GDYNIA MARITIME UNIVERSITY
FACULTY OF MARINE ENGINEERING

THE STUDY PROGRAM

SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION

/operational and management levels of responsibility acc. to STCW Convention/

Field of study: Mechanical Engineering and Machine Design
Mode of studies: full-time
Level of qualification: first-cycle
Educational profile: practical

GDYNIA 2023

The study program, approved by the Senate of the Gdynia Maritime University on September 29, 2023 (Act No. 218/XVII), is adapted to the requirements of the Polish Qualification Framework (PQF) for qualifications at level 6, including engineering competencies.

The program meets the requirements of the Law of July 20, 2018. Law on Higher Education and Science (DZ. U. of 2018 Poz.1668) and the Decree of the Minister of Science and Higher Education of September 27, 2018. (DZ. U. of 2018 Poz. 1861) on studies as amended.

In addition, the program meets the requirements of the framework extended training program at the operational and management level in the engineering department in the mechanical specialty, as set forth in Appendix No. 8 of the Decree of the Minister of Infrastructure and Development of February 28, 2014, item 536, as amended, unified text DZ. U. of 2017. item 775.

Explanation of abbreviations:

L – lecture,
C – exercise,
Lab – laboratory,
P – project,
S – seminar,
E - exam,

ECTS (the European Credit Transfer System) – as ECTS credits, which represent learning based on defined learning outcomes and their associated workload. To complete a year successfully, a student has to collect 60 credits.

STCW – International Convention on Standards of Training, Certification and Watchkeeping for Seafarers. The Convention prescribes minimum standards relating to training, certification and watchkeeping for seafarers which countries are obliged to meet or exceed.

Explanation of designations in symbols for learning outcomes (K):

K – learning outcomes for the study program

Symbols after underscore:
W – knowledge competence,
U – skills competence,
K – social competence,
01, **02**, **03**, et seq. – number of learning outcome

EP – learning outcomes for the subject

Gathered by: dr inż. Justyna Molenda

GENERAL PROGRAMME DESCRIPTION

a) main field of study: **Mechanical Engineering and Machine Design**
b) level of qualification: **first-cycle studies**
c) profile of study: **practical**
d) mode of study: **full-time**
e) number of semesters and ECTS credits to gain: **8 semesters/240 ECTS**
f) awarded degree: **inżynier**
g) discipline of science: **mechanical engineering**

The Faculty of Mechanical Engineering of Gdynia Maritime University meets the conditions for conducting first-cycle studies of practical profile in the field of Mechanical Engineering and Machine Design, as specified in the Law of July 20, 2018, Law on Higher Education and Science (Journal of Laws of 2018 Poz. 1668) and the Regulation of the Minister of Science and Higher Education of September 27, 2018 on studies (Journal of Laws of 2018 Poz. 1861) as amended. The Faculty has a description of learning outcomes, including those enabling engineering competencies and the study program. Faculty ensures also adequate quality of mode of students training realization, has adequate infrastructure to ensure proper implementation of educational objectives, provides access to the library, and has implemented an internal educational quality assurance system. Classes are conducted in proper conditions thanks to a constantly expanded and modernized infrastructure. The faculty has numerous laboratories equipped with state-of-the-art equipment, which allows students to acquire knowledge and practical skills in line with current trends. The study program is improved in response to the needs of students and the labour market, taking into account the results of the monitoring referred to in Article 352 (1) of the Law on Higher Education and Science and analyses of employer demand.

Correlation of the field of study with the mission of Gdynia Maritime University

Gdynia Maritime University continues traditions of the Maritime School, founded on 17th June 1920 in Tczew, as well as the Polish maritime schools in London and Southampton which were responsible for the training of maritime personnel during WWII, and, later, the National Maritime School, the National School of Maritime Fishing, the Higher Maritime School in Gdynia and the Maritime Academy in Gdynia. In line with its mission, the University *"by conducting scientific research, in accordance with the concept of sustainable and balanced development, significantly enhances knowledge related to the design and operation of technical systems within maritime industries, and by educating students and doctoral students – according to international and national standards – it prepares the highest level personnel who are able to effectively meet contemporary challenges, locally, regionally, nationally and internationally, especially in the field of maritime transport and other maritime activities, including in offshore areas.*

The University is committed to the continuous development of its research and teaching staff, and fosters attitudes among its students that are characterized by entrepreneurship, creativity, innovation, discipline and respect for ethics, including collegial cooperation."

The purpose of education in the field of Mechanics and Mechanical Engineering, on first-cycle studies of practical profile, is to obtain qualifications at level 6 of the Polish Qualification Framework (PQF), preparation for safe work on board a ship as a ship's engineer officer at the operational and management level, as well as for employment in shipbuilding companies and others engaged in the manufacture and operation of machinery and ship mechanical systems, both at home and abroad. The high quality of students' education and their good preparation for work are confirmed by the results of the monitoring analyses referred to in Article 352 (1) of the Law on Higher Education and Science. Those results indicate that graduates of the field have no problems finding work after graduation and are satisfied with their chosen field of study.

The study program implements the educational objectives and provides learning outcomes that allow graduates to obtain the knowledge and skills necessary for the labour market. In order to link the educational process with the needs of the economic environment, the Faculty maintains constant contact and cooperation with entities related to the maritime economy.

Internal education quality assurance system

Gdynia Maritime University has developed and implemented a Quality Management System to better meet the needs and expectations of its current and future customers and to improve the management of the University through continuous improvement of the system. The quality management system complies with the ISO 9001: 2015 Standard requirements and applies to the full scope of activity of Gdynia Maritime University, namely:

ACADEMIC EDUCATION
(INCLUDING TRAINING ACTIVITIES COVERED BY THE STCW CONVENTION)

CONDUCTING SCIENTIFIC RESEARCH IN ACCORDANCE WITH POLISH AND INTERNATIONAL REQUIREMENTS

MANAGEMENT OF UNIVERSITY PROPERTY - PROVISION OF RENTAL SERVICES FOR ROOMS AND FACILITIES

Compliance of the quality management system with the requirements of the ISO 9001: 2015 Standard is confirmed by a certificate issued by the Certification Office of the Polish Register of Shipping [Biuro Certyfikacji Polskiego Rejestru Statków S.A.].

Methods of the assessment of assumed learning outcomes

The method of checking whether the established learning outcomes of each subject have been achieved is described in the subject syllabus updated each academic year by the supervisor for the subject. Each semester, one grade is given for all forms of classes, based on the criteria described in the syllabus.

The achievement of learning outcomes from lectures and exercises is typically verified by written tests during the semester. Most often, they take the form of a set of open-ended tasks that require the performance of relevant calculations or the reproduction of information presented in class.

The achievement of learning outcomes in the scope of the laboratory program is verified by the student's performance of a set of experimental tasks, answers to control questions, and completion of a written report including a study of the experimental results.

The achievement of learning outcomes in the field of project and seminar classes is verified by the evaluation of an individually or collectively prepared original project in the field of the assessed subject.

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	**LIST OF SUBJECTS**
Main field of study:	MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:	first-cycle studies
Mode of study:	full-time
Profile of study:	practical
Specialization:	**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

28.	Naval architecture & ship construction*	28.1
29.	Marine power plants*	29.1
30.	Technical diagnostics*	30.1
31.	Safe ship operation*	31.1
32.	Marine internal combustion engines*	32.1
33.	Marine boilers*	33.1
34.	Marine turbines	34.1
35.	Marine auxiliary machines & equipment*	35.1
36.	Refrigeration, ventilation and air conditioning*	36.1
37.	Marine electrotechnics & electronics*	37.1
38.	Fundamentals of marine control engineering*	38.1
39.	Water, fuel & lubricants*	39.1
40.	Law and marine insurance*	40.1
41.	Engine room simulator*	41.1
42.	Fundamentals of marine propulsion plant*	42.1
43.	Marine internal combustion engines operation & maintenance**	43A.1
	Machines of offshore drilling units**	43B.1
	Marine turbines operation & maintenance**	43C.1
44.	Onboard training*	44.1
45.	Diploma thesis seminar	45.1
46.	Diploma thesis	46.1
47.	Graduate profile	47.1
48.	Curriculum for the study	48.1
49.	Learning outcomes for the programme (field of studies)	49.1
50.	Summarized program indicators	50.1

*** - subjects required according to STCW 78/95**

**** - elective courses**

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	1	Name of subject:	**ENGLISH***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
I	2		2					30			
II	2		2					30			
III	2		2					30			
IV	2		2					30			
V	2		2					30			
VII	2		2					30			
VIII E	2		2					30			
Total numbers of hours during study:							**210**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Basic knowledge and competence of secondary school program.

Course objectives

1.	The objective of the course is to gain knowledge and competence within the scope of General English, Technical English, Maritime English, Business English according to STCW Convention.
2.	The course follows the recommendations of the extended model course for engineering department at operating and management level, issued in annex no. 8 of the Directive of the Ministry of Infrastructure and Development of 28th February 2014, item 536, including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	name the University, Faculty, field and specialization, enumerate and describe tools, metals, alloys, ship types and parts, crew members, main engine types, engine components and parameters, auxiliary engines, pipes and fittings, fuel and oil types and specifications	K_W03, K_W08
EP2	analyze diagrams of selected engine room systems , explain the principles of their operation and make use of operating instructions	K_W05, K_U03
EP3	describe safe working procedures on board vessel specifically in the engine room with relation to machine maintenance and repair works (SMCP)	K_W09, K_U11

EP4	use grammar structures and rules in writing and in speech , use the rules of commercial, ship and engine room correspondence	K_U06
EP5	communicate in professional English (Maritime English) , make speeches and comment on engine room operation	K_U02, K_U04
EP6	utilize literature and electronic sources to improve language competences with reference to Technical & Maritime English	K_U01, K_U05, K_U07
EP7	work in group taking various roles, understand the rules of cooperation and the need to develop skills	K_K01, K_K05

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester I

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Basic English grammar rules : verb forms, cardinal umbers, ordinal numbers, personal pronouns, possessive pronouns, English tenses.		4		EP4, EP7
2.	Name of the University, Faculty, field and specialization , academic vocabulary		2		EP1
3.	Terminology related to mathematics and physics (numbers, sets, mathematical operations, formulas, laws)		4		EP6
4.	*Terminology related to structural materials,* properties of materials, tests on materials, metals and alloys. **(8.14.1t)**		5		EP1, EP6
5.	*Terminology related to technological processes:* metal working processes: casting, forging, welding, lathing, milling , grinding , heat treatment. (**8.14.2b)**		8		EP5, EP7
6.	Elements of conversation , describing past and future events. Basics of English phonetics.		5		EP1, EP7
7.	Reading simplified articles with technical terminology.		2		EP6, EP7
	Total numbers of hours during semester:		**30**		

Semester II

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Revision of basic English grammar rules including English tenses.		4		EP4, EP7
2.	*Terminology related to repair works: tools* **(8.14.2c)**		6		EP1, EP6
3.	*Terminology related ship construction*, ship particulars, *deck appliances*, vessel types, ship crew and maritime alphabet. **(8.14.1a, 1b).** Introduction to SMCP. *Communication related to ship operation*. **(8.14.5)**		10		EP1, EP6
4.	Communicative activities developing the acquired technical terminology. English phonetics.		6		EP1, EP7
5.	Reading simplified articles with technical *terminology related to repair works of ship machinery*, new ship technologies and *ship documents and procedures.*		4		EP6, EP7
	Total numbers of hours during semester:		**30**		

Semester III

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	*Terminology related to internal combustion engines*: engine types, their *construction and application , principle of operation, 4 stroke engine, 2 stroke engine, basic components.* **(8.14.1c)**		12		EP1, EP2
2.	*Terminology related to engine work parameters.* **(8.14.1c)**		4		EP1, EP2
3.	Grammar areas covering English tenses, questions formation, compound nouns. Passive Voice introduction based on *technical terminology related to ship installations operation.* **(8.14.1r)**		6		EP4
4.	Reading technical texts and operating manuals related to maintenance, *specifications, repairs and failure description*. **(8.14.3b, 3d)**		4		EP6, EP7
5.	Developing abilities of spoken English usage with respect to technical subject matter.		4		EP1, EP5
	Total numbers of hours during semester:		**30**		

Semester IV

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	*Revision of terminology related to the construction of internal combustion engines.* **(8.14.1c)**		2		EP1, EP5
2.	*Terminology related to functional systems of internal combustion engines: bearings.* **(8.14.1c)**		4		EP1, EP6
3.	*Terminology related to hydraulic devices and installations, pneumatic devices (fittings, valves), pumps and pump systems , compressors in marine system such as ballast system, cooling water system, bilge system and firefighting system.* **(8.14.1f, 1g, 1i, 1j, 1r)**		10		EP1, EP2, EP6
4.	*Terminology related to marine sanitary sewage treatment plant.* **(8.14.1p)**		4		EP1, EP2
5.	Grammar areas covering Passive Voice, Conditional Sentences type 1, noun compounds based on technical terminology related to *repairs, repair report, checklists, failure description, complaints and requisition.* **(8.14.3a, 3b, 3c, 3d, 3f, 3i, 3j, 3l)**		6		EP3, EP4
6.	*Communication related to engine room operation:* *a) reports of engine room monitoring devices,* *b) ship crew communication*. **(8.14.4)**		4		EP5, EP7
	Total numbers of hours during semester:		**30**		

Semester V

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	*Terminology related to fuel system, fuel types*, rules of bunkering and fuel transfer, fuel injection system and exhaust gas scrubber. **(8.14.1r, 1s)**		7		EP1, EP2
2.	*Terminology related to fuel separators.* **(8.14.1k)**		4		EP1, EP2

3.	*Terminology related to waste incinerators*. **(8.14.1q)**		3		EP1, EP2
4.	Grammar areas covering Passive Voice, imperatives in Reported Speech, Conditional Sentences type 2 based on *terminology related to repair works, repair report and ship installations operation*. **(8.14.1r, 3b, 3d, 3f, 3i)**		6		EP3, EP4
5.	Activities developing communicative competence and reading articles from technical magazines dealing with *safe working procedures* on board vessels. **(8.14.3d, 3e, 3j, 3k, 8.14.5, 8.14.6)**		4		EP2, EP5, EP6
6.	*SMCP terminology, communication related to ship operation.*. **(8.14.5)**		2		EP2, EP5
7.	*Terminology related to ISM and ISPS procedures* **(8.14.7)**		4		EP5, EP6
Total numbers of hours during semester:			**30**		

Semester VII

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	*Terminology related to fresh water generating plant*. **(8.14.1l)**		4		EP2, EP5
2.	*Terminology related to marine boilers and steam installations*. **(8.14.1h)**		4		EP2, EP5
3.	*Terminology related to bilge water separators*. **(8.14.1o)**		4		EP2, EP5
4.	*Terminology related to electric devices and systems*. **(8.14.1d)**		4		EP2, EP5
5.	*Elements of correspondence related to engine log book entries, repair reports, accidents reports, repair scope, parts requisition*. **(8.14.3a, 3b, 3d, 3e, 3f, 3h, 3i)**		3		EP6, EP7
6.	SMCP terminology, *communication in alarm and emergency situations*. **(8.14.6)**		3		EP1, EP5
7.	Grammar areas covering Passive Voice, modal verbs, Reported Speech based on texts related to *engine room operation, reports and failure*. **(8.14. 3b, 3d, 3f, 3i, 4a, 4b)**		4		EP4, EP5
8.	Activities developing communicative competences based on students onboard experience *related to engine room operation*. **(8.14.4a, 4b)**		4		EP5, EP7
Total numbers of hours during semester:			**30**		

Semester VIII

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	*Terminology related to steering gear installation*. **(8.14.1m)**		4		EP2, EP7
2.	*Terminology related to propellers*. **(8.14.1n)**		3		EP2, EP6
3.	*Terminology related to marine automatic systems*. **(8.14.1n)**		3		EP2, EP6
4.	*Elements of correspondence related to machine repair and maintenance*, contracting parties e-mails . **(8.14.3a, 3b, 3c, 3j)**		4		EP4, EP6
5.	*Elements of professional correspondence related to appraisal report, special work permits*, job application, CV. **(8.14.3g, 3k)**		4		EP1, EP5

6.	*Terminology related to engine room devices repair and maintenance*, including activities developing communicative competence with respect to new ship and propulsion technologies. **(8.14.2a, 2e)**		5		EP2, EP3, EP4
7.	Preparation for final exam of professional Maritime English, revision of terminology related to : 1. *engine room systems*, **(8.14.1c, 1r, 8.14.5a, 5b)** 2. grammar issues within B2 level of European Framework .		5		EP2, EP4
8.	Terminology related to Bachelor thesis abstract.		2		EP4, EP6
	Total numbers of hours during semester:		**30**		

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1	x		x				x	x	x
EP2	x		x				x	x	x
EP3	x		x					x	x
EP4	x		x					x	x
EP5	x							x	x
EP6							x		x
EP7								x	x

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
I – VIII	Student achieved the presumed learning outcomes and fulfilled the STCW requirements related to passing the course. Student attended all classes. (100 % presence is required by STCW convention), (two absences are permitted during one semester). Getting credits for particular semesters – tests, pass tests, practical demonstration and other forms of assessing English language competence. Final written exam at the end of the course. Exemption from the exam can be granted on the basis of very good grades for the semesters (one good grade or two plus good grades are permitted).

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	210			
Reading literature	50			
Preparing for laboratories, project classes	0			
Preparing for exam, pass test	50			

Developing project/report	0			
Participation in exam, pass test	15			
Consultation with teacher	15			
Total number of hours	340			
Number of ECTS credits	**14**			
Total number of ECTS credits for the subject	**14**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	210 + 15 + 15 = 240 h 10 ECTS			

List of literature:

Required reading
1. International Maritime Language Program , P. van Kluiyven, workbook + CD 2. Ossowska Neumann M., Żurawska E.: English Coursebook for Marine Engineering Students. GMU 2016. 3. Pdf files: engine room simulator files, Safety Digest reports, devices data sheets, engine room checklists, ship documents, operating manuals, formal letters, requisitions etc. 4. On Board Training Record Book, ISF 2013
Recommended reading
1. Buczkowska W.: MarEngine English Underway. Dokmar, 2014. 2. Cbt Programme: MarEng – Maritime English Learning Tool. 3. Puchalski J.: Ilustrowany angielsko – polski słownik marynarza. Trademar, 2003. 4. Sztramska M.: Wybrane Przykłady Korespondencji Handlowej w Języku Angielskim z Tłumaczeniami. 5. Prof. Henry – gramatyka, testy, rozumienie ze słuchu. 6. Gunia M., Mastalerz K.: Workshop on English Grammar for Mechanical Engineering Students. Szczecin 2004. 7. Augustyniak A., Mastalerz K.: English Basics for Marine Engineering Students. Szczecin 2011.

Teacher:

Title/degree, name and surname	**University unit**
1. Supervisor:	
Małgorzata Ossowska-Neumann, M.A.	Foreign Languages Department
2. Other lecturers:	
Lecturers of FLD	Foreign Languages Department

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	2	Name of subject:	FUNDAMENTALS OF INFORMATION TECHNOLOGY
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
II	3	1		2			15		30		
Total numbers of hours during study:							45				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Basic computer skills.
2.	Basic abilities of using a word processor and spreadsheet.

Course objectives

1.	The objective of the course is to provide basic knowledge and skills in computer operation, word processing, use of a spreadsheet and basics of object-oriented programming.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	introduce the basic elements of a computer; describe the operation of a computer, identify the most important operating systems and programming languages	K_W01, K_U01
EP2	use the correct method of complex word processing and data processing in a spreadsheet	K_W01, K_U07,
EP3	explain and apply the basic principles of object-oriented programming	K_W01, K_U01, K_U07, K_K07

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester II

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Construction and operation of a PC computer.	2			EP1
2.	Major operating systems.	1			EP1
3.	Programming languages.	1			EP1

4.	Edit the complex texts in a text editor.	1		4	EP2
5.	Analysis of the data in the spreadsheet.	1		8	EP2
6.	Borland Delphi - programming environment.	1			EP3
7.	Fundamentals of visual programming - the structure of the program.	1		2	EP3
8.	Data types, variables, global and local.	2		4	EP3
9.	Controlling the program.	1		6	EP3
10.	Procedures and Functions	2		2	EP3
11.	Working with Files	1		2	EP3
12.	Podstawy grafiki komputerowej.	1		2	EP3
13.	Edit the complex texts in a text editor.	1		4	EP2
Total numbers of hours during semester:		**15**		**30**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1	x								
EP2								x	
EP3								x	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
II	Student achieved the expected learning outcomes. Lecture: method of assessment - test of the lecture. Laboratory: Execution and completion of all laboratory, according to the schedule. Final evaluation of the average score for each task practical test. **Evaluation index after successful completion of the lab and lecture: Average of all grades received lecture and laboratory.**

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	15	30		
Reading literature	10			
Preparing for laboratories, project classes		20		
Preparing for exam, pass test	3	2		
Developing project/report				
Participation in exam, pass test	2			
Consultation with teacher		3		

Total number of hours	30	55		
Number of ECTS credits	**1**	**2**		
Total number of ECTS credits for the subject	**3**			
Student's workload connected with practical classes	30 + 20 + 2 + 3 = 55 h 2 ECTS			
Student's workload connected with classes involving direct participation of teacher	15 + 2 + 30 + 3 = 50 h 2 ECTS			

List of literature:

Required reading
1. Wróblewski P.: ABC Komputera, Helion, 2017. 2. Wrotek W.: Office 2019 PL. Kurs, Helion, 2019. 3. B. Mrozek, Z. Mrozek: MATLAB i Simulink. Poradnik użytkownika. Wyd. IV, Helion, 2017.
Recommended reading
1. Gonet M.: Zrozumieć Excela. Funkcje i wyrażenia, Helion, 2019. 2. Sradomski W.: MATLAB. Praktyczny poradnik modelowania, Helion, 2015.

Teacher:

Title/degree, name and surname	**University unit**
1. Supervisor:	
Grzegorz Sikora, PhD (Eng)	Department of Marine Propulsion Plants
2. Other lecturers:	
Piotr Cholawo, MSc(Eng)	Department of Marine Maintenance

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	3	Name of subject:	**LABOR SOCIOLOGY**
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
I	2	2					30				
Total numbers of hours during study:							**30**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Basic knowledge and competence of secondary school program.

Course objectives

1.	The purpose of the course is to familiarize students with the basic problems of sociology and the propaedeutics of general humanistic and social knowledge. The student, upon completion of the course, should obtain a general orientation in basic sociological problems.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	list the circumstances of the emergence of sociology as a science and the main sociological theories describing social relations. Student illustrates with examples the reference of sociological theories to explain the mechanisms of social life and is able to use appropriate research tools to study sociocultural processes and phenomena	K_W08, K_U01, K_U06, K_K01, K_U09
EP2	enumerate the factors constituting the basis of social life, describe the processes accompanying the phenomenon of socialization	K_W08, K_K01, K_K09
EP3	distinguish types of social groups, list the principles of their functioning. Be able to characterize interactions occurring in groups, properly describe and use various forms of group and individual communication	K_W08, K_U02, K_K03, K_U04
EP4	characterize different types and systems of cultural symbols, describe their role in social life. Discuss basic issues related to the functioning of organizations	K_W08, K_W09, K_K03, K_K04
EP5	explain what is the essence of governance, list different types of it	K_W08, K_U02,
EP6	list the main elements concerning the decision-making process and their social consequences, knows the ways of conflict resolution	K_W08, K_U02, K_K03, K_K04
EP7	explain the meaning and essence of motivational activities, knows the basic principles of managing people, understands the impact of the personality of the manager on the effectiveness of work	K_W09, K_W01, K_K06,

Course content:

Semester I

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Subject, divisions, place of sociology among other sciences.	3			EP1
2.	Methods of sociological research.	1			EP1
3.	Man as a social being- natural, economic and cultural aspects. The phenomenon and process of socialization. Social roles.	2			EP2
4.	Social groups as a system of individuals interacting with each other.	2			EP3
5.	Organizational culture: types and systems of cultural symbols and their role in social life. Consequences of cultural diversity. Selected instruments for overcoming problems caused by cultural diversity.	4			EP4
6.	Social conflicts and ways to resolve them.	2			EP6
7.	The organization and its personnel.	4			EP4
8.	Motivational actions in organizations - learning to manage people.	2			EP7
9.	Social communication /verbal and non-verbal communication, communication styles, communication barriers, assertiveness/.	2			EP3
10.	Authority - attitude to authority, types of authority, pathology of authority.	2			EP5
11.	Group decision-making.	2			EP6
12.	Human resources management styles and the criteria for their selection.	2			EP7
13.	Presentation of Gdynia Maritime University sociology as an example of the company.	2			EP7
	Total numbers of hours during semester:	**30**			

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1	x								
EP2	x								
EP3	x								
EP4	x								
EP5	x								
EP6	x								
EP7	x								

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
II	Student achieved the expected learning outcomes. Lecture: method of assessment - test of the lecture.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	30			
Reading literature	15			
Preparing for laboratories, project classes				
Preparing for exam, pass test	5			
Developing project/report				
Participation in exam, pass test	1			
Consultation with teacher	2			
Total number of hours	53			
Number of ECTS credits	**2**			
Total number of ECTS credits for the subject	**2**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	30 + 1 + 2 = 33h 1 ECTS			

List of literature:

Required reading
1. Giddens A.: Socjologia. Wyd. Naukowe PWN, Warszawa 2012. 2. Sztompka P.: Socjologia. Społeczny Instytut Wydawniczy Znak, Kraków 2002. 3. Szacka B.: Wstęp do socjologii. Wyd. Oficyna Naukowa, Warszawa 2003. 4. Szczepański J.: Elementarne pojęcia socjologii. Wyd. Naukowe PWN, Warszawa 2000.
Recommended reading
1. Szacki J.: Historia myśli socjologicznej. Wydawnictwo Naukowe PWN, Warszawa 2017. 2. Berger P.: Zaproszenie do socjologii. Wydawnictwo Naukowe PWN, Warszawa 2007. 3. Kozak S.: Socjologia grupy. Wyd. Akademii Morskiej w Gdyni, Gdynia 2002.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Izabela Straczewska, PhD	
2. Other lecturers:	

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	4	Name of subject:	**FUNDAMENTALS OF ECONOMICS AND MANAGEMENT**
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
II	2	2					30				
Total numbers of hours during study:							**30**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	No prerequisites.

