

Faculty of Maritime Studies / MARINE ENGINEERING / MARINE ELECTRICAL SUBSTATIONS

Course:	MARINE ELECTRICAL SUBSTATIONS			
Course ID	Course status	Semester	ECTS credits	Lessons (Lessons+Exercises+Laboratory)
8971	Mandatory	3	4	2+1+1
Programs	MARINE ENGINEERING			
Prerequisites	The precondition is passed exam of "Fundamentals of Electrics and Electronics"			
Aims	The aim of this course is to introduce students to electrical substations on board and their elements (busbars, isolators, circuit breakers, disconnectors, instrument transformers), their roles, applications, divisions, choice and performance. In addition, students are introduced to the schemes of the high-voltage and low-voltage power distribution and electrical installation on board, as well as rules and recommendations for personal protection, control, management and protection of the electrical system.			
Learning outcomes	<ul style="list-style-type: none"> • Explain the basic concepts in the field of energy distribution • Understand and distinguish voltage and current stresses on the equipment • Describe position and basic elements of electrical circuits and their symbols at schemes • Describe and analyze implementation of main switchboard and its components • Understand position, role and work principles of circuit breakers, disconnectors, instrument transformers, surge arresters and busbars. • Understand application of power electronics in modern ships • Describe and distinguish power cables. 			
Lecturer / Teaching assistant	Vladan RADULOVIĆ, assistant professor			
Methodology	Lectures, laboratory, demonstration examples. Consultation.			
Plan and program of work				
Preparing week	Preparation and registration of the semester			
I week lectures	Definitions and classification of marine substations. Voltage and current stresses.			
I week exercises	Calculation of voltage and current stresses.			
II week lectures	Elements of marine substations. Bus (the role, application, sharing, selection of cross section)			
II week exercises	Calculation of bus cross section.			
III week lectures	Insulators (role, application, divisions, selection)			
III week exercises	Selection of insulators			
IV week lectures	Circuit breakers (role, application, divisions, selection). Fuses.			
IV week exercises	Calculation and selection of circuit breakers and fuses			
V week lectures	Disconnectors (role, application, sharing, selection). Power disconnectors.			
V week exercises	Calculation of disconnectors			
VI week lectures	Compulsory test I			
VI week exercises	-			
VII week lectures	Instrument current transformers.			
VII week exercises	Calculation and selection of instrument current transformers.			
VIII week lectures	Instrument voltage transformers.			
VIII week exercises	Calculation and selection of instrument voltage transformers.			
IX week lectures	Schemes of high-voltage power distribution in the ship's electrical systems.			
IX week exercises	Application of schemes			
X week lectures	The layout of elements in marine substations. SF6 and vacuum insulated shielded facilities.			
X week exercises	Determination of layout.			
XI week lectures	Low voltage electrical installations on board.			
XI week exercises	Selection of conductors in low-voltage power installations.			
XII week lectures	The cables on ships. Division, equivalent schemes. Load of cables.			
XII week exercises	Selection of cables			

XIII week lectures	Compulsory test II					
XIII week exercises	-					
XIV week lectures	Auxiliary power circuit and system protection.					
XIV week exercises	Determination of auxiliary power circuits					
XV week lectures	Protection by earthing and protection against electric shock.					
XV week exercises	Calculation of earthing.					
Student workload	Per week 5 credits x 40/30 = 6 hours and 40 minutes Structure: 3 hours of lectures 2 hours of laboratory exercises 1 hour and 40 minutes if individual work, including consultation During semester Lectures and final exam (6 hours and 40 min.) X 16 = 106 hours and 40 min. Necessary preparations before the start of semester (administration, enrollment, etc) 2 x (6 hours and 40 min.) = 13 hours and 20 min. Total hours for the course 5 x 30 = 150 hours Additional hours for the preparation of the correction term(s), including exam taking, 0 to 30 hours. Structure: 106 hours and 40 min. (Lectures) + 13 hours and 20 min. (Preparation) + 30 hours (additional work)					
Per week	Per semester					
4 credits x 40/30=5 hours and 20 minuts 2 sat(a) theoretical classes 1 sat(a) practical classes 1 excercises 1 hour(s) i 20 minuts of independent work, including consultations	Classes and final exam: 5 hour(s) i 20 minuts x 16 =85 hour(s) i 20 minuts Necessary preparation before the beginning of the semester (administration, registration, certification): 5 hour(s) i 20 minuts x 2 =10 hour(s) i 40 minuts Total workload for the subject: 4 x 30=120 hour(s) Additional work for exam preparation in the preparing exam period, including taking the remedial exam from 0 to 30 hours (remaining time from the first two items to the total load for the item) 24 hour(s) i 0 minuts Workload structure: 85 hour(s) i 20 minuts (cources), 10 hour(s) i 40 minuts (preparation), 24 hour(s) i 0 minuts (additional work)					
Student obligations	Students are required to attend classes and to both tests.					
Consultations						
Literature	1. V. Radulović, Brodska električna postrojenja, skripta u izradi 2. Dennis T. Hall „Practical Marine Electrical Knowledge“ 3. N.Bajramović, Brodski električni uređaji i postrojenja, skripta					
Examination methods	4 tests x 2.5 points (10 points) Compulsory test I - 20 points Compulsory test II - 20 points Final exam - 50 points					
Special remarks						
Comment						
Grade:	F	E	D	C	B	A
Number of points	less than 50 points	greater than or equal to 50 points and less than 60 points	greater than or equal to 60 points and less than 70 points	greater than or equal to 70 points and less than 80 points	greater than or equal to 80 points and less than 90 points	greater than or equal to 90 points