volume, cutting force, power, theoretical roughness and the main machine time for particular machining operations</td></tr>
<tr><td rowspan="5">Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="4">Course content</td><td>L hours</td><td>AE hours</td></tr>
<tr><td colspan="4">Introduction. Design for manufacturing. Thechoiceofmaterialsandtechnologies</td><td>3</td><td>/</td></tr>
<tr><td colspan="4">Introduction, basictermsinthefoundry, historyofcastingtechnology. Alloys for casting.Castingpatterns, permanentpatterns, expendablepatterns. Moulds for casting, permanentandexpendablemoulds, cores</td><td>3</td><td>/</td></tr>
<tr><td colspan="4">Castingprocesses: pressurediecasting, centrifugalcasting, continouscasting, sandcasting, precisecasting. Tests for fluidity, solidificationofmetals. Deviationsincastings.</td><td>3</td><td>/</td></tr>
<tr><td colspan="4">Machiningprocesses. Tool andworkpiecemotion. Tool geometry.</td><td>3</td><td>/</td></tr>
</table>

	Modelsofchipformation, shapeandsizeofchip.Cutting-toolmaterials.Qualityofmachinedsurface.	3	/
	Machiningprocesseswithdefinedtooledgegeometry: turning, planing, drilling, milling, broaching, sawing	3	/
	Machiningprocesseswithundefinedtooledgegeometry: grinding, honing, superfinishing, laping, polishing.	3	/
	First midterm exam		
	Importance and classification of metal forming processes	3	/
	Concept of plastic deformation and indicators of material plasticity	3	/
	Changes in material caused by plastic deformation; Anisotropy	3	/
	Strain and strain rate; Flow stress and flow curves	3	/
	Processes of upsetting, forging, drawing and extrusion	3	/
	Processes of rolling and sheet metal quality testing; Processes of sheet metal bending, deep drawing and stamping	3	/
	Second midterm exam		
	List of laboratory exercises		LE hours
	Permanentandexpendablepatterns, sandmoulds for single use		2
	Introduction to machinetoolsinstalledinlaboratory. Turning, Tool andworkpiecegeometry, Chipshapes, Cutting-toolsmaterials		2
	Planingandslotting, compression rate measurement		2
	Drilling, sinking, andreaming. Measuringtheaxialforceandtorque for drilling		2
	Sawing, broaching. Measuringthemaincuttingforce for turningusingthepowerconsumption.		2
	Milling. Measuringthesurfaceroughnessinrelationwithcuttingparametars.		2
	Grinding, honing, superfinishing. Measuringthecuttingforcesusingthreecomponentdynamometer		2
	Influence of deformation on mechanical properties; Testing of material flow		2
	Friction coefficient determination by ring upsetting		2
	Flow stress determination by strip upsetting		2
	Testing of material formability by upsetting and forging		2
	Testing of material formability by extrusion		2
	Sheet metal forming; Determination of spring-back during bending		2

Format of instruction	☒ lectures ☐seminars and workshops ☒ exercises ☐*on line*in entirety ☐partial e-learning ☐field work	☐independent assignments ☒multimedia ☒laboratory ☐work with mentor ☐ (other)
Studentresponsibilities	The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises.	

Screening student work *(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	2,5	Research		Practical training	
	Experimental work	0,5	Report		Individual work	3
	Essay		Seminar essay		(Other)	
	Tests		Oral exam		(Other)	
	Written exam		Project		(Other)	

Grading and evaluating student	There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. In the final exams students that did not pass the midterm exams take part. In the makeup exam students take

<table>
<tr><td>work in class and at the final exam</td><td colspan="3">the entire exam. The midterm, final and makeup exams are carried out as written tests. The requirements for passing grade is:
1. Positive assessment of laboratory exercises
2. 50 % points on each midterm exam or the final exam.