Course objectives

1.	In the field of economics the goal of the subject is to get knowledge about the determinants of behaviour of market players, the effects of decisions made by them and learning about the fundamental economic problems (their sources and ways to solve).
2.	In the field of management the goal of the subject is learning about the organisation's management system, the relationship between the implementation of management functions and the efficiency of the organization.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	describe economic realities using the economic nomenclature.	K_W11, K_K11
EP2	explain the economic reasons for the conduct of market players and the state.	K_W11, K_W13, K_K02
EP3	explain the meaning of the basic concepts of management.	K_W13, K_K08
EP4	describe the mechanism of operation of the organization, the connections and dependencies between management functions and operational efficiency.	K_W11, K_W13, K_K01, K_K02

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester I

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Introduction to Economics.	1			EP2
2.	Demand, Supply, and Equilibrium. Market Mechanism.	1			EP1, EP2
3.	The Price Elasticity of Demand. The Price Elasticity of Supply.	2			EP2
4.	Theory of Cost (Private and Social Costs, Opportunity Costs, Short Run and Long Run Costs).	1			EP1
5.	Competitive Markets for Goods and Services. Monopoly and Imperfect Competition.	2			EP1
6.	Measuring Total Output and Income.	1			EP1
7.	Issues in Fiscal Policy.	2			EP1, EP2
8.	Problems and Controversies of Monetary Policy.	2			EP1, EP2
9.	Labour Market. Unemployment.	1			EP1
10.	Inflation. The Correlation of Commodities Prices to Inflation.	1			EP1
11.	Business cycles.	1			EP1
12.	Subject and scope of management. The organization as an object of management and as a socio-technical system. The efficiency of the organization.	3			EP3, EP4
13.	Management of an organization - basic concepts. Management as a process of decision-making.	3			EP3
14.	Planning.	2			EP3, EP4
15.	Organizing.	2			EP3, EP4
16.	Motivating.	2			EP3, EP4
17.	Controlling.	2			EP3, EP4
18.	The essence of organizational change and its impact on organizational efficiency, people's behaviour towards organizational changes.	1			EP4
	Total numbers of hours during semester:	**30**			

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x					
EP2				x					
EP3				x					
EP4				x					

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
II	Student writes a separate test in economics and management. To receive a passing grade demands 50% of the points possible to get from each part. The final grade is the arithmetic mean of both marks.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	30			
Reading literature	12			
Preparing for laboratories, project classes				
Preparing for exam, pass test	15			
Developing project/report				
Participation in exam, pass test	2			
Consultation with teacher	2			
Total number of hours	61			
Number of ECTS credits	**2**			
Total number of ECTS credits for the subject	**2**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	30 + 2 + 2 = 34h 1 ECTS			

List of literature:

Required reading
1. Sloman J., Wride A., Garratt D.: Economics for business. Pearson Education; 8th edition, 2012 2. Robbins S. P., Decenzo D. A., Coulter M. A., Fundamentals of Management: Essential Concepts and Applications, 10th Edition, Pearson Education 2017.
Recommended reading
1. Stopford M.: Maritime economics. Routledge, Taylor& Francis Group, London, New York 2009. 2. Griffin R., Management 11th Edition, Cengage Learning, 2012.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Katarzyna Szelągowska-Rudzka, PhD	Department of Management and Economics
2. Other lecturers:	
Katarzyna Skrzeszewska, PhD	Department of Management and Economics

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	5	Name of subject:	**FUNDAMENTALS OF PROJECT MANAGEMENT**
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
III	1		1					15			
Total numbers of hours during study:							**15**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Basic knowledge and competence of secondary school program.

Course objectives

1.	The goal of the subject is for students to acquire skills in planning and organizing projects including the use of selected techniques and methodologies.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	define the goals and scope of the project	K_W13, K_U01
EP2	create elements of project documentation, including schedule, risk management plan	K_W13, K_U10, K_U14, K_U17
EP3	properly select and apply available techniques and methods to support project management	K_W11, K_U07
EP4	collaborate effectively in a project team, effectively present ideas	K_U24, K_U25

Course content:

Semester III

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Introduction to project management. Defining the project concept, adopting initial assumptions, overall goal, time frame, planned benefits and results.	1			EP1, EP4
2.	SWOT analysis of the project concept. Defining detailed project objectives, SMART technique.	2			EP1, EP2, EP3

3.	Creating a project team, creating its structure. Determination of competencies and tasks of team members. Project manager - tasks, personality traits, requirements.	2			EP4
4.	Communication in a project team: a) verbal and non-verbal communication, b) communication tools, c) communication channel vs. personality, d) communication tools in conflict situations, e) project communication plan.	2			EP2
5.	Project environment. Project stakeholder analysis.	2			EP2, EP3
6.	Project planning: a) scope planning, b) work breakdown structure (SPP, WBS), c) constraint triangle, d) trade-off matrix, e) RACI matrix.	2			EP1, EP2, EP3
7.	Estimating project duration: a) basics of scheduling, b) Parkinson's law, c) network methods (CPW, PERT), d) scheduling (Gannt chart).	2			EP2, EP3
8.	Zarządzanie ryzykiem w projekcie: a) identyfikacja ryzyka, b) wycena ryzyka, c) odpowiedzi na ryzyko.	2			EP2, EP3
	Total numbers of hours during semester:	**15**			

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1					x				
EP2					x				
EP3					x				
EP4					x			x	

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
III	Student achieved the presumed learning outcomes. Student attended all classes. Credit based on the tasks developed and the ability to work with the project method during the semester.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	15			
Reading literature				
Preparing for laboratories, project classes				
Preparing for exam, pass test				
Developing project/report	15			
Participation in exam, pass test				
Consultation with teacher	2			
Total number of hours	32			
Number of ECTS credits	**1**			
Total number of ECTS credits for the subject	**1**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	15 + 2 = 17h 1 ECTS			

List of literature:

Required reading
1. Watt A. : Project management. BCcampus, 2014. 2. A Guide to the project management body of knowledge. PMBOK GUIDE – sixth edition. 3. Managing succesful project s with PRINCE2TM. sixth Edition. 4. Ward G. G. F.: Effective project management. Guidance anh checklist for engineers and construction.WILEY Blackwell, 2018.
Recommended reading

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Justyna Molenda, PhD (Eng)	Department of Marine Maintenance
2. Other lecturers:	
Agata Wieczorska, MSc (Eng)	Department of Marine Maintenance

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	6	Name of subject:	**INTELLECTUAL PROPERTY PROTECTION**
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	**ECTS credits**	**Number of hours per week**					**Number of hours per semester**				
		L	**C**	**Lab**	**P**	**S**	**L**	**C**	**Lab**	**P**	**S**
II	1	1					15				
Total numbers of hours during study:							**15**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	General knowledge about the legal system and sources of law in Poland.

Course objectives

1.	The goal of the subject is to provide basic knowledge of the protection of intellectual property and to learn about the procedures conducted in this area.
2.	The goal of the subject is to make students aware of the scope of intellectual property protection and the legal consequences of its violation.

Intended key learning outcomes for the subject (EP):

Symbol	**upon completion of the course student is able to:**	**Reference to field learning outcomes**
EP1	explain the basic concepts of legal protection of intangible property	K_W10, K_W14
EP2	present the sources of intellectual property law and the general principles of IP protection described in them	K_W10,
EP3	explain what is the activity of the Patent Office of the Republic of Poland and the European Patent Office, other public administration bodies and non-governmental organizations in the field of protection of creators' rights	K_W14
EP4	describe the lawful use of works and the legal consequences of copyright infringement	K_W11, K_W14
EP5	obtain information and understand what the proceedings conducted in connection with the protection of intellectual property are about	K_U01, K_W11, K_W14

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester II

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Protection of intangible property in historical perspective.	1			EP1
2.	Basic concepts and legal acts in the field of intellectual property protection. Public administration bodies acting in the field of intellectual property protection.	2			EP1, EP2, EP3
3.	"Know-how"- company secrets.	1			EP1, EP2
4.	Copyright and related rights - basic concepts. Scope of protection of works and prerequisites for its application.	2			EP1, EP2
5.	Permitted use - basic concepts and principles.	1			EP1, EP4
6.	Copyright infringement - the concept of plagiarism, piracy. Protection of works versus Internet resources.	1			EP1, EP4
7.	Special protection of computer programs, image and correspondence.	1			EP2, EP4
8.	Industrial property law - general characteristics. Principles of protection of inventions, utility models, industrial designs, geographical indications, topographies of integrated circuits.	4			EP1, EP2, EP3
9.	Trademarks - preliminary provisions.	1			EP1, EP2
10.	Application procedures for invention, utility model and industrial design: national, regional and international.	1			EP3, EP5
	Total numbers of hours during semester:	**15**			

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x					
EP2				x					
EP3				x					
EP4				x					
EP5				x					

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
II	Student achieved the presumed learning outcomes. Student attended classes. Credit based on the written test. Receiving a passing grade demands 50% of the points possible to get.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	15			
Reading literature	8			
Preparing for laboratories, project classes				
Preparing for exam, pass test	5			
Developing project/report				
Participation in exam, pass test	1			
Consultation with teacher				
Total number of hours	29			
Number of ECTS credits	**1**			
Total number of ECTS credits for the subject	**1**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	15+1=16h 1 ECTS			

List of literature:

Required reading
1. Klopschinski S., Gibson C., Grosse Ruse-Khan H.: The Protection of Intellectual Property Rights Under International Investment Law. Oxford International Arbitration Series, 2021. 2. Stim R.: Patent, Copyright & Trademark: An Intellectual Property Desk Reference. Sevententh Edition. NOLO, 2022. 3. https://uprp.gov.pl/pl/platforma-edukacyjna/e-biblioteka 4. http://www.copyright.gov.pl/pages/main-page/copyright-in-poland/general-information.php
Recommended reading
1. https://www.euipo.europa.eu/en 2. www.wipo.int

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Justyna Molenda, PhD (Eng)	Department of Marine Maintenance
2. Other lecturers:	

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	7	Name of subject:	OCCUPATIONAL SAFETY AND ERGONOMICS
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
I	1	1					15				
Total numbers of hours during study:							15				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of secondary school.

Course objectives

1.	The goal of the subject is to provide students with basic knowledge and skills about occupational safety and ergonomics necessary for safe operating the technical ship equipment and estimating possible danger at the work place.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	list the basic Polish and EU legal acts in the field of occupational health and safety; illustrate the labor protection system	K_W10, K_W11, K_W13
EP2	explain the basic physical and mental capabilities of human in the process of work	K_W10, K_W11
EP3	list the objectives of occupational risk assessment; create an energy checklist	K_W15, K_U17, K_K04, K_K06
EP4	identify hazards at the workplace; provide ways to prevent these risks	K_W06, K_U10, K_U11, K_U18,
EP5	describe the tasks of conceptual and corrective ergonomics	K_W09, K_U18
EP6	appreciate the importance of humanizing work	K_K01, K_K02
EP7	work in a group assuming different roles in it, understands the principles of cooperation	K_K05, K_K11

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester I

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Legal basis of labor protection in Poland. Basic concepts, sources of duties regarding occupational health and safety.	1			EP1
2.	Labor protection in the regulations of the International Labor Organization. Labor protection system in the European Union	1			EP1
3.	Systems: human - technical object - work environment	1			EP2
4.	Occupational health and safety management. Contemporary concepts. Risk assessment	2			EP3
5.	Accidents at work - causes and effects. Pro-safe behaviors	1			EP3
6.	Disasters and serious industrial failures. Disasters in maritime transport.	1			EP3
7.	Ergonomics - basic concepts. Humanization of work.	1			EP5
8.	Physiological factors. Physiological and energy cost of dynamic and static physical work.	1			EP3
9.	Psychological and social factors. Social work environment. Psychosocial stress at work.	1			EP6, EP7
10.	The dimensions of the human body as a factor determining the spatial structure of a technical object and work space.	1			EP2
11.	Mechanical factors. Types of factors. Threats. Prevention measures	1			EP4
12.	Noise and mechanical vibrations	1			EP4
13.	Harmful chemicals. Threats. Prevention measures.	1			EP4
14.	Static electricity and electricity. Means of protection against electricity.	1			EP4
Total numbers of hours during semester:		**15**			

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x					
EP2				x					
EP3				x					
EP4							x		
EP5				x					
EP6				x					
EP7							x		

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
I	Student achieved the presumed learning outcomes. Passing the lecture in the form of a test or presentation. Grade to the index after passing the test.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	15			
Reading literature	8			
Preparing for laboratories, project classes				
Preparing for exam, pass test	5			
Developing project/report				
Participation in exam, pass test	1			
Consultation with teacher				
Total number of hours	29			
Number of ECTS credits	**1**			
Total number of ECTS credits for the subject	**1**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	15+1=16h 1 ECTS			

List of literature:

Required reading
1. Salvendy G.: Handbook of human factors and ergonomics. John Wiley & Sons, INC., USA, 2006. 2. Woodson W.E., Tillman B., Tillman P.: Human factors design handbook. McGraw-Hill, INC., 1999. 3. Eggleton E.M. and contributing authors: Ergonomic design for people at work – vol.1 and vol 2. Van Nostrand Reinhold, New York, 1983. 4. Pacholski L.M., Marcinkowski J.S., Horst W.M.: Employee wellness : ergonomics and occupational safety : monograph. Poznań : Institute of Management Engineering, Poznań University of Technology, 2008.
Recommended reading
1. Sanders M. S., McCromick E.J.: Human factors in engineering and design. McGrow-Hill, INC. New York, 1993.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Marcin Frycz, PhD (Eng)	Department of Marine Maintenance
2. Other lecturers:	

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	8	Name of subject:	**MARITIME CEREMONIAL**
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
I	1	0,7					10				
VII	0					0,3					5
Total numbers of hours during study:							**15**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	No prerequisities.

Course objectives

1.	The goal of the subject is to provide students the knowledge about basic maritime customs, elements of a merchant marine officer's uniform, and the relationship between members of the ship's crew.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	list and identify the elements of a merchant marine officer's uniform and behave in uniform in various situations and occasions	K_W10, K_K08
EP2	describe maritime customs and maritime ceremonial and identify situations and occasions when there is a need to raise/lower the flag on a ship	K_W10, K_K08

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester I

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Uniforms and distinctions in the merchant marine.	2			EP1
2.	Rules of conduct in uniform in various situations.	2			EP1
3.	Origins of the ceremonial. Maritime customs.	1			EP2
4.	Maritime ceremonial in the context of the development of the merchant fleet.	1			EP2

5.	Honors rendered in uniform when entering/departing from a ship. Honors rendered on the ship's gangway.	1			EP1, EP2
6.	The rendering of honors by ships.	1			EP2
7.	Raising, lowering the flag on a ship, bandergalas.	1			EP2
8.	Relationships among the ship's crew members. History and present.	1			EP1, EP2
	Total numbers of hours during semester:	**10**			

Semester VI

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Behaviour when wearing uniform in different situations.			3	EP1, EP2
2.	The banner post. Composition, functions and behavior in various situations.			2	EP1, EP2
	Total numbers of hours during semester:			**5**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1								x	x
EP2								x	x

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
I	The student achieved the presumed learning outcomes. The student attended classes. Obtained a positive grade on the final credit. The final grade is a weighted average: 30% class participation, 30% class activity, 40% final credit.
VI	The student achieved the assumed learning outcomes and alternatively participated in a university or the Faculty events, represented the Faculty or the University in the local environment. The student led, organized, participated in activities for the benefit of the social environment, in the public interest, where he/she practically demonstrated knowledge of the rules of behavior of a uniformed student of a naval university, a future officer of the merchant marine. Final grade based on participation in the above-mentioned activities, application of the rules of behavior in uniform (50%) and the total number of hours of participation (50%).

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	10			5
Reading literature				
Preparing for laboratories, project classes				

Preparing for exam, pass test	5			
Developing project/report				
Participation in exam, pass test	1			3
Consultation with teacher				
Total number of hours	16			8
Number of ECTS credits	**1**			**0**
Total number of ECTS credits for the subject	**1**			
Student's workload connected with practical classes	5 + 3 = 8 h 0 ECTS			
Student's workload connected with classes involving direct participation of teacher	10 + 1 + 5 + 3 = 18 h 1 ECTS			

List of literature:

Required reading
1. Koczorowski E., Koziarski J., Pluta R.: Ceremoniał morski i etykieta jachtowa. Alma-Press, Warszawa 2013. 2. Koczorowski E., Koziarski J., Pluta R.: Zwyczaje i ceremoniał morski. Wydawnictwo Morskie, Gdańsk 1972.
Recommended reading
1. Instrukcja mundurowa dla studentów UMG.

Teacher:

Title/degree, name and surname	**University unit**
1. Supervisor:	
Przemysław Wilczyński,, PhD (Eng) Master Mariner – 1st sem.	Department of Ship
Deputy Dean responsible for promotion – 6th sem.	
2. Other lecturers:	
Sławomir Winiarski, MSc	

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	9	Name of subject:	**PHYSICAL EDUCATION**
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
I	0		1					15			
II	0		1					15			5
III	0		2					30			
IV	0		2					30			
Total numbers of hours during study:							**90**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	No medical contraindications to physical exercise.

Course objectives

1.	The goal of the subject is to teach the students the correct swimming technique of each swimming style.
2.	The goal of the subject for students is improving motor skills in the areas of basic gymnastics, team sports and track and field, as well as developing individual motor skills of the student.
3.	The goal of the subject is providing knowledge and skills allowing for conducting recreational activity both during and after the course of studies.
4.	The goal of the subject is promoting physical culture, health-oriented mindset and hygiene.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	name and describe all swimming styles. Student is familiar with their techniques and can describe and demonstrate them. Student is aware of their swimming skills and can appraise them	K_U01, K_K12
EP2	demonstrate and apply knowledge related to exercise physiology, endurance and basics of physical training. Student appreciates physical activity's positive impact on the human body	K_U01, K_K01 K_K12,
EP3	describe the technique of various elements of basic gymnastics, team sports and athletics. Student can perform their basic elements and exercises within the provided scope. Student knows the rules and regulations of taught sports	K_U01, K_K12

EP4	present basic post-exercise metrics, measure them, interpret and apply the results	K_U01, K_K12
EP5	describe and demonstrate Personal Survival Techniques	K_U01,

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester I

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Forces affecting a swimmer's body in water. Exercises in getting used to water, breathing and floating.		1		EP1, EP2
2.	Backstroke - technical leg movement errors and their elimination.		1		EP1, EP2
3.	Backstroke - teaching proper arm movements alongside a pool wall, with the help of a partner, a swimming line, a swimming board, as well as unassisted in water.		2		EP1, EP2
4.	Breaststroke - teaching arm movements out of water and in water - while standing, marching, with a partner, a swimming board, as well as unassisted in water.		2		EP1, EP2
5.	Breaststroke - teaching leg movements out of water and in water while standing, floating on the back and on the torso, alongside a pool wall, with a swimming board, and unassisted in water.		3		EP1, EP2
6.	Teaching arm coordination, leg coordination and breathing during breaststroke and backstroke - out of water and in water.		2		EP1, EP2
7.	Exercises improving arm coordination, leg coordination and breathing during breaststroke and backstroke.		2		EP1, EP2,
8.	Teaching diving off the starting block.		2		EP1
	Total numbers of hours during semester:		**15**		

Semester II

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Exercises improving arm coordination, leg coordination and breathing during breaststroke.		1		EP1, EP2
2.	Freestyle swimming - teaching body position and leg movements out of water and in water - while still, with a swimming board, as well as unassisted in water.		2		EP1, EP2
3.	Freestyle swimming - technical leg movement errors and their elimination.		2		EP1, EP2
4.	Personal Survival Techniques. Emergency equipment on ships (life jackets, lifebuoys and immersion suits - construction and usage).		1		EP5
5.	Personal Survival Techniques. Techniques for rescuing people overboard (guidelines for survival, behavior while awaiting rescue, helicopter rescue).		1		EP5
6.	Personal Survival Techniques. Evacuating a ship using an inflatable life raft (launching, entering and staying in the life raft).		2		EP5

7.	Freestyle swimming - teaching arm movements out of water and in water - while standing, marching, with a swimming board, as well as unassisted in water.		2		EP1, EP2
8.	Exercises improving arm coordination, leg coordination and breathing during freestyle swimming.		2		EP1, EP2
9.	Teaching turn technique for breaststroke and freestyle - approach, turn, pushing off, full technique.		2		EP1,EP2
	Total numbers of hours during semester:		**15**		

Semester III

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Preparing for physical exercise and the value of a proper warm-up.		1		EP2, EP4
2.	Checking pulse, resting and post-exercise HR and BP values.		1		EP2, EP4
3.	Volleyball - overhand and bump setting, overhand serving, rules, court dimensions, strategy basics.		6		EP2, EP3
4.	Basketball - passing and receiving the ball, two-step layup, distance shots, free throws, rules, court dimensions, strategy basics.		6		EP2, EP3
5.	Football - ball handling, passing and receiving, flick-on, instep kicks, basic rules, strategy basics.		6		EP2, EP3
6.	Floorball - forehand and backhand ball handling, shots, basic rules.		6		EP2, EP3
7.	Gymnastics - forward and backward rolls, shoulder stand, gymnastic bridge.		2		EP2, EP3
8.	Sprints, sprint types, block starts.		2		EP2, EP3
	Total numbers of hours during semester:		**30**		

Semester IV

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Body's endurance and how to improve it, VO2 Max.		1		EP2, EP4
2.	Recreational activities and games, badminton, table tennis.		2		EP2, EP3
3.	Volleyball - spiking, strategy, school play.		6		EP2, EP3
4.	Basketball - types of defense, defense footwork, screening, pick and roll, strategy, school play.		6		EP2, EP3
5.	Football - push kick, outside kick, free kick, strategy, school play.		6		EP2, EP3
6.	Handball - passing and receiving the ball, jump shots, standing shots, seven-meter throws, situational shots (hip shots, back shots, lob shots), defense formations, rules, strategy, school play.		6		EP2, EP3
7.	Long-distance running, long-distance race types, standing starts.		1		EP2, EP3
8.	Gymnastics - pullover on high bar, exercise set, vaulting over a box.		2		EP2, EP3
	Total numbers of hours during semester:		**30**		

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1	x							x	
EP2	x							x	
EP3	x							x	
EP4	x							x	
EP5								x	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
I – IV	The student achieved the presumed learning outcomes. Student attended all practical classes, had 100% attendance and passed all tests. The final grade is an average of theoretical knowledge and performance tests. Students exempt from practical classes are assessed based on a test.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	90			
Reading literature				
Preparing for laboratories, project classes				
Preparing for exam, pass test				
Developing project/report				
Participation in exam, pass test				
Consultation with teacher				
Total number of hours	90			
Number of ECTS credits	**0**			
Total number of ECTS credits for the subject	**0**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	0 ECTS			

List of literature:

Required reading
1. Karpiński R.: Pływanie. Podstawy techniki, nauczanie. AWF Katowice 2016. 2. Ronikier A.: Fizjologia wysiłku sportowego, fizjoterapii i rekreacji. Warszawa 2008.
Recommended reading
1. Łatyszkiewicz L., Worobjew M., ZaurbekM., Chromajew M.: Piłka ręczna, koszykówka, piłka siatkowa. Warszawa 1999. 2. Narodowy Model Gry PZPN, PZPN 2016.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Andrzej Lachowicz, PhD	Department of Sport and Physical Education
2. Other lecturers:	
Lecturers of Department	

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	10	Name of subject:	**MATHEMATICS**
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
I E	8	2	4				30	60			
II E	5	2	2				30	30			
Total numbers of hours during study:							**150**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge of concepts and theorems from basic high school mathematics.

Course objectives

1.	The aim of the course is providing basic knowledge and skills in mathematics, necessary to study other courses.
2.	The goal of the subject for students is developing the ability to apply of acquired knowledge to create and analyze mathematical models to solve theoretical and practical issues in various fields of science and technology.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	apply mathematical calculus to solve typical, simple tasks associated with the operation of marine equipment	K_W01
EP2	apply mathematical calculus to interpret the phenomena occurring in machines, equipment and installations of the ship	K_W01, K_U13
EP3	freely use algebra, analysis of functions of one and many variables, integral transformations	K_W01, K_U09
EP4	present basic issues in analytical geometry	K_W01

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester I

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Complex numbers. The definition of a complex number, algebraic, trigonometric and exponential form of a complex number.	2	4		EP1, EP2, EP3
2.	Vector algebra. Operations defined on vectors, dot, cross, mixed product. Analytical geometry. Line and plane in space.	5	10		EP1, EP2, EP4
3.	Mathematical analysis. Limit and continuity of a function, derivative of a function, differential, derivatives of higher orders, Taylor's formula, local and absolute extremes.	8	16		EP1, EP2, EP3
4.	Definition of matrix. Operation on matrices. The determinant of the matrix, the inverse matrix. System of linear equations. Cramer's rule. Solving systems of equations by matrix method.	4	8		EP1, EP2, EP3
5.	Integral calculus of one variable functions. Definition of the primary function and indefinite integral. Basic properties, formulas and methods. Integration of rational, irrational and trigonometric functions. Definite integral. Properties of definite integral, the Newton-Leibniz formula. Improper integrals. Applications of the definite integrals in geometry and physics.	8	16		EP1, EP2, EP3
6.	Differential calculus of functions of many variables. Definition of functions of two variables, limit, continuity of functions. Partial derivatives, directional derivatives, gradient of functions. Extremes of functions of two variables, the complete differential and its applications. Taylor's formula. Entangled function, derivatives, extremum of an entangled function.	3	6		EP1, EP2, EP3
	Total numbers of hours during semester:	**30**	**60**		

Semester II

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Integral calculus of functions of many variables. Double integral over a rectangle and in the normal region. Polar coordinates. Triple integral in a cuboid and in the normal region. Triple integral in cylindrical and spherical coordinates.	5	5		EP1, EP2, EP3
2.	Line and surface integrals. Line integral of a scalar field and a vector field, Green's theorem. Surface integral of a scalar field and a vector field, Stokes theorem, Gauss theorem.	6	6		EP1, EP2, EP3
3.	Differential equations. Definition of a differential equation and boundary problems. Solving selected types of differential equations: Separable differential equations. Linear differential equations of the first order. Solving inhomogeneous linear equations (variation of parameters, trial solution method). Bernoulli equation. Second order linear differential equations with constant coefficients.	10	10		EP1, EP2, EP3
4.	Number series. Definition of a series, convergence of series with positive terms. Convergence tests: root test, ratio test, integral test,	3	3		EP1, EP2, EP3

	direct comparison test. Series with arbitrary real terms, alternating series, Leibniz criterion.				
5.	Laplace transform, inverse Laplace transform, applying the transform to differential equations.	6	6		EP1, EP2, EP3
Total numbers of hours during semester:		**30**	**30**		

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1			x	x					
EP2			x	x					
EP3			x	x					
EP4			x	x					
EP5			x	x					

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
I E	The student has achieved the expected learning outcomes. He attended lectures and classes (3 absences are allowed). **Exercises**: 2 tests. **Lecture**: written exam. The final grade is the average of the grades obtained from the lecture and classes, taking into account the student's initiative during the classes, after passing two tests and the exam.
II E	The student has achieved the expected learning outcomes. He attended lectures and classes. **Classes**: 2 tests. **Lecture**: written exam. The final grade is the average of the grades obtained from the lecture and classes, taking into account the student's initiative during the classes, after passing two tests and the exam.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	150			
Reading literature	40			
Preparing for laboratories, project classes				
Preparing for exam, pass test	100			
Developing project/report				
Participation in exam, pass test	25			
Consultation with teacher	15			
Total number of hours	330			
Number of ECTS credits	**13**			
Total number of ECTS credits for the subject	**13**			

Student's workload connected with practical classes	0 ECTS
Student's workload connected with classes involving direct participation of teacher	150+25+15=190h 7 ECTS

List of literature:

Required reading
1. S. Ahmad, A. Ambrosetti, A Textbook on Ordinary Differential Equations, Springer, 2015. 2. G. Hartman, Fundamentals of Matrix Algebra, Virginia Military Institute, 2011. 3. G. Simmons, Calculus with Analytic Geometry, McGraw Hill, Science, Engineering & Math, 1996. 4. M. Spivak, Calculus, Cambridge University Press, 2006.
Recommended reading
1. G. Strang, Calculus, Wellesley-Cambridge Press, 1991. 2. S. P. Thompson, M. Gardner, Calculus made easy, Springer, 1998. 3. W. F. Trench, Elementary Differential Equations, Trinity University, 2013.

Teacher:

Title/degree, name and surname	**University unit**
1. Supervisor:	
Bartosz Kamedulski, PhD	Department of Mathematics
2. Other lecturers:	
Paulina Dul, MSc	Department of Mathematics

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	11	Name of subject:	**PHYSICS**
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
I E	7	2	3				30	45			
II	3	1		2			15		30		
Total numbers of hours during study:							**120**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in physics at the high school level.
2.	Knowledge and skills in mathematics at the high school level.

Course objectives

1.	The aim of the course is teaching students the basics of physics to the extent necessary to continue learning in vocational subjects.
2.	The goal of the subject for students is gaining the ability to design and perform measurements and their development to the extent necessary for safe operation of technical systems.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	describe the most important physical phenomena, define the quantities characterizing them and their units from the SI system and from other systems used in practice	K_W01
EP2	classify and describe the types of motion in classical mechanics	K_W01, K_U13
EP3	describe and interpret the thermal properties of bodies and the quantities characterizing them, and describe the laws of conversion of thermal and mechanical energy	K_W01, K_U13
EP4	describe the quantities characterizing electrical phenomena and processes related to the presence and flow of electric charges, and describe the relationship between magnetic and electrical phenomena	K_W01, K_U13
EP5	describe the wave and quantum properties of light, the laws describing the emission of light energy and the effects of its interaction with matter	K_W01
EP6	describe the nuclear model of the atom in quantum terms and processes related to changes in energy states	K_W01

EP7	characterize the theory of the structure of the atomic nucleus and interpret the energy processes accompanying nuclear transformations	K_W01
EP8	describe the types of conductivity based on the electron energy band theory	K_W01
EP9	design and carry out measurements aimed at verifying mathematical models of simple physical phenomena	K_U08
EP10	prepare reports on measurement expertise	K_U03
EP11	work in a team, performing managerial and executive roles in it	K_K03
EP12	analyze the functioning of technical devices in terms of physical phenomena occurring in them	K_U14

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester I

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Physical quantities and their units.	2	3		EP1
2.	Kinematics: velocity, speed, acceleration, their instantaneous and average values. Kinematics of the motion in the gravitational field simplified to no aerodynamic drag.	2	6		EP2
3.	Kinematics of circular motion: angular displacement, angular velocity, angular acceleration. Tangential acceleration and centripetal acceleration	2	6		EP2
4.	Gravity, the law of universal gravitation, Kepler's laws of planetary motion, potential and total energy in the gravitational field.	2	3		EP2
5.	Dynamics, types of forces, free-body diagrams, contact forces and forces acting at a distance. Force fields: central and homogeneous.	2	6		EP2
6.	Torque. Moment of inertia of for common shapes of objects. Rotational kinetic energy of a rigid body.	2	3		EP2
7.	Statics. Conditions of equilibrium of rigid bodies. Center of mass. Gravitational torque.	2	3		EP3
8.	Hydrostatics: pressure, Pascal's principle, Archimedes' principle. Hydrodynamics: continuity equation, Bernoulli’s equation, viscosity.	2	3		EP2
9.	Harmonic oscillating motion: simple, damped and with excitation force; comparison of the description of oscillating and rotational motion. Physical pendulum and mathematical pendulum.	2	3		EP3
10.	Wave motion; sound as a wave. Phase velocity of sound propagation in gases, liquids and solids	2	3		EP3
11.	Molecular theory of thermal phenomena, internal energy, temperature scales, gas equations of state, ideal gas transformations.	2	3		EP3
12.	Electrostatic field: Coulomb’s law and Gauss’s law, electric capacitance.	2	3		EP4
13.	Electric current: conductivity and resistivity, Ohm's law, Kirchhoff's rules, circuits of direct current DC and variable current (including alternating current AC).	4			EP4

14.	Magnetic field. Biot-Savart-Laplace law, Ampère's law, electromagnetic induction.	2			EP4
	Total numbers of hours during semester:	**30**	**45**		

Semester II

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Maxwell's equations, electromagnetic waves.	2			EP4
2.	Optics: reflection, refraction	2			EP2
3.	Wave and quantum properties of light.	2			EP5
4.	The Bohr model of the atom, quantum numbers.	4			EP6
5.	The structure of the atomic nucleus and nuclear transformations, elementary particles.	2			EP7
6.	Solid state physics: lattices, electrical properties of solids.	2			EP8
7.	Environmental physics: planet Earth and its energy balance, climate and weather shaping.	1			EP2, EP3
8.	Principles of laboratory work, health and safety regulations.			1	EP11
9.	Measurements, their accuracy, elaboration of results.			1	EP9, EP10
10.	Determination of the density of solids and liquids.			2	EP1, EP2, EP9, EP10
11.	Determination of the intensity of the Earth's gravitational field.			2	
12.	Analysis of harmonic motion, determination of the damping coefficient.			2	
13.	Determination the speed of sound.			2	
14.	Analysis of the rotational motion of a rigid body, determination of the moment of inertia using dynamic methods.			2	
15.	Checking the laws of an ideal gas.			2	EP3, EP9, EP10
16.	Determination of heat of fusion and heat of condensation.			2	
17.	Determination of electric capacitance by capacitor discharge method.			2	EP4, EP9, EP10, EP12
18.	Determination of the wavelength of light using a diffraction grating.			2	EP5, EP9, EP10
19.	Checking Snell's law, determining the refractive index.			2	EP5, EP9
20.	Determination of the focal length of the lenses.			2	EP5, EP9
21.	Determination of the intensity of light sources using the Lambert method.			2	EP5, EP9, EP10
22.	Checking the Einstein-Millikan equation, determining the Planck's constant.			2	EP8
23.	Statistical processing of measurement results.			2	EP10
	Total numbers of hours during semester:	**15**		**30**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1		x	x	x					
EP2		x	x	x					
EP3		x	x	x					
EP4		x	x	x					
EP5		x	x						
EP6		x	x						
EP7		x	x						
EP8		x	x						
EP9					x			x (during lab. classes)	
EP10					x				
EP11								x (during lab. classes)	
EP12								x (during lab. classes)	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
I E	The student has achieved the expected learning outcomes. Participation in lectures and calculation exercises (3 total absences are allowed). Exercise: Student obtained positive grades in colloquia covering the issues discussed in the exercises. Lectures: Passed the written and oral exam covering the issues discussed in the lectures. The final grade is a weighted average of the grades from the exercises and the exam (2/3 - lecture, 1/3 - exercises).
II	The student has achieved the expected learning outcomes. Participation in lectures (2 absences are allowed). Laboratory: Participation in laboratory exercises by performing and passing all planned exercises. Lecture: Student obtained a positive grade for a written test covering the issues presented in the lectures. The final grade is the arithmetic average of the positive grades from the laboratory exercises and the colloquium covering the issues discussed in the lectures.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	75	30		
Reading literature	60	15		
Preparing for laboratories, project classes		20		
Preparing for exam, pass test	30			
Developing project/report		20		
Participation in exam, pass test	10			
Consultation with teacher	15	5		
Total number of hours	190	90		
Number of ECTS credits	**7**	**3**		
Total number of ECTS credits for the subject	**10**			
Student's workload connected with practical classes	30+15+20+20+5=90h 3 ECTS			
Student's workload connected with classes involving direct participation of teacher	75+10+15+30+5=135h 6 ECTS			

List of literature:

Required reading
1. University Physics, 2016, S.J. Ling, J. Sanny, B. Moebs, OpenStax.org, CC BY 4.0. 2. Fundamentals of Physics, 2018, Holiday D., Resnick R., Walker J., John Wiley & Sons, Inc.
Recommended reading
1. University Physics with Modern Physics. 2019, Young, H.D., and Freedman, R.A., Pearson Global Edition. 2. Physics for scientists and engineers. 2010, Jewett J.W., Sewrway R.A., Broocs/Cole. Kanada.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Bogusław Pranszke, DSc, Assoc. Prof.	Department of Physics
2. Other lecturers:	
Włodzimierz Freda, DSc, Assoc. Prof.	Department of Physics
Kamila Haule, PhD	Department of Physics
Barbara Lednicka, PhD	Department of Physics

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	12	Name of subject:	**ENGINEERING MECHANICS***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
II E	3	2	1				30	15			
III E	4	2	1				30	15			
Total numbers of hours during study:							**90**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the field of secondary school and mathematics and physics in the field of first-cycle studies

Course objectives

1.	The aim of the course is to provide basic knowledge and skills in the field of mechanics necessary for the safe technical operation of the ship's equipment, in accordance with the requirements of the STCW Convention.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	list the basic concepts and principles of statics, describe the basic ones supports and their reactions	K_W01, K_W04
EP2	calculate the forces occurring in the elements of the structure necessary for strength calculations	K_W01, K_W04
EP3	analyze systems of forces acting on real systems located in static balance	K_U01, K_U08, K_U13
EP4	describe the basic laws of general mechanics and formulate and solve equations of kinematics and dynamics for systems mechanical	K_U01, K_U08, K_U13, K_U21
EP5	analyze vibrations of basic mechanical systems	K_U01, K_U08, K_U13, K_U21
EP6	apply the laws of mechanics resulting from the operation of mechanisms ships.	K_W01, K_U21
EP7	use modern technical literature for current interpretation technical problems	K_U01

Course content:

Semester II

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Introduction. Definition of the subject and issues of mechanics, history, organization of lectures and exercises, vector calculus for the needs of mechanics, *vector quantities* (*e.g. force, velocity*) *and scalar* (*e.g. mass, time*) **(8.1.3)**, literature on the subject.	1			EP1, EP7
	I. STATICS				
2.	*Basic concepts of rigid body mechanics* **(8.1.2)** and *principles of statics of rigid mechanical systems.* **(8.1.4)** The concept of force, types of forces, internal and external forces, *types of systems of forces and their reduction to the resultant*. **(8.1.6)** Definition of inertia: a) the relationship between mass and weight, b) coefficient of friction, c) the force of inertia in systems. Supports and support reactions - *types and types of constraints used in mechanisms and machines*. **(8.1.5)** Drawing support reactions.	2	1		EP1, EP2
3.	Converging forces. Plane convergent system of forces, spatial convergent system of forces, geometrical and analytical equilibrium conditions, equilibrium equations. *Conditions of static equilibrium of a plane system of forces.* **(8.1.7)** Convergent system of forces − tasks.	3	2		EP1, EP2
4.	A pair of forces. Couple of forces, moment of a couple of forces, couple of forces theorems. The equilibrium condition of the system of pairs of forces.	2			EP2, EP3
5.	Any arrangement of forces. The main vector and the main moment of the system of forces, plane system of forces, spatial system of forces, equilibrium conditions, equilibrium equations. Numerical examples.	4	2		EP2, EP3
6.	Friction. Types of friction: a) *rolling friction*; *friction in annual bearings, coefficient of rolling friction,* **(8.1.14)** b) dry friction; *Coulomb-Moren's law of dry sliding friction and its practical meaning, coefficient of dry sliding friction,* **(8.1.13)** c) sliding friction*; types of sliding friction (dry, sticky) and conditions of their occurrence:* **(8.1.12)** – oil film, – contact area,	2	2		EP3

	– lubrication and friction processes occurring in heavily loaded low-speed bearings, – friction of the tendons. Mechanical systems including friction.				
7.	Center of gravity. Center of parallel forces, center of mass, center of gravity, Guldin's theorems. Calculation of centers of gravity.	3	2		EP2, EP3
	II. KINEMATICS				
8.	Vector function and its derivative. Vector function of a scalar argument, derivative of a vector function, differentiation rules for time-varying vectors, derivatives of unit vectors.	2			EP1
9.	Mathematical ways of describing the motion of a point. Equations of motion of a point, equation of path, vector of a point, velocity and acceleration as derivatives of a vector, normal and tangential acceleration, velocity and acceleration of a point in the polar system. *Velocity of a material point in rectilinear and curvilinear motion, acceleration of a material point. Tangential and normal components of acceleration, circular motion of a point, velocity and linear and angular acceleration of a point in circular motion.* **(8.1.15)** Calculation of velocity and acceleration of a point. Velocity and acceleration in the reciprocating motion of the piston.	3	2		EP4, EP5
10.	Simple cases of motion of a rigid body. Translational motion of a solid, velocity and acceleration of any point of a solid in translational motion. *Translational (e.g. piston) and rotational (e.g. rotor) motion of a rigid body.* **(8.1.19)**. The rotational motion of a body around a fixed axis, the equation of rotational moss: a) rotational acceleration, b) centrifugal force, c) centrifugal speed regulator, d) flywheel, e) the relationship between two masses circulating in the same plane, f) calculation of the maximum and minimum bearing load, g) balancing three masses rotating in different planes. Angular velocity and acceleration, rotational velocity, rotational velocity and acceleration of any point of a solid, kinematics of toothed, belt and friction gears. Calculation of velocities and accelerations in rotational motion of a solid.	2	1		EP5, EP6
11.	Flat body movement. Description of plane motion, speed and acceleration of any point of a body in plane motion, instantaneous center of	4	2		EP5, EP6

	velocity and instantaneous center of acceleration, movable and stationary centroid, kinematics of planetary gears. Determination of speeds and accelerations in flat motion, planetary gears. *Piston kinematics of a crank-piston mechanism of a typical internal combustion engine during uniform rotational motion of the crankshaft. The maximum values of the velocity and acceleration of the piston. Piston inertia forces.* **(8.1.17).**				
12.	Compound point motion. Lifting motion, relative and absolute, speed and acceleration of a point in a complex motion, Coriolis theorem. Calculation of velocity and acceleration of a point in complex motion.	2	1		EP1, EP4
	Total numbers of hours during semester:	**30**	**15**		

Semester III

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
	III. DYNAMICS				
1.	The dynamics of a material point. D'Alembert's principle, two basic problems of dynamics. Point dynamics problems. oblique projection.	2	1		EP4, EP5, EP7
2.	*Mass moment of inertia of the body (material point, material circle, cylinder, ring).* **(8.1.18)** Determination and types of mass moments of inertia, Steiner's theorem, deviation moments, main and main central axes of inertia. Calculation of moments of inertia.	3	2		EP4, EP5, EP6
3.	The principle of momentum. The principle of momentum for a material point, the principle of momentum for a rigid body, theorem about the motion of the center of mass. Application of the momentum principle - tasks.	2	1		EP4, EP5, EP6
4.	The twist principle. The rotation principle for a material point, the rotation principle for a solid, the dynamic equation of rotation. Application of the twist principle - tasks.	2	1		EP4, EP5, EP6
5.	Work and energy. *Kinetic energy of a material point and a rigid body in translation and rotation:* **(8.1.20)** a) calculation of the work of a body subjected to friction, b) energy units, c) kinetic energy in rotation, d) flywheel function, e) *flywheel; its function and selection of the flywheel torque value* **(8.1.21).** Work and power of a force, kinetic energy of a material point	4	2		EP4, EP5, EP6

	and a rigid body, principle of energy and work, field of force, potential field, potential energy, principle of conservation of mechanical energy. Concentrated force and torque, torque measurement with a torsionometer.				
6.	Rotational dynamics: a) linear and angular acceleration, b) angular momentum and twist, c) gyroscopic moment, d) moment of inertia, e) friction in the bearing. Dynamic reactions of bearings. Dynamic equations of rotation, bearing reactions, axis casual body. *Static and dynamic balancing of rigid rotors.* **(8.1.24)** Determination of dynamic reactions of bearings. *The concept of unbalance of a rigid rotor (e.g. electric rotor, road or gear wheel, propeller, etc.). Unbalanced rotor bearing loads.* **(8.1.22)**	2	1		EP4, EP5, EP6
7.	Approximate theory of gyroscopic phenomena. Gyroscopic moment, simplified equation of gyroscope theory, gyroscopic reactions of bearings of machines and marine engines. Calculation of gyroscopic responses of machine and engine bearings.	2	1		EP4, EP5, EP6
8.	Hit. Instantaneous forces, simple blow. oblique and eccentric, coefficient of restitution, center of strokes. Calculation of basic impact cases.	2	1		EP4, EP5, EP6
9.	Fundamentals of vibration theory: Equations of oscillating motion, harmonic oscillations: *harmonic motion of a material point. Amplitude, period and frequency. The maximum and minimum value of the velocity and acceleration of the point.* **(8.1.16)** Compounding of harmonic vibrations, classification of vibrations, natural and forced vibrations with one degree of freedom, vibration resonance, sub- and supercritical vibrations, normalization of vibrations, vibrations in shipbuilding. Calculation examples.	8	4		EP4, EP5, EP6, EP7
10.	Fundamentals of computer mechanics. Calculation methods of structure dynamics, measurement and computational verification of structure tests, errors in calculations and measurements, problems of mechanics in shipbuilding.	3	1		EP6, EP7
	Total numbers of hours during semester:	**30**	**15**		

Reference list of identification of the framework extended training course for operational and management level in engine department, in mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments, with the study program for first-cycle studies with a practical profile with major in Ship Propulsion Plant and Offshore Construction Operation of the Faculty of Mechanical Engineering of the Gdynia Maritime University.

No.	Subject according to the framework extended training program	No. of subject	Subject according to the program of first-cycle studies with a practical profile (ESOiOO) at the UMG	Sem.	No. of subject
1.	Mechanics and strength of materials (8.1)	**1a-f**	Strength of materials	III	1,2,6,10,11,7, 12
2.	Mechanics and strength of materials (8.1)	**8,9,10,11, 25**	Strength of materials	IV	2,7,9,4,13
3.	Mechanics and strength of materials (8.1)	**23**	Strength of materials	III	12

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1			x	x					
EP2			x	x					
EP3			x	x					
EP4			x	x					
EP5			x	x					
EP6			x	x					
EP7			x						

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
II E	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. Attended classes and lectures (1 absence allowed). **Classes:** passing two tests. **Lecture:** written exam. Grade for the student record book after passing the colloquia and exam with a grade averaged from the received grades.
III E	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. Attended classes and lectures (1 absence allowed). **Classes:** passing two tests. **Lecture:** written exam. Grade for the student record book after passing the colloquia and exam with a grade averaged from the received grades.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	90			
Reading literature	80			
Preparing for laboratories, project classes				
Preparing for exam, pass test	40			
Developing project/report				
Participation in exam, pass test	20			
Consultation with teacher	10			
Total number of hours	240			
Number of ECTS credits	**8**			
Total number of ECTS credits for the subject	**8**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	90 + 20 + 10 = 120h 4 ECTS			

List of literature:

Required reading

1. Pytel A., Kiusalaas J.: Engineering Mechanics: Static and Dynamics. Harper Collins Collage Publishers, 1994.
2. Gray G.L., Costanzo M.E.: Engineering Mechanics. McGraw-Hill, 2010.
3. Khurmi R.S.: A text book of Engineering Mechanics. S. Chand and Company Ltd. New Delhi 2022.
4. Osgood L., Cameron G., Christensen E.: Engineering Mechanics: Statics. Robertson Library Pressbooks 2022.
5. Shames I. H.: Engineering Mechanics. Statics and Dynamics. Published by Upper Saddle River. New Jersey 1996.
6. Uicker J., Pennock G., Shigley J.: Theory of Machines and Mechanisms. Oxford University Press. New York 2017.
7. Baker D., Haynes W.: Engineering Statics. Open and Interactive. Colorado State University and Massachusetts Maritime Academy, 2023.
8. Murawski L.: Static and dynamic analyses of marine propulsion systems. Printing house Warsaw University of Technology, Warsaw 2003.

Recommended reading

1. Krasowski P., Powierza Z.: General Mechanics – Statics (in Polish). Published by Gdynia Maritime Academy, Gdynia 2002.
2. Powierza Z., Skorek G.: General Mechanics – Kinematics (in Polish). Published by Gdynia Maritime Academy, Gdynia 2013.
3. Powierza Z., Świtek J.: General Mechanics – Dynamics (in Polish). Published by Gdynia Maritime Academy, Gdynia 2012.
4. Osiński Z.: General Mechanics (in Polish). Published by PWN, Warsaw 2000.
5. Niezgodziński T.: General Mechanics (in Polish). Published by PWN, Warsaw 2012.
6. Kurnik W.: Lectures on general mechanics, Publishing House of the Warsaw University of Technology, Warsaw 2012.
7. Misiak J.: General mechanics problems – Statics (in Polish). Published by WNT, Warsaw. 1995.

8. Misiak J.: Technical mechanics - Kinematics and Dynamics (in Polish). Published by WNT, Warsaw 1996.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Prof. Lech Murawski, DSc (Eng)	Department of Engineering Science
2. Other lecturers:	
Grzegorz Skorek, PhD	Department of Engineering Science
Adam Szeleziński, PhD	Department of Engineering Science
Anna Lesnau, MSc	Department of Engineering Science
Daria Żuk, MSc	Department of Engineering Science

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	13	Name of subject:	**STRENGHT OF MATERIALS***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
III E	4	2	1				30	15			
IV	4	1	1	2			15	15	30		
Total numbers of hours during study:							**105**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the field of Mathematics and Engineering Mechanics in the field of first-cycle studies.