Grade (in percentage) is formed according to the formula:
Grade(%) = 0,5 (M1 + M2)

M1, M2 – test results of first and second midterm exam.
Final grade is determined according to:
Percentage Grade
50% do 61% sufficient (2)
62% do 74% good (3)
75% do 87% verygood (4)
88% do 100% excellent (5)

Examination terms: according to the timetable</td></tr>
<tr><td rowspan="4">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>Duplančić, I.: "Osnove tehnologija", autorizirana predavanja, FESB, Split 2005.</td><td>5</td><td></td></tr>
<tr><td>Bajić, D. “Tehnologije obrade materijala“, autorizirana predavanja.</td><td></td><td>e-learning portal</td></tr>
<tr><td>Živković, D., “Lijevanje metala”, skripta, Sveučilište u Splitu, FESB, Split, 2006.</td><td>5</td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">- Kalpakjian S.: "ManufacturingEngineeringand Technology", Addison - WesleyPublishing Company, 1989.
- Duplančić, I.: Obrada deformiranjem, Sveučilište u Splitu, FESB, Split 2007.
- Math M., “Uvod u tehnologiju oblikovanja deformiranjem”, Sveučilište u Zagrebu, Fakultet strojarstva i brodogradnje, Zagreb, 1999.
- Cebalo, R.: "Obrada odvajanjem čestica", obrađena pitanja i zadaci, Zagreb, 2000.
- Ekinović Š.: "Postupci obrade rezanjem”, Univerzitet u Sarajevu, Mašinski fakultet u Zenici, 2003.
- R. Deželić, Osnove konstrukcijskih materijala, Sveučilište u Splitu, FESB Split, 1996.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">- Keeping records of class attendance
- Evaluation of results in accordance with the above learning outcomes
- Feedback from students via surveys
- Self-evaluation of teachers
- Feedback information from graduated students</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
</table>

NAME OF THE COURSE	STRENGTH OF SHIPS						
Code	FESS23	Year of study	2.				
Course teacher	Frane Vlak, Ph. D., Associate Professor	Credits (ECTS)	8				
Associate teachers	Branka Bužančić Primorac, Ph. D., Teachingassistant	Type of instruction (number of hours)	L	S	AE	LE	DE
			45	0	30	0	15
Status of the course	Obligatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Training students for: - understanding and application of fundamentals in structural analysis of ship structure, - introducing to analysis and calculations of the ship structures using theories of thin-walled structures.		
Course enrolment requirements and entry competences required for the course	Mechanics of materials and Ship structures.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - explain the fundamentals of the energy methods, - explain the force method, - apply the force method in the analysis of frames and grillages, - explain the influence of shear on the beam bending, - explain the method of ship longitudinal strength calculation, - apply the solutions for bending of thin plates in the analysis of the ship plating.		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Generalisedforcesanddisplacements. Flexibilitycoefficients. Flexibilitymatrix.	3	3
	Betti'stheorem, Maxwell'stheorem, andCastigliano's 2nd theorem. Theoremofthe minimum ofthepotentialenergy.	3	3
	Mohr's integral. Vereschagino'srule.	3	3
	Beamstructures.	3	3
	Staticalindeterminacyofstructures.	3	3
	Forcemethod.	3	3
	Methodofinitialparameters.	3	3
	First midterm exam		
	Theoryofthebendingwith influence ofshear.	3	3
	Transversestrengthofships (frames).	3	3
	Localstrengthofships (grillages).	3	3
	Longitudinalstrengthofships.	3	3
	Thinrectangularplates.	3	3
	Stabilityofthepartsofshipstructures.	3	3
	Second midterm exam		
Format of instruction	☒ lectures ☒ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☒ independent assignments ☒ multimedia ☐ laboratory ☐ work with mentor ☐ (other)	