Course objectives

1.	The aim of the course is to provide basic knowledge and skills in the field of strength of materials, necessary for the safe operation of the ship's technical equipment, in accordance with the requirements of the STCW convention.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	list the basic tasks of strength of materials, classify materials, give a definition of a deformable body	K_W01, K_W04
EP2	determine the state of stresses and strains in a body, be able to apply Hooke's law to statically determinate systems	K_W04
EP3	explain how to calculate stresses and displacements in statically indeterminate systems. make diagrams of bending moments and shear forces in statically indeterminate beams	K_U01, K_U08, K_U13
EP4	explain how to calculate stresses and displacements in statically indeterminate torsion systems	K_U01, K_U08, K_U13, K_U21
EP5	determine displacements and deflections in beams using classical and energy methods	K_W01, K_U21
EP6	use literature sources to interpret research results	K_U01, K_U05

EP7	work in a group assuming different roles in it, understands the principles of cooperation	K_K05

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester III

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	*Definition of a deformable solid. Fundamentals of material strength, definition of load and stress, allowable stress, measurement units, test methods*. **(8.1.1)**	2			EP1
2.	*State of deformations and stresses. Linear-elastic materials: Hooke's law. Tensile and compressive loads.* **(8.1.1a,1b)** Statically determinate single-bar tension/compression problems.	2	2		EP1, EP2
3.	Tensile/compression problems in statically indeterminate rod systems. Calculation of displacements and stresses in statically indeterminate bar systems. Deformations and stresses of the rod caused by temperature changes.	2	2		EP2, EP3
4.	Geometric characteristics of flat figures. Moments of inertia and yaw moments in a rectangular coordinate system.	2	2		EP2, EP3
5.	Steiner's theorem, axis rotation, principal axes and moments of inertia.	2			EP2, EP3
6.	*Bending loads.* **(8.1.1c)** Statics of bending beams. Internal forces in bending beams. Differential relationships between bending moment, shear force and continuous load.	4	3		EP2, EP3
7.	*Shear loads.* **(8.1.1e)** Bending moment and shear force. Analysis of a bending beam loaded in motion.	2			EP2, EP3
8.	Differential equation of the beam axis, analytical method of determining the deflection line of the beam, Clebsch method of determining the deflection line of the beam.	2	2		EP2, EP3
9.	Statically indeterminate problems in bending. Determination of the deflection axis in statically indeterminate beams. Superposition method - tables and graphs.	2	1		EP2, EP3
10.	*Pure shear theory. Torsional loads*. **(8.1.1d)** Torsion of circular and free-section bars.	2	1		EP4
11.	*Statically indeterminate problems in torsion.* **(8.1.1d)**	4	1		EP4
12.	*The concept of normal and tangential stress in the cross-section of the shaft.* **(8.1.23)** Calculation of shaft strength. *Fatigue loads.* **(8.1.1f)**	4	1		EP4
	Total numbers of hours during semester:	**30**	**15**		

Semester IV

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	*The concept of normal and tangential stress in the cross-section of the shaft.* **(8.1.23)** Calculation of shaft strength. State of stresses in a		2		EP2, EP3

	beam in bending. Bending section modulus.				
2.	Examples of particular states of loads and stresses for ship elements. *Stress distribution in loaded plates, beams and supports.* **(8.1.8)**		2		EP2, EP3
3.	Examples of particular states of loads and stresses for ship elements. Torsion of circular bars and of any cross-section. *Torsional load test methods.* **(8.1.1d)**		2		EP4
4.	*Safe fastening and transport of equipment elements in the marine engine room.* **(8.1.11)**	2			EP2, EP3
5.	Strength hypotheses and complex strength.	2	3		EP2, EP3
6.	Energy methods. Energy of elastic systems, Castigliano's theorem, Menabrea's theorem.	3	2		EP5
7.	*Typical devices for vertical and horizontal transport in the marine engine room and distribution of loading forces.* **(8.1.9)**	2	2		EP2, EP3
8.	Thin plates. Determination of stresses in cylindrical plates. *Stress distribution in loaded plates, beams and supports*. **(8.1.8)**	3			EP2, EP5
9.	*Permissible loads and conditions of use of devices for vertical and horizontal transport.* **(8.1.10)**	3			EP2, EP5
10.	Buckling. Stability of straight bars.	2			EP2, EP5
11.	*Static tensile and compression test.* **(8.1.1a, 1b)** Modern research methods - videoextensometry, acoustic emission.			5	EP2, EP6, EP7
12.	*Detailed tensile test*. **(8.1.1a)**			4	EP2, EP3, EP6
13.	Determination of material constants by resistance strain gauge. *Measurement of shear stress and torque in the drive shaft using the electroresistance strain gauge method.* **(8.1.25)**			4	EP2, EP4, EP6
14.	*Determination of stresses in an I-beam in bending*. **(8.1.1c, 8.1.8)**			5	EP2, EP6
15.	Determination of the modulus of longitudinal and shear elasticity.			4	EP2, EP6, EP7
16.	*Static and dynamic balancing of rigid rotors.* **(8.1.24)**			4	EP2, EP5, EP7
17.	Rope examination.			4	EP2, EP7
	Total numbers of hours during semester:	**15**	**15**	**30**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1			x	x	x		x (Lab)		
EP2			x	x	x		x (Lab)		
EP3			x	x	x		x (Lab)		
EP4			x	x	x				
EP5			x	x	x				
EP6					x		x (Lab)		
EP7					x		x (Lab)		

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
III E	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. Attended classes and lectures (1 absence allowed). **Classes:** passing two tests. **Lecture:** written exam. Grade for the student record book, after passing the tests and the exam - the average of the grades received.
IV	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. He attended classes and lectures (1 absence allowed) and laboratories (mandatory all attendance). **Laboratories:** performing and passing all laboratory exercises according to the schedule. **Classes:** passing two tests. **Lecture:** passing the test from the theoretical part. Final grade: the average of the colloquium grades (both colloquia passed), theoretical knowledge and laboratory reports.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	75	30		
Reading literature	20			
Preparing for laboratories, project classes		40		
Preparing for exam, pass test	20			
Developing project/report		15		
Participation in exam, pass test	20			
Consultation with teacher	10	5		
Total number of hours	145	90		
Number of ECTS credits	**5**	**3**		
Total number of ECTS credits for the subject	**8**			
Student's workload connected with practical classes	30+45+15=90h 3 ECTS			
Student's workload connected with classes involving direct participation of teacher	75+20+10+30+5=140h 5 ECTS			

List of literature:

Required reading
1. Niezgodziński M. E., Niezgodziński T.: Wytrzymałość materiałów (ang. Strength of materials). PWN, Warszawa 2009. 2. Jakubowicz A., Orłoś Z.: Wytrzymałość materiałów (ang. Strength of materials). WNT, Warszawa 2005. 3. Niezgodziński M. E., Niezgodziński T.: Zadania z wytrzymałości materiałów (ang. Tasks on the strength of materials) . PWN, Warszawa 2010. 4. Banasiak M., Grosman K., Trombski M.: Zbiór zadań z wytrzymałości materiałów (ang. A set of tasks on the strength of materials). PWN, Warszawa 1992. 5. Jastrzębski P., Mutermilch J., Orłowski W.: Wytrzymałość materiałów (ang. Strength of materials), t. 1 i 2. Arkady 1986.

Recommended reading
1. Timoshenko S., Goodier J. N.: Teoria sprężystości. Wydawnictwo Arkady, Warszawa 1962. 2. Tarnowski A.: Wytrzymałość materiałów, Wydawnictwo AMG, Gdynia 1999. 3. Kruszewski J. i in.: Metoda elementów skończonych w dynamice konstrukcji, Arkady, Warszawa 1984.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Prof. Andrzej Miszczak, DSc (Eng)	Department of Engineering Science
2. Other lecturers:	
Katarzyna Panasiuk, PhD	Department of Engineering Science
Grzegorz Hajdukiewicz, PhD	Department of Engineering Science
Norbert Abramczyk, MSc	Department of Engineering Science
Daria Żuk, MSc	Department of Engineering Science

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	14	Name of subject:	**FLUID MECHANICS***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
IV	3	2	1				30	15			
Total numbers of hours during study:							**45**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of secondary school and in range of Mathematics and Physics in the field of first-cycle studies.

Course objectives

1.	The aim of the course is to provide the basic knowledge and skills in the field of fluid mechanics, which are necessary for the safe operation of industrial installations, machines and technical devices, which, in particular, can be found in the ship engine room.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	describe the basic properties of fluids (adhesion, cohesion, compressibility, density, thermal expansion, dynamic and kinematic viscosity etc.) and basic types of flows (laminar, turbulent, steady, unsteady, potential) as well as basic concepts of fluid kinematics (streamlines, path lines, stream surface, circulation).	K_W01, K_W04
EP2	list and apply the basic laws of fluid mechanics (stream continuity equation, momentum conservation equation, conservation of energy equation, Navier-Stokes equation, Bernoulli equation etc.).	K_W01, K_W04, K_U08
EP3	solve problems of hydrostatics (hydrostatic pressure, pressure in terms of Pascal's principle, communicating vessels, center of pressure, total force vector acting at the center of pressure, floating bodies, Pascal's law, Archimedes' law) and hydrodynamics (tank filling time, tank emptying time, equation of Torricelli, pressure losses in pipelines).	K_W01, K_W04, K_U08, K_U21
EP4	to use literature sources to broaden his knowledge, work in a group taking on different roles in it, understand the principles of cooperation.	K_U01, K_K01

Course content:

Semester IV

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Introduction to fluid mechanics. Basic definitions and properties of fluids: viscosity, compressibility, density, thermal expansion. The types of fluids. Introduction to continuum mechanics field theory: scalar, vector and tensor fields, gradient, divergence, curl. Lame's coefficients.	2	1		EP1, EP4
2.	Basic concepts of fluid kinematics: streamlines, stream surface, path lines, rotational and irrotational flows, types of fluid flow.	2	1		EP1, EP4
3.	The conservation of mass principle. Stream continuity equation. Calculation of flow rate. Tank filling time.	2	2		EP2, EP4
4.	The conservation of momentum and the conservation of angular momentum principles and their applications.	2	1		EP2, EP4
5.	The energy conservation principle. Overview of the terms in the equation of energy conservation principle. An example of determining the temperature distribution.	2	1		EP2, EP4
6.	The examples of constitutive relations for specific fluid models. General classification of constitutive relations and their properties.	2			EP2, EP4
7.	Hydrostatics: basics of hydrostatics, definition of pressure, Pascal's law, hydrostatic pressure distribution, hydrostatic pressure on a wall. Centre of pressure and total pressure force. Archimedes' law, floating bodies.	4	2		EP3, EP4
8.	The equations of motion of real fluid: general remarks, basic equations, additional equations, boundary and initial conditions. The fundamental equations of viscous fluid dynamics: Navier-Stokes equation, Prandtl equation, the Poiseuille and Couette flows.	2	1		EP2, EP4
9.	Steady and unsteady, *laminar and turbulent flows*: types of flows, critical flow, influence of viscosity, density and pipe diameter on critical velocity value, *the Reynolds number*. **(8.2.13)**	4	1		EP1, EP4
10.	Similarity laws in fluid mechanics. Similarity in relation to characteristic numbers: dynamic, thermal, electro-magneto-dynamic characteristic numbers.	1	1		EP2, EP4
11.	The inviscid flow of non-heat conductive fluids: equation of motion for inviscid fluids, Euler's equation, *Bernoulli's equation* **(8.2.13)**: the potential, kinetic and pressure energy. The application of Bernouli's equation in venturi meter. Tank emptying time, the Torricelli equation.	4	2		EP2, EP3, EP4
12.	Flows in pipes: the Hagen-Poiseuille law, pressure and energy losses, hydraulic radius, *hydraulic resistance*. *Flow of fluid through components of power installations (pipes, nozzles, reducers, elbows, valves, etc.), characteristics of the hydraulic*	2	1		EP3, EP4

	component, characteristics of the pipeline. **(8.2.13)** Flows through open and closed channels.				
13.	Potential flows and gas dynamics.	1	1		EP1, EP4
	Total numbers of hours during semester:	**30**	**15**		

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1	x			x					
EP2	x			x					
EP3	x			x					
EP4					x				

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
IV	The student has achieved the intended key learning outcomes for the subject and meets the requirements of the STCW convention regarding the requirements for passing the course. The student attended lectures and tutorials (exercises) (the absence must be made up). The student passed the test (**lecture**) and passed two tests and 2 tasks to be performed in the form of a report (**exercises**). The final grade is the average of the grades from the test (lecture) and from the tutorials (exercises), after passing both of them.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	45			
Reading literature	15			
Preparing for laboratories, project classes				
Preparing for exam, pass test	10			
Developing project/report	6			
Participation in exam, pass test	5			
Consultation with teacher	2			
Total number of hours	83			
Number of ECTS credits	**3**			
Total number of ECTS credits for the subject	**3**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	45 + 5 + 2 = 52h 2 ECTS			

List of literature:

Required reading
1. White F. M., Xue H.: ISE Fluid Mechanics, McGraw-Hill, 2021. 2. Cengel Y., Cimbala J.: Fluid Mechanics: Fundamentals and Applications, McGraw-Hill, 2017. 3. Kundu P. K., Cohen I., Dowling D. R.: Fluid Mechanics, Elsevier Ltd. Oxford, 2015. 4. Crowe C. T., Elger D. F.,Roberson J. A.: Engineering fluid mechanics, John Wiley & Sons, Hoboken, 2005. 5. Roberson J. A., Crowe C. T.: Engineering fluid mechanics, Boston : Houghton Mifflin Co., 1975. 6. Massey B.; rev. by Ward-Smith J.: Mechanics of fluids, Spon Press, London, New York, 2006.
Recommended reading
1. Batchelor G. K.: An Introduction to Fluid Dynamics, Cambridge University Pr., 1967, 2010.

Teacher:

Title/degree, name and surname	**University unit**
1. Supervisor:	
Prof. Andrzej Miszczak, DSc (Eng)	Department of Engineering Science
2. Other lecturers:	
Marcin Frycz, PhD	Department of Engineering Science
Adam Czaban, PhD	Department of Engineering Science
Krzysztof Łukaszewski, PhD	Department of Engineering Science

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	15	Name of subject:	**ENGINEERING GRAPHICS***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
II	3	1		2			15		30		
III	2			2					30		
Total numbers of hours during study:							**75**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of secondary school.

Course objectives

1.	The aim of the course is providing a basic knowledge in the field of techniques and methods of drawing up technical drawings, diagrams, plans and freehand sketches necessary to carry out technical maintenance of the ship's equipment, as well as developing the ability to read, verify and use the technical and operational documentation of machines.
2.	The aim of the course for student is to develop the ability to read, verify and use the technical and operational documentation of devices.
3.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	draw parallel and central projections of given geometric figures and reconstruct the real shapes and sizes of geometric figures presented in the projections	K_W01, K_U22
EP2	solve construction tasks using the plotting method according to the given algorithm	K_W01, K_U22
EP3	select standardized elements of a drawing and draw the basic elements of a technical drawing	K_W01, K_U18, K_U21, K_U22
EP4	dimension machine parts according to the selected dimensioning system	K_W01, K_W03, K_W09, K_U13, K_U21, K_U22

EP5	prepare an executive drawing of the machine part based on the assembly drawing, taking into account dimensional and geometrical tolerances and surface roughness markings resulting from the task it performs in the machine assembly	K_W01, K_W03, K_W09, K_U02, K_U13, K_U18, K_U21, K_U22
EP6	recognize the main dimensions, theoretical lines, coordinate axes and base planes when mapping the hull shape of the ship's hull	K_W01, K_W03, K_W09, K_U02, K_U11, K_U13, K_U18, K_U21, K_U22, K_K06
EP7	explain the principle of vector geometry notation in graphical databases; use the drawing tools of a computer drawing editor to make a technical drawing and modify the drawing using editing commands	K_W01, K_U02, K_U21, K_U22
EP8	communicate using various graphic techniques	K_U02

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester II

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab	
1.	Preliminary information. Engineering graphics tasks. The concept of projection and projection methods.	1			EP1
2.	Mapping of the basic elements of space in orthogonal projections.	1			EP1
3.	Determining the belonging of elements in orthogonal projections.	2		2	EP1
4.	Application of the transformation method to represent simple geometric figures.	2		2	EP1
5.	Drawing interpenetrating geometric figures.	2		2	EP2
6.	*Standardized elements of technical drawing:* *a) sheet formats,* *b) scales,* *c) thicknesses, types and use of drawing lines,* *d) technical letter,* *e) basic geometric constructions, such as: division of segments, development of a circle using the Kochański method, regular polygons, plotting of plane curves,* *f) viewport layout,* *g) views, sections, layouts,* *h) nameplates.* **(8.18.1)**	2		13	EP3
7.	*Thread connections:* *a) types of threads,* *b) markings,* *c) drawing simplifications.* **(8.18.2)**	1		2	EP3, EP7, EP8
8.	*Welded connections:* *a) weld shapes,* *b) markings,* *c) drawing simplifications.* **(8.18.3)**	1		2	EP3, EP7, EP8
9.	*Gear's wheels and gears - drawing simplifications.* **(8.18.4)**	1		4	EP3, EP7, EP8
10.	*Dimensioning principles in the technical drawing:*	2		3	EP4

	a) special cases of dimensioning, *b) tolerance and fit in technical drawing.* **(8.18.5)**				
Total numbers of hours during semester:		**15**		**30**	

Semester III

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab	
1.	*Marking of shape, position and runout tolerances.* **(8.18.6)**			2	EP4, EP7, EP8
2.	*Marking of the surface roughness.* **(8.18.7)**			2	EP4, EP7, EP8
3.	*Principles of preparing of detailed drawings of machine parts.* **(8.18.8)**			4	EP5
4.	*Drawing and dimensioning of basic machine elements:* *a) detailed drawing of machine parts,* *b) assembly drawing.* **(8.18.9)**			10	EP3, EP5, EP7, EP8
5.	*Principles of hull lines drawing.* **(8.18.10)**			2	EP6, EP7, EP8
6.	*Principles of preparing schematic diagrams for installations of ship power plant*. **(8.18.11)**			4	EP6, EP7, EP8
7.	*Principles of preparing schematic diagrams for hydraulic and pneumatic installations.* **(8.18.12)**			2	EP6, EP7, EP8
8.	*Principles of preparing schematic diagrams for electric installations*. **(8.18.13)**			2	EP6, EP7, EP8
9.	*Interpretation of engineering drawings*. **(8.18.14)**			2	EP6, EP7, EP8
Total numbers of hours during semester:				**30**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x				x (Lab)	
EP2				x				x (Lab)	
EP3				x				x (Lab)	
EP4				x				x (Lab)	
EP5				x				x (Lab)	
EP6				x				x (Lab)	
EP7				x				x (Lab)	
EP8				x				x (Lab)	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
II	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. Attended lectures (3 excused absences allowed). **Design exercises:** passing all design exercises during the course. **Lecture:** lecture colloquium. Final grade: the average of grades from individual types of classes.
III	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. **Design exercises:** performing and passing all design exercises during classes. Final grade: average of all design exercises.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	15	60		
Reading literature	10	15		
Preparing for laboratories, project classes		50		
Preparing for exam, pass test	10			
Developing project/report		10		
Participation in exam, pass test	2			
Consultation with teacher	5	5		
Total number of hours	42	140		
Number of ECTS credits	**2**	**5**		
Total number of ECTS credits for the subject	**7**			
Student's workload connected with practical classes	60 + 15 + 50 + 10 + 5 = 140 h 5 ECTS			
Student's workload connected with classes involving direct participation of teacher	15 + 60 + 2 + 5 + 5 = 87 h 3 ECTS			

List of literature:

Required reading
1. Lewandowski. Z.: Geometria wykreślna. PWN, 1980. 2. Dobrzański T.: Rysunek techniczny maszynowy. WNT, Warszawa 2006. 3. Danielewicz J.: Rysunek techniczny maszynowy i okrętowy, Wyd. Morskie, Gdynia 1982. 4. Skorek G.: Grafika inżynierska. Komputerowy zapis konstrukcji na przykładzie AutoCAD-a. Wydawnictwo Akademii Morskiej w Gdyni. Gdynia 2012.
Recommended reading
1. Kochanowski M.: Zapis konstrukcji z geometrią wykreślną. Wyd. 1. Wydawnictwo Politechniki Gdańskiej. 2. Pikon A.: AutoCAD 201x. 3. AutoCAD Tutor: http://www.cadtutor.net/tutorials/autocad/

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Grzegorz Skorek, PhD	Department of Engineering Science
2. Other lecturers:	
Krzysztof Rudzki, PhD	Department of Engineering Science
Olha Dvirna, PhD	Department of Engineering Science
Anna Lesnau, MSc	Department of Engineering Science
Daria Żuk, MSc	Department of Engineering Science

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	16	Name of subject:	**COMPUTER AIDED DESIGN**
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
V	2			2					30		
Total numbers of hours during study:							**30**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of secondary school.
2.	Knowledge and skills in basic and directional subjects (mathematics, physics, engineering mechanics, strength of materials, engineering graphics, materials science, fundamentals of manufacturing engineering, fundamentals of machine design), in terms of first degree.

Course objectives

1.	The purpose of the course is to provide basic knowledge of computer-aided design, CAD software, finite element method, numerical calculation methods and computer simulation used in the design of machine parts.
2.	The purpose of the course is to acquire basic skills in the use of CAD systems in the design of machine parts.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	Determine forces and stress distributions in machine parts by numerical methods	K_W01, K_U22
EP2	Make a 2D sketch using basic drawing tools; make a 3D model by applying basic solid creation techniques; prepare an animation of assembly or disassembly of a prepared assembly; calculate a sample machine part using FEM.	K_W01, K_U22
EP3	Retrieve supplemental information for classes from other sources; appreciate the benefits of a synergistic lab group; communicate using a variety of graphic techniques.	K_W01, K_U18, K_U21, K_U22

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester V

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Introduction to CAD - CAD software.			1	EP1, EP2, EP3
2.	Introduction to computer spatial modelling. Vector recording - vector databases. 3D graphics editors.			1	EP2
3.	3D modelling. Making a sketch in 2D and how to transition to 3D. 3D modelling tools (drawing, rotating, dragging along a curve, summing solids).			2	EP2
4.	Basic drawing tools for 3D modelling and how to work with the editor (points lines and construction planes, bonds, datums).			2	EP2
5.	Preparation of a 3D model of a device component. Transition to the executive drawing in 2D.			2	EP2, EP3
6.	Preparation of component badging (defining bonds and connections). Preparation of assembly drawing. Using a database of standardized elements.			2	EP2
7.	Computer-aided design of a machine shaft. Using a database of standardized elements (e.g. retaining ring grooves, technological undercuts). Selecting bearings, keyways and splines.			2	EP1, EP2
8.	Introduction to the finite element method of FEA.			4	EP1
9.	Preparation of the model for FEM calculations (creation of 2D or 3D geometry, division into finite elements, preparation of node mesh, definition of boundary conditions. Execution of calculations and analysis of the obtained results.			4	EP1
10.	Analysis and optimization of the structural form of selected machine parts using FEM.			4	EP1
11.	Kinematic pairs and their kinematic analysis. Simulation and animation of kinematic pairs, (interaction of elements, determination of motion parameters and forces in cooperating elements).			3	EP1
12.	Use of various capabilities of CAD software during design in a design team (concurrent engineering).			3	EP1, EP2, EP3
Total numbers of hours during semester:				**30**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1					x	x	x	x	
EP2					x	x	x	x	
EP3					x	x	x	x	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
V	The student achieved the expected learning outcomes. Participated in all laboratory classes, performed and passed all laboratory exercises during the classes. He/she independently carried out the project during classes. Final evaluation: The average of the pass marks of the individual exercises and the project

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours		30		
Reading literature		10		
Preparing for laboratories, project classes		4		
Preparing for exam, pass test		6		
Developing project/report				
Participation in exam, pass test				
Consultation with teacher		4		
Total number of hours		54		
Number of ECTS credits		**2**		
Total number of ECTS credits for the subject	**2**			
Student's workload connected with practical classes	30 + 10 + 4 + 6 + 4 = 54 h 2 ECTS			
Student's workload connected with classes involving direct participation of teacher	30 + 4 = 34 h 1 ECTS			

List of literature:

Required reading
1. M.Eng. Johannes Wild, Autodesk Inventor Step by Step – CAD Design and FEM Simulation with Autodesk Inventor for Beginners, Publish Drive, 2022.
Recommended reading
1. Al-Tabey Wael, Machine Design for Mechanical Engineering, OmniScriptum GmbH & Co. KG, 2017, 2. Stolarski Tadeusz, Nakasone Yuji, Yoshimoto Shigeka, Engineering Analysis with ANSYS Software, Elsevier Ltd. Oxford, Elsevier Ltd. Oxford, 2017, 3. Michaud Michel, CATIA Core Tools: Computer Aided Three-Dimensional Interactive Application, Mcgraw-Hill Education-Europe, 2012, 4. Madsen David, Engineering Drawing and Design, Cengage Learning Inc., 2000.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Krzysztof Rudzki, PhD (Eng)	Department of Engineering Science
2. Other lecturers:	
Prof. Lech Murawski, DSc (Eng)	Department of Engineering Science

Grzegorz Skorek, PhD	Department of Engineering Science
Katarzyna Panasiuk, PhD	Department of Engineering Science
Grzegorz Hajdukiewicz, PhD	Department of Engineering Science
Anna Lesnau, MSc	Department of Engineering Science

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	17	Name of subject:	**FUNDAMENTALS OF MACHINE DESIGN**
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
III	3	2	1				30	15			
IV E	2	2					30				
V	2			1				15			
Total numbers of hours during study:							**90**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of secondary school.
2.	Knowledge and skills in basic and major subjects (mathematics, physics, technical mechanics, strength of materials, engineering graphics, materials science, basics manufacturing engineering), in the field of first-cycle studies.

Course objectives

1.	The aim of the course is to provide basic knowledge in the field of characteristics and classification, design rules, selection of materials for construction, application, proper operation of elements and machine components.
2.	The aim of the course is to acquire the ability to design and operate various types of machine components and assemblies, such as: connections, bearings, shafts, couplings, gears.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	present the design process and characterize it basic construction principles; present the essence of tolerance dimensions, fits of machine parts, tolerances and to select and calculate dimensional tolerances and matching of cooperating machine parts	K_W01, K_W03, K_W04, K_W07, K_W08, K_W09, K_U12, K_U17, K_U18
EP2	justify the benefits of lubrication; explain the essence formation of hydrodynamic load capacity, calculate the bearing hydrodynamic; characterize the different types of bearings, select fits and explain the rules for determining rolling bearings as well as identify the designation of a rolling bearing	K_W01, K_W03, K_W04, K_W08, K_W09, K_U13, K_U17, K_U18, K_U20, K_K03

EP3	Retrieve supplemental information for classes from other sources; appreciate the benefits of a synergistic lab group; communicate using a variety of graphic techniques	K_W01, K_U18, K_U21, K_U22
EP4	discuss the different types of springs, clutches, brakes and valves; present the principles of shaping the construction of shafts and explain the essence of static and dynamic shaft balancing	K_W01, K_W03, K_W08, K_W09, K_U17, K_U18
EP5	introduce the types and types of gear teeth, geometric features meshing and conditions of meshing stability and continuity; characterize the basic design features of a spur gear, drive systems, stuffing boxes, seals, cantilever bearings	K_W01, K_W03, K_W04, K_W08, K_W09, K_U13, K_U17, K_U18, K_K03
EP6	determine the distribution of shear stresses in the fillet weld, forcesoperating in pre-tensioned bolt connection and in bolt connections loaded with force and torque, pressure distributions in the bearing with hydrodynamic lubrication	K_W01, K_W03, K_W04, K_W08, K_U12, K_U18, K_U20
EP7	find supplementary information for classes from other sources; appreciate the benefits of the synergistic action of the laboratory group; communicate using various graphic techniques	K_U01, K_U02, K_U05

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester III

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	The basic materials used in shipbuilding.	1			EP1
2.	The design process and its phases. Construction optimization. Computer aided CAD design process.	1			EP1, EP7
3.	Dimensional tolerances and fits of machine parts. Tolerances geometric. Surface roughness.	4	2		EP1
4.	Types of sliding friction (dry, sticky) and their conditions occurrence. Hypothesis of sliding friction, dry and its meaning practical. Multi-layer bearing shell. Boundary Friction.	2			EP2
5.	Lubricants and their properties. Viscosity and lubricity. Ferroliquids and theirs application.	1			EP2, EP7
6.	Hydrodynamic theory of lubrication. The essence of the formation of bearing capacity on the example of a flat bearing model. Ways of implementation and conditions for the formation of hydrodynamic friction.	4	2		EP2
7.	The criterion for the transition of liquid friction to mixed friction.	1			EP2
8.	Bearing classification. Sliding bearings.	2			EP2
9.	The criterion of hydrodynamic similarity of bearings.	1			EP2
10.	Rolling friction. Friction in rolling bearings. Coefficient of friction rolling. Bearing classification. Bearing designation rules. Rules fitting, fixing and selection of rolling bearings.	3	2		EP2
11.	Classification of machine connections. Welded joints, welded and glued. Weld and stress concentration - ways to reduce it impact of the notch.	2	2		EP3

12.	Threaded and bolted connections. Efficiency and self-locking thread. Thread strength. Basic bolt load conditions and rules for their calculation.	4	3		EP3
13.	Shaped connections.	2	2		EP3
14.	Friction connections. Stress distributions in a friction joint. Contact compliance of the friction connection. Connection load capacity friction.	2	2		EP3
	Total numbers of hours during semester:	**30**	**15**		

Semester III

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Types of stresses and loads. Fatigue strength of elements machines. Wöhler chart. Factors affecting strength and the method of taking them into account in the calculations. Smith Fatigue Chart.	2			EP3
2.	Vulnerable elements. Springs.	1			EP4
3.	Clutches. General characteristics of couplings, their classification and general calculation rules.	2			EP4
4.	General characteristics of valves, their classification and general calculation principles. Thermal compensators.	1			EP4
5.	Shafts and axles. Principles of construction shaping of embankments. Static and dynamic balancing of shafts.	2			EP4
6.	Characteristics of the propulsion system of the ship's shaft line.	1			EP5
7.	A line of shafts with a power plant located in the stern part of the ship and amidships.	1			EP5
8.	Shaft line elements: screw shaft, intermediate shaft, thrust shaft. Calculation and selection of shafts. Ways of connecting shafts. Support bearings, thrust bearing - sliding/rolling. Scabbard of the propeller shaft.	2			EP5
9.	The stern tube with seals.	1			EP5
10.	Cantilever bearings - types, construction, calculation. Bow and stern shaft seals.	2			EP5
11.	Connection of the propeller shaft to the hub of the fixed and variable pitch propeller.	1			EP5
12.	General characteristics of mechanical gears.	2			EP5
13.	Kinematic and geometric gear ratio. Geometric features of the meshing. Module, center distance.	2			EP5
14.	The principle of meshing - the condition for the constancy of the gear ratio. Line and angle of pressure. Degree of coverage.	2			EP5
15.	Basic features of involute meshing. Limit number of teeth.	2			EP5
16.	Correction of teeth and teething. Straight tooth helical gears.	3			EP5
17.	Friction gears. Cable gears.	2			EP5
18.	Sealing of moving and stationary machine elements.	1			EP5

Total numbers of hours during semester:	**30**			

Semester IV

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Introduction to the PKM laboratory.			1	EP6
2.	Selection of fits for selected construction nodes.			2	EP6, EP7
3.	Study of stress distribution in a fillet weld. Calculation of stresses in the weld.			2	EP6
4.	Testing pre-tensioned bolt connections. Bolt connection calculation examples.			2	EP6
5.	Study of screw connections loaded with force and torque. Calculation of bolted connections for a complex load condition.			2	EP6
6.	Testing of compression springs. Calculation tasks of fatigue strength.			2	EP6
7.	Examination of the friction clutch during start-up. Selection and calculation of couplings.			2	EP6
8.	Study of pressure distribution in a hydrodynamic bearing. Calculation and selection of plain and rolling bearings.			2	EP6
Total numbers of hours during semester:				**15**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1	x	x							
EP2	x	x							
EP3	x	x							
EP4		x							
EP5		x							
EP6				x	x				
EP7									x

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
III	The student has achieved the expected learning outcomes. **Lecture**: passing a test. **Classes:** passing the test. **Final grade**: passed tests from lectures and exercises.
IVE	The student has achieved the expected learning outcomes. **Lecture:** passing a test on the entire material concerning the 4th semester. **Final grade:** written final exam covering all the material.
V	The student has achieved the expected learning outcomes. Participation in all laboratory classes. **Laboratory**: performing and passing all laboratory exercises during classes. **Final grade:** the average of the grades for each laboratory, after obtaining positive grades.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	75	15		
Reading literature	25			
Preparing for laboratories, project classes		10		
Preparing for exam, pass test	25			
Developing project/report		15		
Participation in exam, pass test	10			
Consultation with teacher	10	4		
Total number of hours	145	49		
Number of ECTS credits	**5**	**2**		
Total number of ECTS credits for the subject	**7**			
Student's workload connected with practical classes	15 + 10 + 15 + 4 = 49 h 2 ECTS			
Student's workload connected with classes involving direct participation of teacher	75 + 10 + 10 + 15 + 4 = 114 h 4 ECTS			

List of literature:

Required reading
1. Kyzioł L.: Podstawy Konstrukcji Maszyn (ang. Fundamentals of machine design), Part I – III. AMW, Gdynia 2009. 2. Mazanek E.: Przykłady obliczeń z podstaw konstrukcji maszyn (ang. Examples of calculations from the fundamentals of machine design) . Tom 1-2. WNT, Warszawa 2005. 3. Osiński Z.: Podstawy Konstrukcji Maszyn (ang. Fundamentals of machine design). PWN, Warszawa 1999. 4. Catalog SKF. Warszawa 2001. 5. Kurmaz L.W.: Podstawy Konstrukcji Maszyn, Projektowanie (ang. Fundamentals of machine design. Designing). PWN, Warszawa 1999. 6. Knosala R., Gwiazda A., Baier A., Gendarz P.: Podstawy Konstrukcji Maszyn, Przykłady obliczeń (ang. Fundamentals of machine design. Examples of calculations). WNT, Warszawa 2000.

7. Wykład z Podstaw Konstrukcji Maszyn z ćwiczeniami (ang. Fundamentals of machine design – lecture with calculations), Skrypty Politechniki Gdańskiej: - Siwek B.: Połączenia spawane, zgrzewane, lutowane i klejone (ang. Welded, soldered and glued connections . - Maciakowski R.: Połączenia śrubowe (ang. Screw connections).
8. Dietrych J, Korewa W., Zygmunt K.: Podstawy Konstrukcji Maszyn (ang. Fundamentals of machine design), Part I – III. WNT, Warszawa.
9. Osiński Z., Bajon W., Szucki T.: Podstawy Konstrukcji Maszyn (ang Fundamentals of machine design). PWN, Warszawa 1990.
10. Bowden, Tabor D.: Wprowadzenie do trybologii (ang. Introduction to Tribology). WNT, Warszawa.
11. Niezgodziński T., Niezgodziński S.: Obliczenia zmęczeniowe elementów maszyn (ang. Fatigue calculations for elements of machines). PWN, Warszawa.
12. Markusik S.: Sprzęgła mechaniczne (ang. Mechanical clutches) . WNT, Warszawa.
13. Muller L.: Przekładnie zębate – projektowanie (ang, Gears - designing). WNT, Warszawa.
14. Tarełko W.: Laboratorium Podstaw Konstrukcji Maszyn. Wydawnictwo Wyższej Szkoły Morskiej w Gdyni (ang. Laboratory of Fundamentals of Machine Design. Publishing house of the Gdynia Maritime University), Gdynia 2001.
15. Skorek G.: Zbiór ćwiczeń Autodesk Inventor (ang. A collection of Autodesk Inventor exercises). Wydawnictwo Akademii Morskiej w Gdyni, Gdynia 2012.

Recommended reading

1. Rusiński E., Czmochowski J., Smolnicki T.: Zaawansowana metoda elementów skończonych w konstrukcjach nośnych (ang. Advanced finite element method in load-bearing structures). Oficyna Wyd. Pol. Wroc., Wrocław 2000.
2. Nagórski Z.: Modelowanie przewodzenia ciepła za pomocą arkusza kalkulacyjnego (ang. Heat conduction modeling using a spreadsheet). Wydawnictwo Politechniki Warszawskiej. Warszawa 2001

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Grzegorz Hajdukiewicz, PhD (Eng)	Department of Engineering Science
2. Other lecturers:	
Prof. Lech Murawski, DSc (Eng)	Department of Engineering Science
Grzegorz Skorek, PhD	Department of Engineering Science
Katarzyna Panasiuk, PhD	Department of Engineering Science
Krzysztof Rudzki, PhD	Department of Engineering Science

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	18	Name of subject:	**MACHINE ELEMENTS – DESIGNING EXERCISES**
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
IV	1				1					15	
V	2				1					15	
Total numbers of hours during study:							**30**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of secondary school.
2.	Knowledge and skills in basic and major subjects: Physics I and II, Technical Mechanics I and II, Strength of Materials I and II, Engineering Graphics I and II, Fundamentals construction of machines I, II and III.

Course objectives

1.	The aim of the course is to provide knowledge and skills in the field of building mechanical structures and reading and producing technical documentation of ship equipment.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	use knowledge in the field of strength of materials in practice	K_W0l, K_W03
EP2	use technical standards related to the construction and operation of machines	K_W09
EP3	list the methods and techniques used in solving simple engineering tasks	K_W08, K_U17
EP4	design a simple technical device	K_Ul8

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester IV

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Selection of the concept of a technical solution for the design of the screw mechanism.			4	EP3
2.	Bolt and nut strength calculations.			4	EP1
3.	Selection and strength calculation of the mechanism drive.			2	EP1
4.	Mechanism design.			3	EP4
5.	Preparation of technical documentation of the mechanism.			2	EP2
Total numbers of hours during semester:				**15**	

Semester V

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Development of a gearbox concept for a selected application.			1	EP1
2.	Calculation of kinematic and geometric parameters of gearboxes.			2	EP1
3.	Strength calculations of gear wheels.			4	EP2
4.	Strength calculations of shafts.			2	EP2
5.	Selection of bearing, lubrication and gear body components.			2	EP3
6.	Preparation of gearbox design documentation.			4	EP4
7.	Development of a gearbox concept for a selected application.			1	EP1
Total numbers of hours during semester:				**15**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1						x			
EP2						x			
EP3						x			
EP4						x			

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
IV	The student actively participated in at least 75% of the classes and submitted correctly prepared technical documentation of the given project.
V	The student actively participated in at least 75% of the classes and submitted correctly prepared technical documentation of the given project.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours			30	
Reading literature			10	
Preparing for laboratories, project classes			15	
Preparing for exam, pass test				
Developing project/report			10	
Participation in exam, pass test			6	
Consultation with teacher			10	
Total number of hours			81	
Number of ECTS credits			**3**	
Total number of ECTS credits for the subject	**3**			
Student's workload connected with practical classes	30+10+15+10+6+10=81h 3 ECTS			
Student's workload connected with classes involving direct participation of teacher	30+10+6=45h 2 ECTS			

List of literature:

Required reading
1. Kyzioł L.: Podstawy Konstrukcji Maszyn. Cz. I – III. AMW, Gdynia 2009. 2. Mazanek E.: Przykłady obliczeń z podstaw konstrukcji maszyn. Tom 1-2. WNT, Warszawa 2005. 3. Osiński Z.: Podstawy Konstrukcji Maszyn. PWN, Warszawa 1999. 4. Katalog SKF. Warszawa 2001. 5. Kurmaz L. W., Kurmaz O. L.: Projektowanie Węzłów i Części Maszyn. Kielce 2004. 6. Kurmaz L.W.: Podstawy Konstrukcji Maszyn. Projektowanie. PWN, Warszawa 1999. 7. Dietrich M.: Podstawy Konstrukcji Maszyn. Tom I, II, III, WNT, 2008.
Recommended reading
1. Pkm.edu.pl 2. Podsiadło A.: PKM materiały pomocnicze do projektowania. Tom I, II, III, Wyd. AM, 1997.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Katarzyna Panasiuk, PhD (Eng)	Department of Engineering Science
2. Other lecturers:	

Krzysztof Rudzki, PhD (Eng)	Department of Engineering Science
Norbert Abramczyk, MSc (Eng)	Department of Engineering Science
Grzegorz Hajdukiewicz, PhD (Eng)	Department of Engineering Science

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	19	Name of subject:	**FUNDAMENTALS OF MACHINE OPERATION AND MAINTENANCE**
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
IV	1	1					15				
VIII	1	1					15				
Total numbers of hours during study:							**30**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of secondary school.
2.	Knowledge in the field of first-cycle studies in the following subjects: Physics, Materials Science, Power Plants and Repair Technology.

Course objectives

1.	The aim of the course is to provide basic knowledge and skills in the field of rational operation of marine power plants and offshore construction equipment.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	identify the basic issues related to the operation of machines	K_W03, K_W07, K_U18
EP2	illustrate the basic concepts of systems theory	K_W01
EP3	classify processes in machine operation	K_W04
EP4	distinguish machine operation system	K_W09
EP5	define the basic issues of reliability theory	K_U13

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester IV

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Basic issues related to the operation of machines: phases of machine life, classification and properties of machines, man-environment-machine system, extortion factors, causes and effects of damage, operational quality.	2			EP1
2.	Fundamentals of systems theory: elements, structure and purpose of the system, structure of the system and its states, decomposition of the system, acting element and its couplings, system models, events.	1			EP2
3.	Processes in the operation of machines: controlled and uncontrolled processes, classification of processes, utility processes, ensuring suitability, supporting control, logistic and decommissioning processes.	5			EP3
4.	Machine operation systems: structure and construction of the system, features and objectives of the system, the role of information in the system, decision-making process, operational strategies, repertoire, potential, cycle and operating condition, evaluation of the system's effectiveness, criteria and types of evaluation.	5			EP4
5.	Fundamentals of reliability theory: system and element reliability, unrepairable element, theoretical and empirical functions of unreliability and reliability, durability and damage intensity of elements, frequency of damage, reliability tests of elements and systems, system reliability structures, system recovery time.	2			EP5
	Total numbers of hours during semester:	**15**			

Semester VIII

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Types of friction: dry, border mixed liquid. The definition of friction. Dry friction theories: – mechanical, – mechanical and molecular, – molecular.	1			EP1
2.	Real contact area. The surface layer, its formation and properties. Physico-chemical phenomena on the metal surface; physical sorption; chemisorption; Rebinder's effect.	2			EP2
3.	Boundary and mixed friction.	1			EP1
4.	Fluid friction conditions: – assumptions of the hydrodynamic theory of lubrication, – Reynolds equation and methods of solving it, – Sommerfeld number, – Hersey parameter.	2			EP1
5.	Evaluation of the influence of design parameters on the load capacity of a hydrodynamic bearing.	2			EP1
6.	Criteria for operational reliability of hydrodynamic bearings: – minimum oil film thickness,	2			EP1

	− temperature, − surface loads, − cavitation.				
7.	Hydrostatic bearings.	0.5			EP1
8.	Elasto-hydrodynamic theory of lubrication, examples of associations. Properties of lubricants.	1			EP1
9.	Classification of tribological wear processes. Identification of the process type based on visual inspection. Methods of minimizing the intensity of destruction processes.	3			EP1
10.	Working conditions of tribological nodes in transient processes.	0.5			EP1
	Total numbers of hours during semester:	**15**			

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x					
EP2				x					
EP3				x					
EP4				x					
EP5				x					

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
IV	The student has achieved the expected learning outcomes. Grade to the student record book after passing the pass test.
V	The student has achieved the expected learning outcomes. Grade to the student record book after passing the pass test.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	30			
Reading literature	15			
Preparing for laboratories, project classes				
Preparing for exam, pass test	10			
Developing project/report				
Participation in exam, pass test	2			
Consultation with teacher	2			
Total number of hours	59			
Number of ECTS credits	**2**			

Total number of ECTS credits for the subject	2
Student's workload connected with practical classes	0 ECTS
Student's workload connected with classes involving direct participation of teacher	30 + 2 + 2 = 34 h 1 ECTS

List of literature:

Required reading
1. Bhushan B., *Introduction to Tribology*, A John Wiley & Sons Publication, 2013 or later. 2. Booser E. R., *CRC Handbook of Lubrication and Tribology*, CRC Press, Inc. 1994 or later.
Recommended reading
1. Neale M. J., *The Tribology Handbook*, Butterworth-Heinemann, ISBN 0 7506 1198 7, 2001 or later.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Olha Dvirna, PhD (Eng) – 4th sem.	Department of Engineering Science
Jerzy Herdzik, DSc (Eng), Assoc. Prof. – 8th sem.	Department of Marine Propulsion Plants
2. Other lecturers:	
Krzysztof Rudzki, PhD (Eng)	Department of Engineering Science
Andrzej Młynarczak, PhD (Eng), Assoc. Prof.	Department of Marine Propulsion Plants

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	20	Name of subject:	**MATERIALS SCIENCE***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
I	2	2					30				
II	3	1		2			15		30		
III	1			1					15		
Total numbers of hours during study:							**90**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of secondary school.

Course objectives

1.	The aim of the course is to provide basic knowledge and skills in the field of materials science, necessary for the safe operation of the ship's technical equipment.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	list construction materials used for marine structures; describe the structure, properties, application and testing methods of materials	K_W02, K_W08
EP2	describe the destruction mechanisms of construction materials	K_W07, K_K02
EP3	explain the influence of heat and plastic treatment on the properties of metal alloys used in shipbuilding	K_W02, K_W03, K_W05
EP4	select heat treatment parameters; perform metallographic tests of metal construction materials, hardness measurements, interpret the obtained results and draw conclusions	K_U08, K_U09, K_U12, K_U13, K_U18
EP5	list and apply technical norms and standards related to technical materials used in shipbuilding and their testing	K_W09, K_U21
EP6	use literature sources to interpret research results	K_U01, K_U05
EP7	work in a group assuming different roles in it, apply the principles of cooperation	K_K05

Course content:

Semester I

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*Fundamentals of solid construction:* **(8.17.1)** *metallic crystal and amorphous structure, crystal systems, defects, influence the physical construction on materials properties.*	0,5			EP1
2.	*Mechanisms of materials degradation:* **(8.17.2)** *a) corrosion,* *b) wear,* *c) brittle fracture,* *d) fatigue,* *e) erosion.*	1			EP2
3.	*Fundamentals of metals alloys structure.* **(8.17.3)**	0,5			EP1
4.	*Types of equilibrium systems, phase components of alloys. Iron–carbon diagram.* **(8.17.4)**	0,5			EP1
5.	*Technical ferrous alloys* **(8.17.5):** *a) steels and cast steel, cast iron, special alloys,* *b) alloying elements in iron alloys and their influence on the properties,* *c) marking iron alloys,* *d) selected properties and application examples.*	3			EP1
6.	*Technical nonferrous alloys* **(8.17.6):** *a) copper, aluminium, titanium, nickel, magnesium, tin, lead,* *b) marking nonferrous alloys,* *c) selected properties and application examples.*	1,5			EP1
7.	*Non-metallic materials*. **(8.17.7)**	0,5			EP1
8.	*Natural materials* **(8.17.7a)***:* *a) ceramics* *b) polymers.*	0,5			EP1
9.	*Composites*. **(8.17.7b)**	0,5			EP1
10.	*Fundamentals of composites mechanics* **(8.17.7b)**: *a) composites based on polymers and metals,* *b) examples of technical applications*	0,5			EP1
11.	*Auxiliary materials: adhesives, sealants, insulation, paint, varnish, abrasive pastes, chemicals.* **(8.17. p.7c)**	0,5			EP1
12.	*Welding materials.* **(8.17.8)**	0,5			EP1
13.	*Application of metals and their alloys in shipbuilding.* **(8.17. p.9)**	2			EP1
14.	*Application of natural materials, ceramics and polymers in shipbuilding.* **(8.17. p.10)**	2			EP1
15.	*Application of composites based on polymers and metals in shipbuilding.* **(8.17. p.11)**	2			EP1
16.	*Application of adhesives, sealants and other auxiliary materials for the regeneration of machine parts and use in the ship power plant.* **(8.17. p.12)**	2			EP1
17.	*Application of welding materials in shipbuilding.* **(8.17.13)**	2			EP1

18.	*The rules of classification societies of marine materials.* **(8.17.17)**	2			EP5
19.	*Metallurgy and casting, and their influence on the properties of metals* **(8.17. p.14)**: *a) basis for metallurgy and foundry,* *correctness assessment of cast iron, steel and nonferrous alloys structures.*	3			EP1
20.	*Fundamentals of metal forming and its influence on the properties of metals, plastic deformation, cold work and recrystallization.* **(8.17.15)**	3			EP3
21.	*Fundamentals of heat treatment processes and their influence on material properties, heat treatment of non-ferrous alloys.* **(8.17.16)**	2			EP3
	Total numbers of hours during semester:	**30**			

Semester II

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	*Standard, high-strength and firm ship steels. Hull steels for low temperature service.* Boiler steels. Steels for ship pipelines. **(8.3.7)**	1			EP1
2.	Steels: stainless, creep-resistant, heat-resisting, valve, for quenching and tempering, carburizing and nitriding. Tool steels. Cast steels.	3		2	EP1, EP4
3.	Copper alloys for casting and forming. Brasses and bronzes. Copper alloys for ship propellers.	2			EP1, EP5, EP4
4.	*Aluminium alloys casting and forming. Application of aluminium alloys in marine construction.* **(8.3.7)**	1		2	EP1, EP4
5.	Bearing materials: alloys of tin and lead, copper and aluminium alloys, other metals alloys. Composites.	2		2	EP1, EP6, EP4
6.	Modern construction materials. Steels: to work in low temperatures, maraging, shape memory materials, glass and glass ceramics.	2			EP1
7.	Polymer and composite materials.	2			EP1
8.	*Construction materials: a combination of elements, corrosion protection.* **(8.3.7)**	2		2	EP1, EP4
9.	Introduction to laboratory classes. Safety rules. Terms of the laboratory. Discussion of exercise forms.			3	EP1
10.	Ultrasonic flaw detection.			2	EP6
11.	Radiographic flaw detection. Interpretation of radiographs.			2	EP6, EP5, EP7
12.	Studies of structural steel.			2	EP4
13.	Microscopic examination of steel after heat treatment. *Influence of heat treatment on properties of ferrous alloys.* **(8.17.18a)**			2	EP1, EP3
14.	Research of steel after plastic forming.			2	EP3
15.	Research of properties and microstructure of cast iron. *Influence of heat treatment on properties of ferrous alloys.* **(8.17.18a)**			2	EP1, EP6, EP7
16.	Measurements of microhardness and hardness.			2	EP1, EP5, EP7
17.	Non-destructive testing. Radiographic, penetrant and acoustic			2	EP4,EP5,

	emission.				EP7
18.	Annealing and hardening of steel. *Influence of heat treatment on properties of ferrous alloys.* **(8.17.18a)**			3	EP4, EP5, EP7
	Total numbers of hours during semester:	**15**		**30**	

Semester III

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Introduction to laboratory classes. Discussion of exercises.			2	EP1, EP6, EP7
2.	Microscopic examination of steel after thermo-chemical treatment.			2	EP1, EP4, EP5
3.	Tests of metal and protective coatings.			2	EP1, EP4, EP5
4.	Ship steels. Steels for marine shaft lines.			3	EP1, EP4, EP5
5.	Testing of copper alloys. *Influence of heat treatment on the properties of non-ferrous alloys.* **(8.17.18b)**			2	EP1, EP4,
6.	Microscopic examination of welded joints.			2	EP1, EP4, EP5
7.	Testing of properties and microstructure of tool steels.			2	EP1, EP4, EP5
	Total numbers of hours during semester:			**15**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x					
EP2				x					
EP3				x					
EP4				x	x			x	
EP5				x	x				
EP6					x			x	
EP7					x			x	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
I	Student achieved the expected learning outcomes and meets the STCW Convention requirements relating to completing the course. Attended lectures (limit - 3 absences). **Lecture**: method of assessment - test of the lecture.
II	Student achieved the expected learning outcomes and meets the STCW Convention requirements relating to completing the course. Attended lectures and laboratories. **Lecture**: written and oral. **Laboratories**: Execution and completion of all laboratory, according to the schedule. Final evaluation of the average score for the theoretical knowledge, laboratory work and reports. Evaluation index after successfully completing the two forms of activity with the assessment of the average grades received lecture and laboratory.
III	Student achieved the expected learning outcomes. Performed and passed all laboratory classes, according to the plan of study. Final evaluation of the average score for the theoretical knowledge, the work in the laboratory, the reports.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	45	45		
Reading literature	15			
Preparing for laboratories, project classes		20		
Preparing for exam, pass test	20			
Developing project/report		10		
Participation in exam, pass test	4			
Consultation with teacher	4	5		
Total number of hours	88	80		
Number of ECTS credits	**3**	**3**		
Total number of ECTS credits for the subject	**6**			
Student's workload connected with practical classes	45 + 20 + 10 + 5 = 80 h 3 ECTS			
Student's workload connected with classes involving direct participation of teacher	45 + 4 + 4 + 45 + 5 = 103 h 4 ECTS			

List of literature:

Required reading

1. Cicholska M., Czechowski M.: Materiałoznawstwo okrętowe. Wydawnictwo Akademii Morskiej w Gdyni, Gdynia 2013.
2. Dobrzański L.A.: Podstawy nauki o materiałach i metaloznawstwo. WNT, Warszawa 2002.
3. Prowans S.: Materiałoznawstwo. PWN, Warszawa 1988.
4. Rudnik S.: Metaloznawstwo. WNT, Warszawa 1994.
5. Przybyłowicz K.: Metaloznawstwo. WNT, Warszawa 1992.