<table>
<tr><td>Studentresponsibilities</td><td colspan="6">The presence on lectures in the amount of at least 70 % of the times scheduled. Performed all required laboratory exercises.</td></tr>
<tr><td rowspan="6">Screening student work (name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>3,0</td><td>Research</td><td>1</td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>2</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td>0,8</td><td>Laboratory exercises</td><td></td></tr>
<tr><td>Tests</td><td>0,2</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td></td></tr>
<tr><td>Written exam</td><td>0,2</td><td>Project</td><td>0,8</td><td>(Other)</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests. Grade (in percentage) is formed according to the formula:
Grade(%) = 0,45 (M1 + M2) + 0,1S
the activities in percentage:
• M1, M2 – test results,
• S - seminar essey.</td></tr>
<tr><td rowspan="8">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="3">R. Pavazza: Uvod u analizu tankostjenih štapova, Kigen, Zagreb 2007.</td><td></td><td></td></tr>
<tr><td colspan="3">J. Uršić: Čvrstoća broda I, Fakultet strojarstva i brodogradnje, Zagreb, 1972.</td><td></td><td></td></tr>
<tr><td colspan="3">J. Uršić: Čvrstoća broda II, Fakultet strojarstva i brodogradnje, Zagreb,1983.</td><td></td><td></td></tr>
<tr><td colspan="3">J. Uršić: Čvrstoća broda III, Fakultet strojarstva i brodogradnje, Zagreb,1992.</td><td></td><td></td></tr>
<tr><td colspan="3"></td><td></td><td></td></tr>
<tr><td colspan="3"></td><td></td><td></td></tr>
<tr><td colspan="3"></td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">- Det Norske Veritas: Load & Strength, 1977.
- Hughes, O. F.: Ship Structural Design, John Whiley & Sons, New York, 1983.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">- Evaluation of results in accordance with the above learning outcomes
- Feedback from students via surveys
- Self-evaluation of teachers
- Institutional and non-institutional evaluations</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

NAME OF THE COURSE	PRODUCTION PREPARING AND PLANNING							
Code	FETS03	Year of study	2.					
Course teacher	Boženko Bilić, Ph.D.,Full Professor	Credits (ECTS)	4					
Associate teachers	Nikola Gjeldum, Ph.D., AssistantProfessor	Type of instruction (number of hours)	L	S	AE	LE	DE	
			30	0	15	0	0	
Status of the course	Obligatory	Percentage of application of e-learning	0					

COURSE DESCRIPTION

Course objectives	Prepare students for work in the operational preparation of shipyards		
Course enrolment requirements and entry competences required for the course	Completed the first year of vocational study of naval architecture or mechanical engineering.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - Explain the characteristics of discrete and continuous material flows in the production process - Explain the cycle of production and throughput - Classify and explain the components of the processing time - Describe organizational structures - Inventory planning and control - Project planning using project network diagrams (network planning techniques) and gantt charts.		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L hours	AE hours
	Definition of production and manufacturing system. Definition of production and manufacturing process. Fundamentals ofmaterialflowintheproductionprocess. Thebasicelementsofmanufacturingprocesses (process, composedandgroupprocesssteps, processstep).	3	
	Characteristics of modern technologies and manufacturing processes. Manufacturing process capability. Manufacturing processes: Metal casting processes. Powdermetallurgy. Metal forming processes.Material removal processes. Joining processes. Heat treatment and surface protection. Processing ofpolymermaterials.	3	
	The scale of business success in the enterprise. Time and motion study: Processing time analysis. Work improvement process. Production cycles.	3	
	The basic principles of manufacturing process design. The basic data required for manufacturing process design. Analysis of technical drawings (of product). The choice of raw material. The choice of manufacturing process, machine tools, tools, tool holders and cutting parameter. Calculation of manufacturing costs.	3	6
	Organizational structures.	2	
	First midterm exam.		
	Inventory planning and control.	6	1
	Project management: Project network diagrams (network planning techniques) and gantt chart. Project structure analysis - project phases and activities. Project time management using project network diagrams. Project cost	6	6

<table>
<tr><td></td><td colspan="5">management using project network diagrams. Resource planning.</td><td></td><td></td></tr>
<tr><td></td><td colspan="5">Second midterm exam.</td><td></td><td></td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐on line in entirety
☐ partial e-learning
☐ field work</td><td colspan="4">☐ independent assignments
☒ multimedia
☐ laboratory
☐ work with mentor
☐ (other)</td></tr>
<tr><td>Studentresponsibilities</td><td colspan="7">The presence on lectures and exercises in the amount of at least 70 % of the times scheduled.</td></tr>
<tr><td rowspan="5">Screening student work (name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1,5</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>2,5</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Laboratory exercises</td><td>0</td></tr>
<tr><td>Tests</td><td>0</td><td>Oral exam</td><td></td><td>Preparation for laboratory exercises</td><td>0</td></tr>
<tr><td>Written exam</td><td>0</td><td>Project</td><td>0</td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="7">During semester there are two midterm exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. The student can take the first midterm exam if he/she regularly attended classes. Requirements for access to the second midterm exam are: regularly attended classes and at least 25% of points achieved at the first midterm.
Midterm exams are conducted in written form. They consist of theoretical questions and numerical problems. The teacher reserves the right to hold a midterm exam in oral form. The requirement for passing grade represents minimal 50% points on each midterm exam:
Grade (%) = 0,5(M1 + M2)
M1 – first midterm grade (%), i.e. percentage pointsachieved on thefirstmidterm
M2 – second midterm grade (%), i.e. percentage pointsachieved on thesecondmidterm
Requirement for access to the final exams is regularly attended classes. In the first two final exams students that did not pass at least one of the midterm exams take part. In the third and fourth final exams students take the whole exam regardless results of midterm exams. Final exams are conducted in written form. They consist of theoretical questions and numerical problems. The teacher reserves the right to hold a final exams in oral form. The requirement for passing grade is positive assessment in exam. Positive assessment represents minimal 50% points on final exam.

Grade (%): Final mark:
50% - 60% sufficient (2)
61% - 75% good (3)
76% - 90% very good (4)
91% - 100% excellent (5)

Grade (%) is averagepointsachieved on midtermexamsexpressed as a percentageornumberofpointsachieved on thefinalexamexpressed as a percentage.</td></tr>
<tr><td>Required literature (available in the</td><td colspan="5">Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
</table>

library and via other media)	G. Halevi, R. D. Weill: Principles of Process Planning: A logical approach, Chapman& Hall, 1995.	0	
	M. Jurković, Dž. Tufekčić: Tehnološki procesi: projektiranje i modeliranje, Mašinski fakultet, Tuzla, 2000.	0	
	I. Veža, B. Bilić, N. Gjeldum, M. Mladineo: Upravljanje projektima (interna skripta), Fakultet elektrotehnike strojarstva i brodogradnje, Split, 2011.		
Optional literature (at the time of submission of study programme proposal)	- B. Bilić: Predavanja postavljena na e-learning portalu FESB-a		
Quality assurance methods that ensure the acquisition of exit competences	- Keeping records of the attendance of students - Annual evaluation of results in accordance with the above learning outcomes - Feedback from students via surveys - Self-evaluation of teachers		
Other (as the proposer wishes to add)			