Recommended reading

1. Ashby M. F., Jones D. R. H.: Materiały inżynierskie. Tom I, II. WNT, Warszawa 1995.
2. Dobrzański L.A.: Materiały inżynierskie i projektowanie materiałowe. WNT, Warszawa 2005.
3. Dobrzański L.A.: Metalowe materiały inżynierskie. WNT, Warszawa 2004.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Mirosław Czechowski, DSc (Eng), Assoc. Prof.	Department of Marine Maintenance
2. Other lecturers:	
Robert Starosta, DSc (Eng), Assoc. Prof.	Department of Marine Maintenance
Krzysztof Dudzik, DSc (Eng), Assoc. Prof.	Department of Marine Maintenance
Justyna Molenda, PhD (Eng)	Department of Marine Maintenance
Sylwia Bazychowska, MSc (Eng)	Department of Marine Maintenance
Patryk Krawulski, MSc (Eng)	Department of Marine Maintenance

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	21	Name of subject:	**FUNDAMENTALS OF MANUFACTURING ENGINEERING***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
I	2	2					30				
II	3	1		1			15		15		
III	2			4					60		
Total numbers of hours during study:							**120**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of secondary school.

Course objectives

1.	The The aim of the course is to provide basic knowledge and skills in the basics of manufacturing engineering, necessary for the safe operation of technical equipment of the ship.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	name and describe the basic methods of casting, plastic forming and welding	K_W03, K_W08
EP2	explain the phenomena occurring in the process of cutting	K_W01, K_W03
EP3	name and distinguish machining methods	K_U13
EP4	make a project technological process typical machine parts	K_W03, K_W08
EP5	perform basic locksmith, assembling, welding, select the necessary measuring instruments	K_W05, K_W09, K_U12, K_U14, K_U18
EP6	use literature in order to expand and clarify their knowledge	K_W03, K_W08, K_U17, K_K10
EP7	work in a team, understand the principles of cooperation	K_U01, K_U05

Course content:

Semester I

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	Introductive information. Manufacture, assembly, part, material, blank. Manufacturing processes, machining processes and assembly. Types of production. Technological means workstation. Technological operations and procedures. Technical and technological preparation of production.	2			EP4
2.	Casting. Classification methods and processes for producing castings. Gravity casting: disposable forms and reusable forms. Casting under pressure. Principles of design of castings. Casting defects.	6			EP1
3.	Plastic forming. The state of stress and strain. Plasticizing stress. Law and strain rates. The mechanism of plastic deformation. Loss of stability and consistency of the workpiece. Methods of forming. Rolling. Forging. Drawing. Extrusion. Stamping.	6			EP1
4.	Joining processes. Mechanism of joining. Classification of joining processes. Methods of electric welding (covered electrode, submerged arc, shielded gas). Welding: electroslag, thermite, electron, plasma and laser welding. Welding stresses and strains. Weldability of certain materials. Classification and general characteristics of welding. Resistance welding (spot, linear, hump, butt, linear butt). Welding: friction welding, crush welding, diffusion welding, ultrasonic welding, explosion welding, gas welding, exothermic welding, induction welding. General characteristics and classification of soldering methods. Gluing technology. *Gas welding and cutting.* (**8.10.7**) *Electric welding and cutting*. (**8.10.8**)	8			EP1
5.	The base of cutting. Cutting and machining conditions. Layout and cutting kinematics. Force power and heat cutting. Means and methods of machining. Construction and geometry of cutting edge. Create a chip. Wear of the cutting edge. Cooling lubricants. *Safe work rules on machine tools*. (**8.10.3**)	6			EP2, EP6
6.	Principles of design of manufacturing processes. Design of machine parts manufacturing processes. General recommendations. Technical documentation.	2			EP4, EP6
	Total numbers of hours during semester:	**30**			

Semester II

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Machining processing. Classification of means or methods machining. Turning. Drilling. Milling. Machine tools and machining. The quality of the machined surface. Principles of selecting machining conditions. *Lathes*. (**8.10.4**) *Drilling machines*. (**8.10.5**)	3		6	EP3
2.	Abrasive Machining. Classification of abrasive machining methods. General characteristics of grinding. Machine tools and abrasive machining. The quality of the machined surface. Principles of selecting machining conditions. *Grinding machines*. (**8.10.6**)	3		2	EP3
3.	Finishing treatment. General characteristics: honing, superfinishing, lapping and polishing. The quality of the machined surface. Principles of selecting machining conditions.	3			EP1, EP3
4.	Treatment of erosion. The genesis of erosive machining. Characteristics of treatment: EDM, electrochemical anodic - mechanical, streaming.	1			EP3, EP6
5.	Screw cutting. Cutting turning tool, screw tap, screwing die, diehead, milling cutters. Grinding threads.	1		2	EP3
6.	Cutting gear teeth. Profile milling and hobbing. Shaving and grinding of gear teeth.	2		2	EP3
7.	Basics of designing manufacturing processes. Design processes. Fundamentals of computer aided process planning (CAM – Computer Aided Manufacturing).	2		3	EP4, EP6
	Total numbers of hours during semester:	**15**		**30**	

Semester III

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	*Basic locksmithing operations: marking, cutting, sawing, sawing, scraping, grinding, lapping, sharpening, threading, principles of safe handling of hand tools..* **(8.10.22)**			4	EP5, EP7
2.	Power tools principles of operation: drills, saws, threading machines, grinders.			2	EP5
3.	Fundamentals of machining types of machining.			2	EP3, EP5
4.	Parameters of machining. Selection of parameters..			2	EP3, EP4
5.	*Turning machines: basic operations.* **(8.10.23)**			10	EP3, EP4
6.	*Drilling machines: basic operations*. **(8.10.24)**			2	EP3, EP4

7.	*Grinding machines: basic operations*. **(8.10.25)**			2	EP3, EP4
8.	Milling machines.			2	EP3, EP4
9.	Assembly methods and techniques. Basic assembly operations.			2	EP5, EP7
10.	*Welding and gas cutting:* *a) occupational health and safety and fire regulations in gas welding and cutting,* *b) properties of technical gases,* *c) storage and transportation of industrial gases,* *d) structure and types of flame,* *e) types and construction of welding and cutting torches,* *f) auxiliary materials for gas welding,* *g) practical operation of welding equipment,* *h) types of joints, welds and welding positions,* *i) preparation of material for welding and cutting,* *j) cutting (burning) of steel sheets, profiles and pipes,* *k) surfacing in sub-low and vertical positions,* *l) welding of butt joints in the sub-floor, wall and vertical positions,* *m) types of joints, welds and welding positions,* *n) preparation of material for welding and cutting,* *o) cutting (burning) of steel in the form of sheets, profiles and pipes,* *p) welding of butt joints in sub-lower, wall-mounted and vertical positions.* **(8.10.26)**			8	EP1, EP5, EP7
11.	*Electric welding and cutting:* *a) health, safety and fire regulations for welding and electric cutting,* *b) construction and principles of operation of electric welding and cutting equipment,* *c) auxiliary materials for electric welding,* *d) electrodes,* *e) technical gases (argon, CO2, mixtures),* *f) ceramic washers,* *g) practical operation of equipment for electric welding and cutting,* *h) types of joints, welds and welding positions,* *i) preparation of material for welding and cutting,* *j) bare wire and covered electrode surfacing,* *k) welding of T-joints in lateral and vertical positions,* *l) welding of butt joints prepared on "I", "V" and "Y" in sub-low and vertical positions,* *m) electric cutting of steel sheets, profiles and pipes.* **(8.10.27)**			8	EP1, EP5, EP7
12.	*Electrical workshop:* *a) processing of wire and cable terminations,* *b) disassembly, repair and installation of electric light fixtures,* *c) maintenance and repair of switchboards, electric motors, generators,* *d) disassembly, repair and installation of containerized l-phase and 3-phase contact outlets,* *e) disassembly, repair and installation of circuit breakers and branch sockets of various types,* *f) methods of laying cables..* **(8.11.26)**			8	EP5, EP7
13.	*Measurements of the electrical parameters:*			8	EP5, EP7

	a) voltage, *b) current,* *c) resistance,* *d) single-phase and three-phase power,* *e) state of insulation of the electric motor,* *f) state of insulation of the electrical network.* **(8.11.27)**				
	Total numbers of hours during semester:			**60**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x					
EP2				x					
EP3				x	x			x	
EP4					x			x	
EP5					x			x	
EP6					x			x	
EP7					x			x	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
I	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. Attended lectures. Lecture: pass test of the lecture.
II	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. Attended lectures. Lecture: pass test of the lecture. Laboratory: Execution and completion of all laboratory, according to the schedule. Final evaluation of the average score for the theoretical knowledge, the work in the laboratory, with the report. Grade for the student record book after successfully completing 2 forms of classes with an average grade from the grades received from the lecture and laboratory.
III	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. He completed and passed all laboratory classes in accordance with the study plan. Final grade: average of grades for theoretical knowledge, lab work, report.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	45	75		
Reading literature	15			
Preparing for laboratories, project classes		30		
Preparing for exam, pass test	20			

Developing project/report		10		
Participation in exam, pass test	3			
Consultation with teacher		5		
Total number of hours	83	120		
Number of ECTS credits	**3**	**4**		
Total number of ECTS credits for the subject	**7**			
Student's workload connected with practical classes	75 + 30 + 10 + 5 = 120 h 4 ECTS			
Student's workload connected with classes involving direct participation of teacher	45 + 3 + 75 + 5 = 128h 4 ECTS			

List of literature:

Required reading
1. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes and Systems, John Wiley & Sons Inc; 7th Edition, International Adaptation, 2021.
Recommended reading
1. Bartosiewicz, Józef., Manufacturing technology. Wyd. AM w Gdyni, Gdynia, 2002. 2. Rosłanowski, Jan., Workshop practice: issues welding and cutting materials. Wyd. AM w Gdyni, Gdynia, 2002. 3. Engineer's Guide. Casting. Warszawa: WNT 1986. 4. Erbel S., Kuczyński K., Marciniak Z., Plastic forming. Warszawa: PWN 1986. 5. Gourd L. M., Fundamentals welding technology. WNT, Warszawa 1997. 6. Górski E., Guide turner. WNT, Warszawa 2008.

Teacher:

Title/degree, name and surname	**University unit**
1. Supervisor:	
Tomasz Dyl, DSc (Eng), Assoc. Prof.	Department of Marine Maintenance
2. Other lecturers:	
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GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	22	Name of subject:	**THERMODYNAMICS***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
III	4	2	2				30	30			
IV	3	1		2			15		30		
Total numbers of hours during study:							**105**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the field of secondary school as well as mathematics and physics in the field of first degree studies.

Course objectives

1.	The aim of the course is to impart the basic knowledge and skills in thermodynamics necessary for the safe operation of industrial installations, machinery and equipment found inter alia, in marine power plant.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	list and apply the basic laws of thermodynamics (the zero law of thermodynamics, the first law of thermodynamics, the second law of thermodynamics); describe the properties and physical quantities	K_W01, K_W02, K_W06
EP2	describe basic thermodynamic processes (transformations); discuss thermodynamic thermal and refrigeration cycle (heat engine, refrigerator, heat pomp) – gas and steam cycle (Carnot, Otto, Diesel, Sabathe, Atkinson, Clausius-Rankine, Joul, Striling and Ericson, Linde, Brayton, jet engine, compressor, etc.)	K_W01, K_W02, K_W04, K_W06, K_U11, K_U13
EP3	discuss the basics of: heat transfer mechanisms and heat exchangers; characterise parallel flow and counter flow heat exchangers; calculation energy balance for heat exchanger	K_W01, K_W02, K_W04, K_W06, K_W09, K_U11
EP4	discuss the basics of: combustion processes, and the phenomena and processes (transformations) occurring in steam and moist gases	K_W01, K_W02, K_W04, K_W06, K_W09, K_U11

EP5	Characterise conventional and non-conventional energy sources and ways of using them	K_W01, K_W02, K_U01
EP6	select appropriate measuring apparatus and carry out basic thermal and flow measurements (measurement of: temperature, pressure, humidity, flow velocity, conduction coefficient, calorific value of fuel, exhaust gas composition, etc.)	K_W01, K_W02, K_U01, K_K07
EP7	use literature sources to interpret research results	K_U01
EP8	work in a group taking on different roles, understand the principles of cooperate in a group	K_K07

Course content:

Semester III

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	Basic concepts of thermodynamics such pressure, temperature, mass, energy, work, units. A thermodynamic system, parameters, thermodynamic equilibrium. **(8.2.1)**	3	2		EP1
2.	Ideal gas laws. Ideal gas, semi-perfect gas, real gas. Boyle's (Boyle-Mariotte) law, Gay-Lussac's law, Charles' law. Equation of state of ideal-gas (Clapeyron equation). Equations of state of real gas. **(8.2.3)**	3	4		EP1, EP2
3.	Specific heats. Enthalpy. Gas mixtures. Entropy. **(8.2.4)**	1	1		EP1
4.	The first law of thermodynamics. Moving boundary work (a mechanical work), flow work, useful work. Formulation of the first law of thermodynamics. **(8.2.5)**	3	3		EP1
5.	Thermodynamic processes (transformations). Isochoric process. Isothermal process. Isobaric process. Adiabatic process. Polytropic process. Isentropic process. Isenthalpic process. **(8.2.6)**	1	2		EP1, EP2
6.	The second law of thermodynamics. Formulations of the second law of thermodynamics. Thermodynamic cycles. The Carnot cycle. **(8.2.7)**	3	2		EP1, EP2
7.	Theoretical cycles of thermal engines. The Otto cycle. The Diesel cycle. The Sabathe cycle (air-standard dual cycle). Working cycle diagrams of single-stage and multi-stage compressors. Cycles used in turbojet engines and turbine sets. **(8.2.8)**	4	2		EP2
8.	Vapor thermodynamics. Vapor generation, unsaturated steam (wet), superheated steam, parameters of steam. **(8.2.9)**	2	2		EP1, EP2
9.	*P-v* and *i-p* diagrams for water. Temperature-Entropy (T-s) diagrams for water steam. Enthalpy-Entropy (i-s) diagrams for water steam. Throttling process of water steam. The Clausius-Rankine cycle. **(8.2.10)**	2	2		EP1, EP2
10.	Ways of increasing the energy conversion efficiency of the marine power plant.	1	1		EP2
11.	Refrigeration cycles. Energy balance for refrigeration cycles. **(8.2.11)**	2	1		EP2
12.	Energy transfer by heat. Heat transfer mechanisms: conduction, convection, radiation, heat transfer with phase change. An influence of fouling gathered on the surfaces on the heat transfer. Ways of the intensification heat transfer. **(8.2.14)**	3	2		EP3
13.	Heat exchangers – principle of operation. Energy balance calculation	1	4		EP3

	for heat exchanger. **(8.2.15)**				
14.	Moist gases. Parameters of moist air. The enthalpy of moist air. Most air i-x diagram. Isobaric processes (transformations) of moist air. **(8.2.12)**	1	2		EP1, EP4
	Total numbers of hours during semester:	**30**	30		

Semester IV

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Basics of parameter measurement in thermodynamic processes. **(8.2.2)**	4			EP1, EP6
2.	Heat exchangers. Types of heat exchangers. **(8.2.15)**	2			EP3
3.	Moist gases. (continued issues and supplementing the material). **(8.2.12)**	2			EP1, EP4
4.	Theoretical foundations of combustion processes. Types of combustion. Composition of exhaust gases. **(8.2.16)**	2			EP4
5.	Non-conventional energy sources: solar energy, geothermal energy, watercourses, biomass, wind energy, other forms of non-conventional energy (hydrogen fuel, waste heat, fuel cells, non-conventional engines, MHD generators and MGD heat pumps).	5			EP5
6.	The Bernoulli equation. Flow of fluids through components of power installations (pipes, nozzles, reducers, elbows, valves etc.) stratified and turbulent flow, Reynolds number, hydraulic resistance, characteristics of the hydraulic component, characteristics of the pipeline.	The issue is implemented in the subject of Fluid Mechanics **(8.2.13)**			
7.	Introduction to laboratory exercises, fundamental issues of thermal-flow processes: measured quantities, measuring methods and techniques, methods of presenting data from experiments.			2	EP6, EP8
8.	Manometer calibration by the comparison method.			2	EP6, EP7, EP8
9.	Thermometer calibration by the comparison method (thermocouple, resistance thermometer, pressure thermometer, a liquid expansion thermometer).			2	EP6, EP7, EP8
10.	Surface temperature measurement. Determination of mutual emissivity with a pyrometers.			2	EP6, EP7, EP8
11.	Study of characteristics of a Peltier module.			2	EP6, EP7, EP8
12.	Measurement of air humidity.			2	EP6, EP7, EP8
13.	Volume and mass flow rate measurement. Checking the constriction flow meter with a Prandtl tube.			2	EP6, EP7, EP8
14.	Checking the cup anemometer with a discharging nozzle.			2	EP6, EP7, EP8
15.	Determination of pressure losses in hydraulic pipeline system.			2	EP6, EP7, EP8
16.	Technical analysis of the exhaust gas.			2	EP6, EP7, EP8

17.	Study of heat loss of the shell and tube heat exchanger.			2	EP6, EP7, EP8
18.	Determination of the polytropic and the isentropic exponent when expanding air.			2	EP6, EP7, EP8
19.	Determination of heat of combustion/calorific value of fuel.			2	EP6, EP7, EP8
20.	Determination of the thermal conductivity with a single-plate Poensgen apparatus.			2	EP6, EP7, EP8
21.	Verification of acquired knowledge and skills related to issues thermal-flow measurement.			2	EP6, EP7, EP8
	Total numbers of hours during semester:	**15**		**30**	

Reference list of identification of the framework extended training course for operational and management level in engine department, in mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments, with the study program for first-cycle studies with a practical profile with major in Ship Propulsion Plant and Offshore Construction Operation of the Faculty of Mechanical Engineering of the Gdynia Maritime University.

No	The subject according to the framework extended training programme	Topic number	The subject according to the first degree studies program with a practical profile (ESOiOO) at UMG	Semester	Topic number
1.	Thermodynamics (8.2)	**13**	Fluid Mechanics	IV	9, 11, 12

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1	x			x					
EP2	x			x					
EP3	x			x					
EP4	x			x					
EP5	x			x					
EP6					x			x (Lab)	
EP7					x				
EP8								x (Lab)	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
III i IV	The student has achieved the expected learning outcomes and meets the requirements of the STCW Convention for successful completion of the course. Attended lectures, exercises and laboratories (absences must be made up). Passed the lecture (test) and exercises (2 passes test) and laboratory (reports). Final evaluation: the average of the marks for the lecture test and the pass mark for the exercises (thermodynamics I); the average of the marks for the lecture test and pass mark for the exercises and the pass mark for the laboratory reports (thermodynamics II). The final grade after successful completion of all forms of classes.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	75	30		
Reading literature	20	5		
Preparing for laboratories, project classes		10		
Preparing for exam, pass test	20	5		
Developing project/report		8		
Participation in exam, pass test	10			
Consultation with teacher	5	2		
Total number of hours	125	60		
Number of ECTS credits	**5**	**2**		
Total number of ECTS credits for the subject	**7**			
Student's workload connected with practical classes	30 + 5 + 10 + 5 + 8 + 2 = 60 h 2 ECTS			
Student's workload connected with classes involving direct participation of teacher	75 + 30 + 10 + 5 + 2 = 122 h 5 ECTS			

List of literature:

Required reading

1. Moran M.J., Shapiro H.N., Boettner D.D., Bailey M.B.: Principles of Engineering Thermodynamics: SI Version. Wiley 2015.
2. Look D.C., Sauer H.J.: Engineering thermodynamics. PWS Engineering, Boston 1986.
3. Szewczyk W.: Lectures in engineering thermodynamics. Selected problems. Wydawnictwo AGH, Kraków 2009.
4. Kreith F., Manglik R.M., Bohn M.S.: Principles of heat transfer. Centage Learning, Stamford 2003.

Recommended reading

1. Saggion A., Faraldo R., Pierno M., Thermodynamics. Fundamental principles and applications. Springer Nature Switzerland AG 2019.
2. Bejan A., Kraus A.D., Heat transfer handbook. Wiley 2023.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
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GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	23	Name of subject:	**FUNDAMENTALS OF ELECTROTECHNICS AND ELECTRONICS***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
I	3	2	1				30	15			
II	2			1					15		
Total numbers of hours during study:							**60**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the field of secondary school.

Course objectives

1.	The aim of the course is to impart the basic knowledge and skills in fundamentals of electrical and electronic engineering necessary for the safe operation of the ship's technical equipment.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	discuss basic concepts in electrical engineering and electronics	K_W02, K_U05
EP2	discuss the phenomena occurring in systems of coupled coils, give a practical example of such a system	K_U12, K_U013, K_K05
EP3	on the basis of a given diagram, select meters and measure basic electrical quantities and perform a theoretical analysis of the tested system	K_U01, K_U12, K_U22, K_K05
EP4	carry out research in a symmetrical and asymmetrical three-phase system	K_W04, K_U09

K_W02, K_U08; K_K05 – symbole efektów uczenia się dla kierunku (W-wiedza, U-umiejętności, K-kompetencje społeczne)

Course content:

Semester I

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*Basic concepts of electrical engineering:* *a) direct current,* **(8.11.1a)** *b) alternating,* **(8.11.1b)** *a) SI units.* **(8.11.1c)**	1			EP1
2.	Elements of the electrical circuit: *current sources and receivers* **(8.11.2)**, types of arrowing, meters. *Symbols used in electrical and electronic diagrams*. **(8.11.3e, 8.11.11e)**	1			EP1
3.	*Electric current circuits, basic laws:* *a) definition of electric current, types of current conduction, division of materials due to current conduction, conduction in semiconductors,* **(8.11.3a)** *b) Ohm's law, explanation of the terms: current, voltage, electromotive force, resistance, basic units, wire resistance, resistivity, conductivity of materials, heating effect of electric current, power of electric current,* **(8.11.3b)** *c) Kirchhoff's laws, equations of complex DC circuits, rules for writing equations, rules for using directional arrows, description of methods for calculating complex circuits: superposition theorem, Thevenin's theorem*, **(8.11.3c)** *d) electric field, electric field strength, displacement current, electrical capacitance, unit of capacitance, capacitors, circuit with capacitor and resistance, time constant of circuit with capacitance, energy of a charged capacitor, electric potential*. **(8.11.3d)**	5	3		EP1
4.	*Electromagnetism:* *a) magnetic field, image of the field, electric current field, Biot and Savart's law, Ampere's law, magnetic field strength, coil and wire field, right-hand corkscrew rule, mechanical influence of the magnetic field on the current, simple model of the electric motor, left-hand rule, magnetic induction, magnetic induction unit, other force field models, directional rules for current in a magnetic field*, **(8.11.4a)** *b) electromagnetic induction, emf of induction, magnetic flux, inductance of an electric circuit, unit of magnetic flux and inductance, directional rules of emf of induction, circuit with inductance, time constant of circuit with inductance, winding field energy, principle of operation of an electric generator, emf of a conductor in a magnetic field*, **(8.11.4b)** *c) magnetization of bodies, magnetic permeability, types of magnetic materials, ferromagnetism, characteristics of ferromagnetic magnetization, soft and hard magnetic materials, magnetic circuit, Ohm's law for a magnetic circuit, reluctance, magnetic forces in circuits*. **(8.11.4c)**	3	1		EP1
5.	*Single and three-phase sinusoidal current:* *a) single-phase sinusoidal alternating current, sinusoidal current parameters (average, rms, maximum value), analytical, graphical and symbolic representations of sinusoidal current,*	9	6		EP1

	phase shift of sinusoidal current and voltage, power of sinusoidal current, average power, **(8.11.5a)** *b) simple sine current circuits (RL, RC, RLC) in time representation, reactance, impedance, admittance, phase shift, Ohm's law for simple circuits, series and parallel resonance*, **(8.11.5b)** *c) equations of sinusoidal current circuits in vector (phasor) representation - symbolic method, complex sinusoidal current circuits, vector power of sinusoidal current, active, reactive and apparent power, interpretation of power*. **(8.11.5c)**				
6.	*Single- and three-phase sinusoidal current cont.:* *a) three-phase sinusoidal currents, vector representation of three-phase currents and voltages, quantitative relations in a three-phase system, associating sources and receivers in Δ/Y systems, symmetry or asymmetry of three-phase systems, powers in three-phase systems, power in a 3- and 4-wire system*. **(8.11.5d)** Phase sequence indicator.	4	2		EP4
7.	*Basics of electronics:* *a) selected low-power semiconductor devices, p-n contact barrier, diode, bipolar transistor, field effect transistor, basic optoelectronic components, LED diode, optocoupler, liquid crystal components*, **(8.11.11a)** *b) basic power electronic semiconductors, high power diode, classic thyristor (SCR), high power bipolar transistor, IGBT voltage gate transistor, GTO thyristor, MCT thyristor*. **(8.11.11b)**	4			EP2
8.	Selected circuits, methods of analysis and application of electronic components*, introduction to digital circuits*: **(8.11.11c)** a) methods of analysis of circuits with non-linear elements, b) uncontrolled and controlled bridges, operational amplifiers, gates.	3	3		EP1
	Total numbers of hours during semester:	**30**	**15**		

Semester II

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	*Measurements of electrical quantities:* *a) analog and digital measuring instruments:* − *operating principle,* − *classification,* − *application,* − *accuracy,* − *markings*, **(8.11.9a)** *b) measurement methods and systems*, **(8.11.9b)** *c) construction and operation of magnetoelectric indicating meters, electromagnetic, dynamic, inductive, thermal, resonant gauges*, **(8.11.9c)** *d) A/D conversion, digital multimeters:* − *measurements of direct and alternating currents and voltages, measurement ranges, single-phase and three-phase power measurements, alternating current energy measurement, electricity quality,* − *resistance measurements of various quantities and methods, bridge methods, technical methods,*			10	EP3

	− *measurement of inductance and capacitance,* − *measurements of non-electrical quantities,* − *tests and calibration of measuring sensors*, **(8.11.9d)** *e) measurements and recording of time-varying waveforms, oscilloscope and computer methods*, **(8.11.9e)** *f) measurement interfaces, computer measurement systems*, **(8.11.9f)** *g) principles of constructing electrical and electronic circuits*, **(8.11.3f, 8.11.11f)** *h) iinterpretation of electrical and electronic circuit diagrams*. **(8.11.3g, 11g, 31, 32)**				
2.	*Electronic and power electronic components and systems, service and replacement:* *a) semiconductor components*, **(8.11.12a)** *b) diode,* **(8.11.12b)** *c) transistors*, **(8.11.12c)** *d) thyristors*, **(8.11.12d)** *e) power transistors,* **(8.11.12e)** *f) resistors,* **(8.11.12f)** *g) capacitors,* **(8.11.12g)** *h) selected electronics systems*. **(8.11.11d)**			5	EP3
Total numbers of hours during semester:		**15**		**30**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x					
EP2				x					
EP3					x				
EP4				x					

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
I	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. Attended lectures (3 absences allowed). **Exercise**: credit on the basis of points obtained in 3 colloquia (60% of the total points pass classes and lecture) **Lecture**: credit on the basis of a colloquium.
II	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. He attended the laboratory. **Laboratory**: Performing and passing all laboratory exercises according to the schedule. The final grade is the average of the grades for theoretical knowledge, laboratory work, and reports. Grade to the index after passing 2 tests.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	45	15		
Reading literature	15			
Preparing for laboratories, project classes		15		
Preparing for exam, pass test	20			
Developing project/report		15		
Participation in exam, pass test	4			
Consultation with teacher				
Total number of hours	84	45		
Number of ECTS credits	**3**	**2**		
Total number of ECTS credits for the subject	**5**			
Student's workload connected with practical classes	15 + 15 + 15 = 45 h 2 ECTS			
Student's workload connected with classes involving direct participation of teacher	45 + 15 + 4 = 64 h 3 ECTS			

List of literature:

Required reading
1. Matulewicz W.: Elektrotechnika i Elektronika dla mechaników. Wydawnictwo Politechniki Gdańskiej, Warszawa 2010.
Recommended reading
1. Przeździecki F.: Elektrotechnika i Elektronika. PWN, Warszawa 1978.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Damian Hallmann, PdD (Eng) – 1st sem.	Department of Marine Electrical Power Engineering

Tomasz Nowak, PdD (Eng) – 2nd sem.	Department of Marine Electrical Power Engineering
2. Other lecturers:	
Marcin Pepliński, PhD (Eng)	Department of Marine Electrical Power Engineering
Andrzej Piłat, PhD (Eng)	Department of Marine Electrical Power Engineering

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	24	Name of subject:	**FUNDAMENTALS OF CONTROL ENGINEERING AND ROBOTICS***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
IV E	3	2		1			30		15		
Total numbers of hours during study:							**45**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the field of mathematics, physics and engineering mechanics in the field of first-cycle studies.
2.	Knowledge and skills in the field of thermodynamics, fluid mechanics and electrical engineering and electronics in the field of first-cycle studies.

Course objectives

1.	The purpose of subject is to convey basic knowledge and skills in automation, necessary for the safe operation of ship systems on board.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	present the basic concepts used in automation i.e.: signal, element, object, static characteristic & dynamic characteristic, spectral characteristic, Laplace transform, transfer function and spectral transfer function	K_W02, K_W04
EP2	characterize the basic elements of the control system i.e.: object, regulator, signal converter, control element and to characterize the regulation signals, i.e. setpoint value, interference and response, highlights the main loop and feedback loop in the control system	K_W02, K_W04
EP3	describe the continuous operation of the PID, the transfer function and the parameters, draws a step characteristic, Nyquist and Bode characteristic.	K_W02, K_W04
EP4	adjust the setting of the PID controller to the control system, e.g. the Ziegler and Nicholsa method or method of a known object	K_W04, K_U05, K_U08, K_U09,

		K_U13, K_U15, K_U17, K_U21
EP5	recognize the type of control used in the example	K_W04, K_U09, K_U13, K_U15,
EP6	present the characteristics of the good response and the quality indicator, improves the indicated adjustment quality indicator for adjuster setting	K_W09, K_U08, K_U09, K_U13, K_U15, K_U17, K_U21
EP7	analyze the specified adjustment arrangement for response and the solution applied	K_U01, K_U05, K_U13, K_U15, K_U18, K_K03
EP8	develop knowledge, work in a group and accept different roles, apply the cooperation rules	K_U01, K_U13, K_U15, K_K01, K_K05, K_K06, K_K07

K_W02, K_U08; K_K05 – symbole efektów uczenia się dla kierunku (W-wiedza, U-umiejętności, K-kompetencje społeczne)

Course content:

Semester IV

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*Structure of feedback loop system and control systems, basic members and components.* **(8.12.1)**	2			EP1, EP2
2.	*Measuring transducers used in control systems.* **(8.12.2)**	2			EP1, EP2
3.	*Signal transmissions.* **(8.12.3)**	2			EP1, EP2
4.	*Basic components of control system and characteristics:* *a) proportional members and their examples,* *b) inertial members – first order system and their examples,* *c) oscillating members – second order system and examples,* *d) differential & integral members and their examples,* e) *static and dynamic characteristics.* **(8.12.4)**	10			EP1, EP2, EP3
5.	*Controllers type PID – functions performed, selection of settings.* **(8.12.5)**	2			EP4, EP5, EP6
6.	*Actuator, control valve and positioner.* **(8.12.6)**	2			EP1, EP2
7.	*Digital control systems and control of their operation (testing).* **(8.12.12)**	4			EP1, EP2, EP7
8.	*Digital control alarm systems and control of their operation (testing).* **(8.12.13)**	4			EP7
9.	*PLC controllers used in marine systems*. **(8.12.14)**	2			EP7
10.	Construction and testing of pneumatic control systems.			2	EP1, EP2
11.	Construction and testing of hydraulic control systems.			1	EP1, EP2
12.	Examination the dynamics characteristic of basic control components.			2	EP1, EP2
13.	*Measuring transducers used in control systems*. **(8.12.16)** Testing characteristic of measuring transducers.			2	EP1, EP2
14.	*Examination the characteristics of the actuators with positioner.* **(8.12.18)**			2	EP1, EP2

15.	Examination of the pneumatic characteristics of the PID controller			2	EP3
16.	*Controller type PID – selection of the settings.* **(8.12.17)**			2	EP4, EP6, EP7, EP8
17.	Parameters identification of control objects			1	EP4, EP6, EP7, EP8
18.	Construction of control systems with PLC controller.			1	EP4, EP6, EP7, EP8
	Total numbers of hours during semester:	**30**		**15**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1			x	x	x			x (Lab)	
EP2			x	x	x			x (Lab)	
EP3			x	x	x			x (Lab)	
EP4			x	x	x			x (Lab)	
EP5			x	x	x			x (Lab)	
EP6			x	x	x			x (Lab)	
EP7			x	x	x			x (Lab)	
EP8			x	x	x			x (Lab)	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
IV	The student gained the assumed effects of learning and meets the requirements of the STCW Convention on the passing of the subject. He attended lectures (admissible – 1 absence). He attended all laboratory exercises. **Laboratory**: Practical execution, report and individual evaluation of all laboratory exercises, according to the schedule. Final assessment of average evaluations from work in the laboratory and from the reports. **Lecture**: two colloquium, a laboratory exercise and a written exam. Final assessment: average 25% colloquium, 35% laboratory exercises and 40% written exam.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	30	15		
Reading literature	10			
Preparing for laboratories, project classes		5		
Preparing for exam, pass test	10			
Developing project/report		5		
Participation in exam, pass test	2			

Consultation with teacher	2	5		
Total number of hours	54			
Number of ECTS credits	**2**	**1**		
Total number of ECTS credits for the subject	**3**			
Student's workload connected with practical classes	15 + 5 + 5 + 5 = 30 h 1 ECTS			
Student's workload connected with classes involving direct participation of teacher	30 + 15 + 2 + 2 + 5 = 54 h 2 ECTS			

List of literature:

Required reading

1. Kaczorek T., Dzielinski A., Dabrowski W., Łopatka R.: Podstawy teorii sterowania. MIKOM Warszawa 2006.
2. Żelazny M.: Podstawy automatyki. PWN Warszawa 1976.
3. Amborski K., Marusak A.: Teoria sterowania w ćwiczeniach. Wydawnictwo PWN 1978.
4. Findeisen W.: Technika regulacji automatycznej. Państwowe Wydawnictwo Naukowe 1969.
5. Holejko D., Kościelny W., Niewczas W.: Zbiór zadań z podstaw automatyki. Wydawnictwa Politechniki Warszawskiej 1985.
6. Kowal J.: Podstawy automatyki, tom I i II. Uczelniane Wydawnictwa Naukowo –Dydaktyczne Akademii Górniczo – Hutniczej w Krakowie 2004.
7. Jędrzykiewicz Z.: Teoria sterowania układów jednowymiarowych. Kraków UWND AGH 2002.

Recommended reading

1. Kaczorek T.: Teoria sterowania i systemów. PWN Warszawa 1999.
2. Kaczorek T.: Teoria układów regulacji automatycznej. WNT Warszawa 1974.
3. Próchnicki W., Dzida M.: Zbiór zadań z podstaw automatyki. Wydawnictwo Politechniki Gdańskiej1993.
4. Praca zbiorowa: Zbiór zadań z podstaw automatyki. WPW Warszawa 1985.
5. Amborski K.: Teoria sterowania, podręcznik programowany. PWN Warszawa 1985.
6. Pełczewski W.: Teoria sterowania, ciągłe stacjonarne układy liniowe. Warszawa 1980.
7. Skrzywan-Kosek A., Świerniak A., Baron K., Latarnik M.: Zbiór zadań z teorii liniowych układów regulacji. Wydanie IV. Wydawnictwo Politechniki Śląskiej 1999.
8. Markowski A., Kostro J., Lewandowski A.: Automatyka w pytaniach i odpowiedziach. Wydawnictwa Naukowo-Techniczne Warszawa.
9. Mazurek J., Vogt H., Żydanowicz W.: Podstawy Automatyki. Oficyna wydawnicza PW Warszawa 1996.
10. Nowakowski J.: Podstawy automatyki, tom I. Wydawnictwo Politechniki Gdańskiej 1985.
11. Węgrzyn S.: Podstawy automatyki. PWN Warszawa 1976.
12. Węsierski Ł., Maślanka T.: Zbiór zadań z przełączających układów automatyki. Kraków, Wyd. AGH 1980.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Andrzej Mielewczyk, PdD (Eng) Assoc. Prof.	Department of Engineering Sciences
2. Other lecturers:	
Hoang Nguyen, DSc (Eng) Assoc. Prof.	Department of Engineering Sciences
Norbert Abramczyk, Msc (Eng)	Department of Engineering Sciences

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	25	Name of subject:	METROLOGY AND MEASUREMENT SYSTEMS*
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
III	3	1		2			15		30		
Total numbers of hours during study:							45				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge of the nomenclature of technical elements and manual skills to safely operate workstations.

Course objectives

1.	The purpose of subject is to transfer of basic knowledge on the use of measurement technology for the assessment of operating conditions and the technical condition of ship equipment.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	name the basic SI units and their etalons; discuss the transfer of units of measurement from etalons to measurement tools; save measurement results and their multiples	K_W01, K_W09
EP2	make measurements with a measuring tool; choose measurement methods for metrological tasks; use metrological nomenclature	K_W04, K_W05, K_U08, K_U09
EP3	describe the construction of measurement tools and the processing of input to output; state the correctness of the condition of measuring tools	K_W02, K_U15
EP4	determine the parameters of the geometric structure of the surface (deviations of shape, position, surface roughness parameters) and measurement uncertainties (standard and extended, save the measurement result)	K_U12, K_U16, K_W08
EP5	use literature sources and apply technical norms and standards related to the use of measuring tools	K_W09, K_U01, K_U05, K_U07
EP6	work in a team with understanding of the rules of cooperation and health and safety in laboratory rooms	K_K04, K_K05

Course content:

Semester III

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	The role of measurements in the operation and diagnostics of technical systems. Placement of the Metrology and measurement systems under the STCW Convention requirements". Measurement information and its presentation. The system of SI units and their etalons. Transfer of standard values to measurement tools.	2			EP1, EP5
2.	Accuracy of measurement and its representation. Determination of the standard and extended uncertainty of measurement. Reference conditions and their influence on the measurement. *Fundamentals of workshop metrology:* *a) methods for measuring linear and angular dimensions with universal equipment.* **(8.10.2c)**.	4			EP1 EP2, EP4
3.	Metrological characteristics of measuring tools. Division of measuring tools and their structure: a) *measurement standards - types of standards and their application,* **(8.10.2e)** *b) measuring tools used in repairs of machines and devices and their purpose,* **(8.10.2a)** *c) rules for using measuring tools,* **(8.10.2b)** *d) control tools (standards),* **(8.10.2f)** e) measuring transducers, f) measuring systems.	4		2	EP1, EP2, EP3
4.	Analog and digital measurements. Basics of processing and measuring the parameters of measurement signals.	2		4	EP1, EP2, EP5
5.	Measurements of selected non-electrical values: a) temperature, b) pressure, c) geometrical dimensions: *external and internal dimensions,* **(8.10.2d)** d) flow level and parameters, e) stresses and moments.	3		2	EP2, EP6
6.	The geometric structure of the surface and its components: a) shape deviations, b) waviness deviations, c) surface roughness.			2	EP2, EP3, EP4, EP6
7.	*Direct measurements of dimensions:* *a) external,* **(8.10.2d)** *b) internal,* **(8.10.2d)** c) mixed.			4	EP2, EP5, EP6
8.	Measurements by methods: a) differential, b) optical, c) indirect.			6	EP2, EP4, EP5, EP6
9.	Measurements of complex shapes: a) threads, b) *gears*. **(8.10.2g)**			2	EP2, EP6
10.	Measurements of reference conditions for measurements:			2	EP2, EP6

	a) temperature, b) humidity, c) pressure.				
11.	*Controlling the straightness, flatness and perpendicularity of planes.* **(8.10.20)**			2	EP2, EP6
12.	Controlling the concentricity, perpendicularity and parallelism of the hole axes.			2	EP2, EP6
13.	Parameters measurements of the signals.			2	EP2, EP6
		15		**30**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x					
EP2								x	
EP3					x			x	
EP4				x	x			x	
EP5								x	
EP6								x	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
III	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. He attended lectures and the laboratory. **Laboratory**: The student performed and passed all exercises on the basis of measurement cards according to the schedule, in accordance with the study plan. **Lecture**: Colloquium of the lecture. The final note is the average of the grades for theoretical knowledge, colloquium, laboratory work and measurement cards.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	15	30		
Reading literature	5	5		
Preparing for laboratories, project classes		10		
Preparing for exam, pass test	5	5		
Developing project/report		8		
Participation in exam, pass test	2			
Consultation with teacher		2		
Total number of hours	27	60		

Number of ECTS credits	1	2		
Total number of ECTS credits for the subject	**3**			
Student's workload connected with practical classes	30+5+10+5+8+2=60h 2 ECTS			
Student's workload connected with classes involving direct participation of teacher	15+5+30+2=52h 2 ECTS			

List of literature:

Required reading
1. Sydenham P.H.; Thorn R. (Eds.) Handbook of Measurement Science. Vol. 1 Theoretical Fundamentals, A Wiley – Interscience Publication; John Wiley and Sons Ltd.: Hoboken, NJ, USA, 1991. 2. Sydenham P.H.; Thorn R. (Eds.) Handbook of Measurement Science. Vol. 2 Practical Fundamentals, A Wiley – Interscience Publication; John Wiley and Sons Ltd.: Hoboken, NJ, USA, 1991. 3. Morris A.S.: Measurement & Instrumentation Principles, BH, Oxford, 2001. 4. Tumański S., Principles of Electrical Measurement, Series in Sensors, Taylor & Francis, New York – London 2006. 5. H. Wayne Beaty, Donald G. Fink: Standard Handbook for Electrical Engineers, Sixteenth Edition, 2013, The McGraw-Hill Companies, Inc. 6. Nawrocki W.: Measurement Systems and Sensors, 2005 ARTECH HOUSE, INC. 685 Canton Street Norwood, MA 02062 7. Raghavendra N. V., Krishnamurthy L.: Engineering Metrology and Measurements. Oxford 2013 8. Pfeifer T.: Production Metrology. Munich 2002 9. Smith G. T.: Industrial Metrology. Surface and Roundness. Springer 2013
Recommended reading
1. JCGM (Joint Committee for Guides in Metrology), International Vocabulary of Metrology – Basic and General Concepts and Associated Terms (VIM); BIMP: Saint-Cloud, France, 2008 [Google Scholar]. 2. JCGM, Guide to the Expression of Uncertainty in Measurement, BIMP: Saint-Cloud; France, 2008 and further completions. 3. European Accreditation EA-4/02 rev. 03: Evaluation of the uncertainty of Measurement in calibration, April 2022, https://www.accredia.it/en/documento/ea-4-02-rev-03-evaluation-of-the-uncertainty-of-measurement-in-calibration/ 4. Mindykowski J., Assessment of Electric Power Quality in Ships Fitted with Converter Subsystems, Chapter 4: Requirements for measurement and control instruments of ship power plant in the light of the rules of classification societies, Chapter 5: Measurement instrumentation of ship electric power plant, Shipbuilding&Shipping Gdański, Poland, 2004. 5. https://www.mitutoyo.co.uk/education

Teacher:

Title/degree, name and surname	**University unit**
1. Supervisor:	
Janusz Mindykowski, DSc (Eng) Assoc. Prof.	Department of Marine Electrical Power Engineering
2. Other lecturers:	
Robert Starosta, DSc (Eng) Assoc. Prof.	Department of Marine Maintenance
Krzysztof Dudzik, DSc (Eng) Assoc. Prof.	Department of Marine Maintenance
Wojciech Labuda, PhD (Eng)	Department of Marine Maintenance
Sylwia Bazychowska, MSc (Eng)	Department of Marine Maintenance
Patryk Krawulski, MSc (Eng)	Department of Marine Maintenance

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GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	26	Name of subject:	**MARINE ENVIRONMENTAL PROTECTION***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
I E	2	1,7					25				
Total numbers of hours during study:							**25**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of secondary school.

Course objectives

1.	The aim of the course is to provide basic knowledge in the field of environmental protection, MARPOL and Helsinki conventions, global and local environmental threats.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	give basic definitions and concepts of ecology.	K_W10
EP2	define the principles of safe operation of equipment and engine room regarding the removal of pollutants from the ship.	K_W09
EP3	process information regarding the safe operation of engine room equipment related to the removal of pollutants from the ship.	K_U07
EP4	list the conditions for the use of technical measures to prevent environmental pollution.	K_U16
EP5	apply the standards of Polish law on environmental protection.	K_W11
EP6	make decisions about ethical and financial implications.	K_K03

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester I

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*Definitions and basic concepts of ecology.* **(8.13.1).**	1			EP1
2.	*The role of water transport in the economy in global and regional terms, transport as a source of environmental pollution emissions.* **(8.13.2).**	2			EP1
3.	*Ship as a source of pollution, types and amounts of operational pollution from ships:* *a) exhaust gases,* *b) sanitary sewage,* *c) bilge waters,* *d) operating fluids: fuels, lubricants, cleaning agents, maintenance agents, etc.,* *e) garbage,* f) *ballast water*. **(8.13.3).**	6			EP1, EP2, EP4
4.	*Impact of operational pollution on the environment.* **(8.13.4).**	1			EP 1
5.	*International and local environmental regulations in ship operation.* **(8.13.5).**	2			EP1
6.	*Methods and means of preventing environmental pollution by the ship:* *a) exhaust gases (flue gas) control,* *b) sanitary sewage treatment plants,* *c) bilge water oil separators,* *d) inspection of operating fluid waste,* *e) garbage incinerators,* *f) control of ballast water,* g) *other*. **(8.13.6).**	6			EP1, EP2, EP4
7.	*Conditions for the use of technical measures to prevent environmental pollution.* **(8.13.7).**	2			EP1, EP2
8.	*Types of documentation and responsibility for documentation supervision.* **(8.13.8).**	1			EP3
9.	*Types and principles of inspections in the field of environmental protection regulations.* **(8.13.9).**	1			EP3
10.	*Legal aspects of liability for environmental pollution in ship operation.* **(8.13.10).**	2			EP5
11.	*The role of crew members in proactive prevention activities marine pollution.* **(8.13.11).**	1			EP6
		25			

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1		x		x					
EP2		x		x					
EP3		x		x					
EP4		x		x					
EP5		x		x					
EP6		x		x					

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
I E	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. Attended lectures (1 absence allowed). Lecture: passing the lecture test. Written exam.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	25			
Reading literature	15			
Preparing for laboratories, project classes				
Preparing for exam, pass test	10			
Developing project/report				
Participation in exam, pass test	3			
Consultation with teacher	5			
Total number of hours	58			
Number of ECTS credits	**2**			
Total number of ECTS credits for the subject	**2**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	25+3+5= 33h 1 ECTS			

List of literature:

Required reading
1. MARPOL 73/78 Convention with later amendments. 2. Helsinki Convention with later amendments. 3. International Maritime Organization. Marine Environment Protection Committee publications. 4. www.imo.org.
Recommended reading
1. European Maritime Safety Agency publications.