NAME OF THE COURSE	PROJECT						
Code	FESS36	Year of study	3				
Course teacher	Dario Ban Branko Blagojević Boris Ljubenkov	Credits (ECTS)	5				
Associate teachers	Josip Bašić Klement Jadrešić	Type of instruction (number of hours)	L	S	AE	LE	DE
			0	30	0	0	30
Status of the course	Mandatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Training students for development of engineering skills regarding preliminary ship design.		
Course enrolment requirements and entry competences required for the course	Ship Hull Forms, English 1, English 2, Mechanicsof Materials, Mechanics 1		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - Tellbasicmethodsofshipandmaritimeobject design. - Identifyshippropertiesinearly design phase. - Plan andorganizethepartofship design project, withapplyingspecificengineeringskills. - Workinteam on solvingpracticalengineeringproblems. - Design andpresentconceptualship design project, individuallyandinsidetheteam. - Choosethebestcommunicationtechnique for design presentation, - Criticspecific design problemsandtheirsolutions.		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L or S hours	AE hours
	Design methodologies. Identification, analysisandsimulationofship's operative requirements.	2	
	Design process. Design computationalmethods. Transport problem. Project task.	2	
		2	
		2	
		2	
		2	
		2	
		2	
		2	
		2	
		2	
		2	
		2	
		2	
	List oflaboratoryor design exercises		LE or DE hours
	Solving design problem. Tasks for individualwork.		30

<table>
<tr><td></td><td colspan="6"></td></tr>
<tr><td>Format of instruction</td><td colspan="3">☐lectures
☒seminars and workshops
☒exercises
☐on linein entirety
☐partial e-learning
☒field work</td><td colspan="3">☒independent assignments
☐multimedia
☐laboratory
☐work with mentor
☒project</td></tr>
<tr><td>Studentresponsibilities</td><td colspan="6"></td></tr>
<tr><td rowspan="6">Screening student work (name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual work</td><td>2</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>Exercises</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td>2</td><td>(Other)</td><td></td></tr>
<tr><td></td><td colspan="5"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6"></td></tr>
<tr><td rowspan="6">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="3">Literature depending on the design task.</td><td></td><td colspan="2"></td></tr>
<tr><td colspan="3"></td><td></td><td colspan="2"></td></tr>
<tr><td colspan="3"></td><td></td><td colspan="2"></td></tr>
<tr><td colspan="3"></td><td></td><td colspan="2"></td></tr>
<tr><td colspan="3"></td><td></td><td colspan="2"></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">Literature depending on the design task.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">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.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

NAME OF THE COURSE	COMPUTER GRAPHICS IN NAVAL ARCHITECTURE						
Code	FESS15	Year of study	3				
Course teacher	Branko Blagojević Dario Ban	Credits (ECTS)	5				
Associate teachers	Josip Bašić	Type of instruction (number of hours)	L	S	AE	LE	DE
			30	0	0	0	30
Status of the course	Mandatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Training students for: - Application of computers for 3D modelling in naval architecture (geometry, structure, systems, etc.).		
Course enrolment requirements and entry competences required for the course	Ship geometry English language 1 and 2.		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - Explain advantages and disadvantages of application of computer programs for graphical presentation and modelling of ship systems. - Describe mathematical fundamentals of modern graphic programs and their limitations. - Independently make professional 3D models on computer.		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L or S hours	AE hours
	Graphic presentation in naval architecture. General information on CAD systems in naval architecture.	2	
	Mathematical foundations of graphic modeling on computers.	2	
	Mathematical foundations of graphic modeling on computers.	2	
	Types of curves and surfaces. Control points. Control nets.	2	
	Continuity and discontinuity.	2	
	Smoothness.	2	
	Curvatures.	2	
	Stiffness of curves and surfaces - impact on models.	2	
	Selection of curves and surfaces for specific modeling purposes.	2	
	Review of 3D modeling programs for naval architecture.	2	
	Review of 3D modeling programs for naval architecture.	2	
	Data formats. Exporting and importing data. Compatibility issues.	2	
	General information for preparing drawings for 3D printing.	2	
	List of laboratory or design exercises		LE or DE hours
	Making 3D models of ship structure, geometry, systems, etc. in various software (individual assignments). Exporting and importing data and corrections.		30

<table>
<tr><td></td><td colspan="6"></td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☒ exercises
☐on line in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☒ independent assignments
☐ multimedia
☐ laboratory
☐ work with mentor
☐ project (other)</td></tr>
<tr><td>Studentresponsibilities</td><td colspan="6"></td></tr>
<tr><td rowspan="6">Screening student work (name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>Individual assignments (Other)</td><td>3</td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td>1</td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Continuous assessment on lectures, seminars and exercises. Assessment of individual tasks (oral exam).</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td colspan="3">Title</td><td>Number of copies in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="3">Blagojević B. Computer graphics in Naval Architecture. FESB, Split 2016.</td><td></td><td colspan="2">online</td></tr>
<tr><td colspan="3"></td><td></td><td colspan="2"></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">Software manuals and tutorials.</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">-</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
</table>

NAME OF THE COURSE	MARINE PROPULSION SYSTEM						
Code	FESS29	Year of study	3.				
Course teacher	Gojmir Radica, Ph. D., FullProfessor	Credits (ECTS)	5				
Associate teachers	Dario Bezmalinović, Ph. D., Teachingassistant Ivan Tolj, Ph. D.,Teachingassistant,Tino Sumić, Teachingassistant	Type of instruction (number of hours)	L	S	AE	LE	DE
			30	0	30	0	0
Status of the course	Obligatory	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Training students for: - understanding basic principles of marine propulsion system, auxiliary machineries and devices , - understanding application of marine machineries.		
Course enrolment requirements and entry competences required for the course	Thermodynamics, Fluid Mechanics		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - analyze basic principles of marine propulsion and auxiliary machineries and devices, - recommend main propulsion engine and auxiliary machinery for requested application, energy demand and according to rules and regulation, - choose elements of propulsion system, fuel, oil, cooling systems and exhaust and ventilation system.		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L or S hours	AE hours
	Marine propulsionsystems development. Steamboilers.	2	2
	Marine steamturbines.	2	2
	Marine gas turbines.	2	2
	Marine propulsionengines.	2	2
	Enginecombustion.	2	2
	Scavengingandexhaust.	2	2
	Turbochargers.	2	2
	Mainparametersof marine engines	2	2
	Applicationof marine engine. Test bed andseatrial.	2	2
	Fuel, oil, coolingsystems.	2	2
	Marine auxiliaryengines, pumps, compressors.	2	2

	Propellersystems.	2	2
	Diesel-electricpropulsion. Combinedpropulsionsystems. IMO regulation.	2	2
	List of laboratory or design exercises		LE or DE hours

Format of instruction	☒lectures ☐seminars and workshops ☒exercises ☐*on line*in entirety ☐partial e-learning ☐field work	☐independent assignments ☒multimedia ☒laboratory ☐work with mentor ☐ (other)
Studentresponsibilities		

Screening student work *(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	2,0	Research		Practical training	
	Experimental work		Report		(Other)	2,7
	Essay		Seminar essay		(Other)	
	Tests	0,2	Oral exam		(Other)	
	Written exam	0,1	Project		(Other)	

Grading and evaluating student work in class and at the final exam	There are two midterms and final exams. The first midterm exam is after 7 weeks of lecturing and the second one is after the next 6 weeks. In the final exams students that did not pass the midterm exams take part. The midterm and final exams are carried out as written tests (oral test-if necessary). The requirement for passing grade is the positive assessment of exercises and 50 % points for theory and exam on each midterm exam or the final exam. Grade (in percentage) is formed according to the formula: Grade(%) = 0,54 (M1 + M2) the activities in percentage: • M1, M2 – test results.

	Title	**Number of copies in the library**	**Availability via other media**
Required literature (available in the library and via other media)	Radica G. Predavanja iz predmeta Brodski propulzijski sustavi		e-learning
	Grljušić M. Pogonski pomorski sustavi. Interna skripta, FESB, 2001.	5	

	Šneller S, Parat Ž. Pogon broda II. Sveučilište u Zagrebu, FSB, 1999.	5	
Optional literature (at the time of submission of study programme proposal)	- Woodyard , D.:Pounder's Marine Diesel Engines and Gas Turbines,UK,2009. - 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., "Brodskimotori s unutarnjimizgaranjem", Sveučilište u Zagrebu, FSB,2005. - Ozretić, V., "Brodskipomoćnistrojevi i uređaji", Split Ship Management, Split, 2004.		
Quality assurance methods that ensure the acquisition of exit competences	- Evaluation of results in accordance with the above learning outcomes - Feedback from students via surveys - Self-evaluation of teachers - Institutional and non-institutional evaluations		
Other (as the proposer wishes to add)	Available in English language.		

NAME OF THE COURSE	ADVANCED MARINE VEHICLES						
Code	FESS33	Year of study	3				
Course teacher	Branko Blagojević	Credits (ECTS)	5				
Associate teachers	Josip Bašić	Type of instruction (number of hours)	L	S	AE	LE	DE
			30	0	0	0	30
Status of the course	Elective	Percentage of application of e-learning	0				

COURSE DESCRIPTION

Course objectives	Training students for: - Insight into structural and hydromechanics issues of high-speed crafts and advanced marine vehicles – AMV (catamarans, trimarans, SWATH, SES, WiG, submarines, ROV, AUV).		
Course enrolment requirements and entry competences required for the course	Ship geometry Fluid mechanics. Stability of ships. Ship construction. English language 1 and 2		
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	Students will be able to: - Point out features of various AMVs on examples. - Compare structural and hydro mechanical issues of AMV and monohull displacement ships. - Estimate, preliminary, performance of high-speed craft using commercial software. - Sketch general arrangement of various AMVs.		
Course content broken down in detail by weekly class schedule (syllabus)	Course content	L or S hours	AE hours
	Historic development high-speed crafts and advanced marine vehicles. Overview of design process.	2	
	Categorization of marine vehicles. Design space.	2	
	Overview of features of known types of advanced marine vehicles. Von Karman Gabrielli diagram.	2	
	Structural specifics of high-speed crafts and advanced marine vehicles. Hull materials.	2	
	General arrangement, Structural loads and hydrodynamic performance: fast monohulls.	2	
	General arrangement, Structural loads and hydrodynamic performance: catamarans.	2	
	General arrangement, Structural loads and hydrodynamic performance: hydrofoils and surface effect ships.	2	
	General arrangement, Structural loads and hydrodynamic performance: SWATH and WiG.	2	
	Types of propulsors for advanced marine vehicles.	2	
	Submersibles: types. Working principles.	2	
	Submarines: structure, materials, loads.	2	
	Submarines: stability, hydrodynamics.	2	
	Design procedures for submarines.	2	
	List of laboratory or design exercises		LE or DE hours
	Estimation of performance of known AMV using commercial software.		30

Format of instruction	☒ lectures ☒ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☒ project (other)
Studentresponsibilities		

Screening student work *(name the proportion of ECTS credits for eachactivity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	2	Research		Practical training	
	Experimental work		Report		Individual assignments (Other)	
	Essay		Seminar essay		(Other)	
	Tests		Oral exam	1	(Other)	
	Written exam		Project	2	(Other)	

Grading and evaluating student work in class and at the final exam	Continuous assessment on lectures, seminars and exercises. Assessment of project task. Oral exam.		
Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	McKesson CB. The Practical Design of Advanced Marine Vehicles. College of Engineering, University of New Orleans, 2009.		online
Optional literature (at the time of submission of study programme proposal)	1. Dubrovsky V, Matveev K, Sutulo S. Small Waterplane Area Ships. ISBN13: 978-09742019-3-1. 2. Dubrovsky V. Ships with Outriggers. isbn 0-9742019-0-1. 3. Dubrovsky VA, Lyakhovitsky AG. Multi-Hull Ships. Isbn 09644311-2-2. 4. Burcher R, Rydill L. Concepts in Submarine Design. Cambridge University Press, Ocean Technology Series 2, 1994. ISBN: 0 521 41681 7.		
Quality assurance methods that ensure the acquisition of exit competences	-		
Other (as the proposer wishes to add)			