2. Scientific articles on environmental protection.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Jerzy Herdzik, DSc (Eng) Assoc. Prof.	Department of Marine Propulsion Plants
2. Other lecturers:	

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GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	27	Name of subject:	**REPAIR ENGINEERING***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
V E	2	2					30				
VII	2	1				0,7	15				10
VIII	3	1		2		15	15		30		
Total numbers of hours during study:							**25**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of secondary school.

Course objectives

1.	The aim of the course is to provide basic knowledge in the field of repair engineering of ship machinery and equipment as well as hull equipment and its safe implementation.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	describe the construction and operation of basic disassembly and assembly tools and the principles of their use	K_W02, K_W08
EP2	characterize disassembly as a technological phase of the repair process and dismantle ship machinery	K_W07, K_K02
EP3	regenerate the surfaces of ship machinery elements using plastic adhesive composites	K_W02, K_W03, K_W05
EP4	apply protective plastic coatings to metal surfaces and list the types of paint materials	K_U08, K_U09, K_U12, K_U13, K_U18
EP5	carry out periodical surveys of the marine engine and other marine machinery for confirmation or renewal of class survey	K_W09, K_U21
EP6	remove malfunctions of fittings and leaks in the ship's installation	K_U01 K_U05

EP7	work in a group assuming different roles in it, apply the principles of cooperation	K_K05
EP8	manage spare parts and materials and list the principles of anti-corrosion protection of metals, indicate their applications	K_W02, K_W06
EP9	list the principles of welding, especially in the argon shield, cutting metals, is able to select the welding or cutting parameters for the material	K_W04, K_U11 K_U15

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester V

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*General work safety rules during repairs and overhauls of machinery and equipment in the ship's engine room.* **(8.10.1)**	1			EP1
2.	*Types of tools used in the disassembly and assembly of devices.* **(8.10.10)**	2			EP1
3.	*Phases of the technological process and phases of renovation.* **(8.10.11)**	2			EP1, EP2
4.	*Rules for dismantling devices, subassemblies and elements in the engine room:* *a) methods of removing impurities,* *b) replacement of elements and subassemblies,* *c) principles of assembly and leaking testing.* **(8.10.12)**	8			EP2
5.	*Safety rules in disassembly and assembly works.* **(8.10.13)**	1			EP2
6.	*Regeneration of machine and device elements:* *a) by surfacing,* *b) using epoxy resins,* *c) using plastics,* *d) using composites.* **(8.10.14)**	8			EP3, EP4
7.	Installation of rotors and control of their assembly. Installation of rolling bearings.	3			EP2
8.	Installation of multi-support shafts: checking the alignment of bearing holes, mounting sliding bearings, measuring clearances.	4			EP2
9.	Installation of movement seals.	1			EP2
		30			

Semester VII

No	Content description	No of hours			Reference to EP of the subject
		W	C	S	
1.	Phases of the technological process of repairing ship equipment.	1			EP1
2.	Diagnostics of machines and devices using modern NDT methods: thermography, acoustic emission, ultrasonic testing, etc.	1			EP5, EP6
3.	*The technology of overhaul of marine internal combustion piston engines:* *a) preparation and organization of engine overhaul,* *b) measurements before starting disassembly,*	6		3	EP4, EP5, EP6, EP7

	d) disassembly of basic engine assemblies, *e) verification and repair of engine components,* *f) engine tests after overhaul.* **(8.10.15)**				
4.	*Turbocharger repair technology.* **(8.10.16)**	3		2	EP4
5.	*Technology of repair of machines and auxiliary devices:* *a) pumps,* *b) compressors,* *c) fans,* *d) filters,* *e) heat exchangers,* *f) centrifuges,* *g) hydraulic devices,* *h) marine environment protection devices.* **(8.10.17)**	4		3	EP4, EP6, EP7
6.	Presentation of materials collected during sea practice in accordance with the Practice Book. Discussion and conclusions.			2	EP1, EP5, EP6
		15		**10**	

Semester VIII

No	Content description	No of hours			Reference to EP of the subject
		W	C	S	
1.	*Overhauls and acceptances:* *a) hulls,* *b) tanks,* *c) boilers and pressure vessels,* *d) gears,* *e) lines of shafts and propellers,* *f) on-board equipment,* *g) marine environment protection devices,* h) *automation and control devices.* **(8.10.18)**	2			EP5, EP6, EP7
2.	*Technology of repairs of pipelines and marine fittings:* *a) pipe cutting,* *b) pipe threading,* *c) temporary removal of pipe leaks,* *d) plugging sections of pipelines with flange connections,* *e) disassembly of pipes,* *f) making new sections of pipes with flanges (straight and profiled), fitting flanges,* g) *valve repair.* **(8.10.9, 8.10.28)**	2		2	EP3, EP4
3.	*Ship repair management. Aging processes of the ship's hull and equipment:* *a) organization of ship repairs (types of repairs: class, annual, emergency, other),* *b) planning inspections and repairs,* c) *management of spare parts.* **(8.10.19)**	2			EP1, EP6, EP8, EP9
4.	*Implementation of cylindrical press joints (by pressing, heating, cooling). Implementation of conical push-fit connections (by pressing, hydraulic expansion of the hub, heating, cooling). Assembly inspection. Repairs by inserting elements: bushing, pinning, sewing.* **(8.10.37)** *Implementation of screw connections: control of the position of the screws, control of preload.* **(8/10/38)** *Implementation of wedge and groove connections.* **(8.10.39)**	2		4	EP4, EP7
5.	*Basic disassembly and assembly operations with the use of hand tools, with electric, hydraulic and pneumatic drives.* **(8.10.29)**			1	EP3, EP4

6.	*Installation of rotors and control of their assembly. Installation of rolling bearings.* **(8.10.40)** *Installation of multi-support shafts: checking the alignment of bearing holes, mounting slide bearings, measuring clearances.* **(8/10/41)** *Installation of pipe seals.* **(8.10.43)**			1	EP3, EP4
7.	*Installation of multi-support shafts: checking the position of the smooth and cranked shaft (measurement of deflection and checking the clearance in main bearings of the shaft).* **(8.10.42)**	2		2	EP2, EP4
8.	*Installation of piston-crank systems.* **(8.10.44)**	2		2	EP2, EP4
9.	*Assembly of the timing system.* **(8.10.45)**	1		2	EP2, EP4
10.	*The coaxial setting of the shafts of the unit. Assembling the machine on the foundation.* **(8.10.46)**	1		2	EP2, EP4
11.	*Checking the alignment of shaft lines.* **(8.10.47)**	1		2	EP2, EP4
12.	*Repairs with the use of adhesives and chemically cured masses.* **(8.10.48)**			2	EP2, EP4
13.	*Measurements of shaft shape deviations (including crankshaft pins)* **(8.10.30)**			2	EP2, EP4
14.	*Measurements of deviations in the shape of holes (cylinder sleeves, holes of bearing shells).* **(8.10.31)** *Measurements of position deviations (piston, connecting rod, crankshaft, etc.).* **(8.10.32)**			2	EP2, EP4
15.	*Fuel centrifuge:* *a) disassembly of the centrifuge drum, assessment of the technical condition of the components,* *b) assembly of the centrifuge drum,* c) *checking the correctness of assembly.* **(8.6.23)**			2	EP2, EP4
16.	*Detection of material macrostructure discontinuities by penetration methods.* **(8.10.33)** *Detection of discontinuities in the material's macrostructure using magnetic particle methods.* **(8.10.34)**			2	EP2, EP4
17.	*Detection of discontinuities in the material's macrostructure using ultrasonic methods.* **(8.10.35)** Testing of machine elements using the acoustic emission method. *Leak testing.* **(8.10.36)**			2	EP2, EP4
		15		**30**	

Reference list of identification of the framework extended training course for operational and management level in engine department, in mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments, with the study program for first-cycle studies with a practical profile with major in Ship Propulsion Plant and Offshore Construction Operation of the Faculty of Mechanical Engineering of the Gdynia Maritime University.

No	Subject according to the framework extended training program	Subject No	Subject according to the program of first-degree studies with a practical profile (ESOiOO) at the GMU	Sem.	Subject No
1.	Repair Engineering (8.10)	**2**	Metrology and measurement systems	III	2,3,5,7,9
2.	Repair Engineering (8.10)	**3**	Fundamentals of manufacturing engineering	I	5

3.	Repair Engineering (8.10)	**4-6**	Fundamentals of manufacturing engineering	II	1,2
4.	Repair Engineering (8.10)	**7,8**	Fundamentals of manufacturing engineering	I	4
5.	Repair Engineering (8.10)	**20,21**	Metrology and measurement systems	III	11,12
6.	Repair Engineering (8.10)	**22,23-25, 26,27**	Fundamentals of manufacturing engineering	III	1,5-7, 10,11

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1		x		x			x		
EP2		x		x					
EP3		x		x					
EP4		x		x	x		x	x	
EP5		x		x	x		x		
EP6					x		x	x	
EP7					x		x	x	
EP8				x					
EP9				x				x	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
V E	Student achieved the expected learning outcomes and meets the STCW Convention requirements relating to completing the course. Attended lectures (limit - 3 absences). **Lecture**: method of assessment - exam of the lecture.
VII	Student achieved the expected learning outcomes and meets the STCW Convention requirements relating to completing the course. Attended lectures and laboratories. **Lecture**: written and oral. **Laboratories**: Execution and completion of all laboratory, according to the schedule. Final evaluation of the average score for the theoretical knowledge, laboratory work and reports. Evaluation index after successfully completing the two forms of activity with the assessment of the average grades received lecture and laboratory.
VIII	Student achieved the expected learning outcomes. Performed and passed all laboratory classes, according to the plan of study. Final evaluation of the average score for the theoretical knowledge, the work in the laboratory, the reports.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	60	30		10
Reading literature	15			
Preparing for laboratories, project classes		15		30

Preparing for exam, pass test	20			
Developing project/report		10		
Participation in exam, pass test	3			
Consultation with teacher		5		
Total number of hours	98	60		40
Number of ECTS credits	**3**	**2**		**2**
Total number of ECTS credits for the subject	**7**			
Student's workload connected with practical classes	30+15+10+5 = 60h 2 ECTS			
Student's workload connected with classes involving direct participation of teacher	60+30+10+3+5 = 108h 4 ECTS			

List of literature:

Required reading
1. Vekataraman K.: Maintenance engineering and management. PHI Learning Private Limited, New Delhi, 2007. 2. Ben-Daya M., Duffuaa S.O., Raouf A.: Handbook of Maintenance Management and Engineering. Springer, 2009. 3. Dhillon B.S.: Engineering Maintenance: A Modern Approach. CRC Press, 2002. 4. Mobley R.K.: Maintenance Fundamentals. Elsevier, 2011. 5. Mishra R.C.: Reliability and Maintenance Engineering. New Age International (P) Ltd., Publishers, 2006.
Recommended reading
1. Ben-Daya M., Kumar U., Prabhakar Murthy D. N.: Introduction to Maintenance Engineering: Modelling, optimization and management. John Wiley & Sons, 2016. 2. Alshakhshir F., Howell Marvin T.: Maintenance Strategy. River Publishers, 2021.

Teacher:

Title/degree, name and surname	**University unit**
1. Supervisor:	
Krzysztof Dudzik, DSc (Eng) Assoc. Prof.	Department of Marine Maintenance
2. Other lecturers:	
Tomasz Dyl, DSc (Eng) Assoc. Prof.	Department of Marine Maintenance
Sylwia Bazychowska, MSc (Eng)	Department of Marine Maintenance
Patryk Krawulski, MSc (Eng)	Department of Marine Maintenance

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	28	Name of subject:	NAVAL ARCHITECTURE AND SHIP CONSTRUCTION *
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
V	2	2					30				
VII	3	2	1				30	15			
Total numbers of hours during study:							75				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of frst-cycle studies in the field of Mechanics Engineering, Strength of Materials and Fluid Mechanics.

Course objectives

1.	The purpose of the course is to provide basic knowledge of ship construction and theory, necessary for safe operation of technical ship equipment at the management level.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	determine the geometric characteristics of the ship's hull	K_U22
EP2	describe the concepts and explain the principles underlying buoyancy and stability of a ship	K_U22
EP3	describe structural details specific to particular types of ships	K_U22
EP4	explain the principles underlying the assessment of ship hull strength	K_U15, K_U22
EP5	explain the purpose and role of the main hull structural elements	K_U15, K_U22
EP6	make basic use of the structural and stability of a ship	K_W10, K_U22
EP7	describe the rules of action and proceedings in cases of occurrence events causing partial loss of full buoyancy	K_W10, K_K09
EP8	explain the principles underlying the hydrodynamics of a ship, including resistance of the hull, operation of thrusters and rudder	K_W01, K_U13

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester V

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*Geometry of the ship's hull:* *a) main dimensions and cross-sections,* *b) theoretical lines,* *c) ratios of main dimensions, fullness ratios of the hull,* *d) freeboard, load line.* **(8.3.2)**	3			EP1
2.	*Center of gravity and center of buoyancy of a ship:* *a) mass operations,* *b) elevation of the center of buoyancy above the keel,* *c) position of the center of buoyancy relative to the center of gravity,* *d) equilibrium conditions of the ship.* **(8.3.10)**	4			EP2
3.	*Transverse stability:* *a) transverse metacenter,* **(8.3.12a)** *b) small metacentric radius,* **(8.3.12b)** *c) metacentric height,* **(8.3.12c)** *d) effect of free liquid surfaces on vessel behavior.* **(8.3.15c)**	4			EP2
4.	*Longitudinal stability:* *a) longitudinal metacentric height,* *b) large metacentric radius,* *c) longitudinal metacentric height,* *d) trim,* *e) change in draught due to change in trim.* **(8.3.13)**	2			EP2
5.	*Dynamic stability:* *a) angle of dynamic heel,* *b) stability criteria.* **(8.3.15)**	3			EP2
6.	*Buoyancy and unsinkability.* **(8.3.11)**	2			EP2
7.	*Stability of a supported ship:* *a) in dock,* *b) when aground.* **(8.3.14)**	3			EP2
8.	*Hull resistance:* *a) types of resistance; in the submerged part - friction, hydrodynamic, wave and residual, air,* *b) drag characteristics; design drag, changes in drag hull in service, assessment methods.* **(8.3.3)**	2			EP8
9.	*Ship types, spatial arrangement:* *a) bulk carriers,* *b) general cargo ships,* *c) container ships,* *d) tankers,* *e) gas carriers* *f) roll-on/roll-off vessels,* *g) ferries,* *h) passenger ships,* *i) special.* **(8.3.1)**	4			EP3
10.	*Hull structural loading:* *a) local and overall hull strength,* *b) displacement and load curves,*	3			EP4

	c) hull bending, shear force and bending moment diagrams, hull torsion. **(8.3.18)**				
		30			

Semester VII

No	Content description	No of hours			Reference to EP of the subject
		W	C	S	
1.	*Ship's hull structure:* *a) hull blueprints,* *b) scantlings,* *c) joints,* *d) bottom structure,* *e) side structure,* *f) deck structure,* *g) watertight bulkheads,* *h) holds,* *i) fore and aft end structure,* *j) tanks (bottom, side, ballast, fuel and other), their standard equipment,* *k) hull plating.* **(8.3.6)**	9			EP5
2.	*Ship ballasting – purpose and effects.* **(8.3.16)**	2			EP2
3.	*Ways of steering the ship:* *a) thrusters:* – *types and principle of operation,* – *propellers: lobe theory, cavitation,* – *rotational and hydrodynamic characteristics of propelers,* – *cooperation of propelers and ship hull.* *b) rudders, construction and principle of operation,* *c) maintaining and changing the course,* *d) maneuvering.* **(8.3.5)**	6			EP8
4.	*Typical hull damage, evaluation criteria.* **(8.3.21)**	4			EP3, EP4, EP5
5.	*Shipboard equipment.* **(8.3.8)**	3			EP5
6.	*Lifesaving equipment of the ship.* **(8.3.9)**	3			EP7
7.	*Ship emergency plans.* **(8.3.22)**	1			EP7
8.	*IMO and classification societies activity.* **(8.3.24)**	1			EP2, EP4, EP7
9.	*Inspections on ships, their scopes, docking.* **(8.3.19)**	1			EP2, EP4, EP7
10.	The centers of gravity. Theorems of added weight and shifted weight.		7		EP6
11.	*Using of the ship's structural and stability documentation.* **(8.3.23)**		5		EP6
12.	*Tanks scaling, measuring cargo volume.* **(8.3.17)**		2		EP2
13.	*Rules for the inspection of the hull, propellers and bottom valves.* **(8.3.20)**		1		EP6, EP7
		30	**15**		

Reference list of identification of the framework extended training course for operational and management level in engine department, in mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments, with the study program for first-cycle studies with a practical profile with major in Ship Propulsion Plant and Offshore Construction Operation of the Faculty of Mechanical Engineering of the Gdynia Maritime University.

No	Subject according to the framework extended training program	Subject No	Subject according to the program of first-degree studies with a practical profile (ESOiOO) at the GMU	Sem.	Subject No
1.	Naval architecture & ship construction (8.3)	**3**	Fundamentals of marine propulsion plant	V	2,3
2.	Naval architecture & ship construction (8.3)	**4**	Fundamentals of marine propulsion plant	V	1
3.	Naval architecture & ship construction (8.3)	**5**	Fundamentals of marine propulsion plant	V	4,9
4.	Naval architecture & ship construction (8.3)	**7**	Material science	II	1,4,8
5.	Naval architecture & ship construction (8.3)	**19-21, 24**	Fundamentals of marine propulsion plant	V	15

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1	x								
EP2	x								
EP3	x								
EP4	x								
EP5	x								
EP6								x	
EP7	x								
EP8	x								

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
V	The student has achieved the expected learning outcomes and has complied with the requirements of the STCW Convention requirements for successful completion of the course. Attendance at lectures (3 absences allowed). **Lecture**: credit in the form of a test.
VII	Students achieve the expected learning outcomes and satisfy the requirements of the STCW Convention for successful completion of the course requirements for the completion of the course. Attended lectures (3 absences allowed). **Lecture** and **exercise**: credit in the form of a test.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	75			
Reading literature	25			
Preparing for laboratories, project classes				
Preparing for exam, pass test	20			
Developing project/report				
Participation in exam, pass test	8			
Consultation with teacher	10			
Total number of hours	138			
Number of ECTS credits	**5**			
Total number of ECTS credits for the subject	**5**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	75+8+10 = 93h 3 ECTS			

List of literature:

Required reading
1. Staliński J., Teoria okrętu (eng. Naval architecture). Wydawnictwo Morskie, Gdynia 1961.
Recommended reading
1. Batchelor G.K.: An Introduction to Fluid Dynamics, Cambridge University Press, Cambridge, 1965.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Prof. Lech Murawski, DSc (Eng)	Department of Engineering Sciences
2. Other lecturers:	
Justyna Molenda, PhD (Eng)	Department of Marine Maintenance
Krzysztof Rudzki, PhD (Eng)	Department of Engineering Sciences
Norbert Abramczyk, PhD (Eng)	Department of Engineering Sciences

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	29	Name of subject:	**MARINE POWER PLANTS***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
IV	2	2					30				
V	2	1	1				15	15			
VII E	2	1				0,7	15				10
Total numbers of hours during study:							**75**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the field of secondary school as well as mathematics and physics in the field of first-cycle studies.

Course objectives

1.	The aim of the course is to provide basic knowledge and skills in the field of marine power plants, necessary for safe operation of the ship's technical equipment.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	explain the function, construction and operation of power plant and general ship installations as well as power and propulsion systems for cargo ships	K_W03, K_W04, KU_13, KU_15, KU_22
EP2	list the types of factors occurring in ship installations, power and propulsion systems and knows the values of operating and limit parameters of these parameters	K_W03, K_W04, K_W09
EP3	use technical and operational documentation, also in English, in the scope of using ship installations as well as ship's power and propulsion systems	K_U01, K_U05, KU_22
EP4	characterize solutions that increase the efficiency of marine power plants and reduce operating costs, and knows the principles of economic operation of power plants	K_W03, K_W04, K_U15

EP5	list and characterize the principles of safe operation and control of the proper operation of ship installations, ship's power plant and propulsion system,	K_W04, KU_11, KU_13, K_U15
EP6	characterize the operation of propulsion systems and power plants in a steady state of motion and in transient states: maneuvers, acceleration, braking	K_W04, K_U13, KU_22
EP7	characterize the rules of conduct and procedures during the watch in terms of hazard detection and their occurrence, e.g. fire occurrence, significant fuel spills, etc.	K_W04, K_U11, K_U13, K_U15

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester IV

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*General characteristics of marine power plants:* *a) the concept of a ship's power plants, tasks of marine power plant, classification and types of power plant, construction of power plant, propulsion system and ship's power plant,* *b) energy balance of the ship's engine room; energy systems, energy efficiency of the power plant and the possibilities of its increase, general efficiency of the main drive and its components*. **(8.5.1)**	8			EP1, EP4
2.	*Construction and operation of the ship's basic installations and engine room:* *a) engine cooling systems:* – *cylinder cooling, cylinder cooling systems for slow-speed and medium-speed engines, selection of circulation pumps and radiators, the role of the expansion tank, its selection and inclusion in the system, engine heating, system venting, the impact of the vacuum evaporator on the operation of the system and its selection and inclusion in the system,* – *operating parameters of the system and their adjustment,* – *cylinder cooling system with a pressure equalizing tank,* – *water control and treatment, installation cleaning;* **(8.5.2a)** *b) fresh water piston cooling systems for engines:* – *advantages and disadvantages of fresh water as piston cooling agent,* – *basic diagram of the installation, its components and their operation,* **(8.5.2b)** – *cooling of injectors, basic installations for fresh water, lubricating oil and diesel oil, operating rules for individual installations;* *c) sea water cooling systems:* – *general characteristics,* – *series, parallel and mixed connections of cooled elements,* – *calculation and operational parameters of the system, adjustment of parameters, prevention of corrosion, erosion and deposits;* **(8.5.2c)** *d) central cooling installations:* – *advantages and disadvantages of central installations,* – *basic systems of central installations,*	22			EP1, EP2, EP3, EP4

	− *optimization methods, operating parameters and adjustment of the installation,* **(8.5.2d)** − *selection of sea water pumps, central coolers and flow rates in the low-temperature cycle;* *e) fuel installations:* − *requirements of standards and engine manufacturers regarding marine fuels and the impact of fuel properties on the construction and operation of the entire system;* **(8.5.2e)** *f) fuel transport installations:* − *basic functions of the installation: collection, storage and return,* − *rules of transport and bunkering,* − *protection against spills,* − *storage, return and disposal of fuel waste;* **(8.5.2f)** *g) fuel purification installations:* − *methods of cleaning marine fuels,* − *factors determining the correct fuel purification in centrifuges and filters and their impact on the construction and operation of the purification system,* − *selection and operation of selected elements of the installation: settling tanks, centrifuges and filters,* − *application of unconventional methods of fuel purification and treatment: decanters, homogenizers, part-flow filters, fuel additives,* − *modern treatment system;* **(8.5.2g)** *h) engine fuel supply systems:* − *atmospheric system – conventional and pressure for distilled and residual fuels,* − *application of the pressure control system, selection, construction and operation of selected system elements,* − *the role of the return tank and venting,* − *heating and adjusting fuel viscosity in front of the engine,* − *fuel filtering in the supply system,* − *single-fuel installations,* **(8.5.2h)** − *fuel pressure regulation, mixed fuel supply systems, auxiliary boiler supply system;* *i) installations for the transport and consumption of lubricating oils;* **(8.5.2i)** *j) lubricating engine oil purification installations:* − *operation of centrifuges and filters,* − *selection of centrifuges and selection of optimal centrifuge efficiency and circulating oil centrifugation for continuous and periodic centrifugation,* − *part-flow filtering,* − *modern circulating oil purification system;* **(8.5.2j)** *k) lubrication circulation systems for reciprocating engines:* − *components of the installation, their selection, construction and operation: tanks and circulation pumps, coolers, filters and valves,* − *rules of conduct in case of contamination of lubricating oil;* **(8.5.2k)** *l) cylinder liners lubrication systems;* **(8.5.2l)** *m) lubrication circulation systems for gears, turbochargers, propeller and intermediate shafts;* **(8.5.2m)**				

	n) auxiliary steam and water installations: − *basic diagram of the steam installation and its construction,* − *conventional steam-water installation (for dry saturated steam), steam collection, steam balance of the ship, factors influencing the efficiency of the utilization boiler and its capacity regulation, selection of auxiliary boilers,* − *connection of a fuel-fired boiler with a utilization boiler,* − *basic diagram of the condensate installation,* − *installation components: condensate valves, flow control, condensate observation tanks, condensate coolers, excess condenser,* − *basic diagram of the power supply system,* − *system components: heat box, boiler water storage tanks, feed pumps, water control and treatment, boiler feed regulation,* − *principles of operation of the steam-water installation: start-up of the installation, control during operation, shutdown of the installation, maintenance and cleaning;* **(8.5.2n)** *o) installations for the utilization of heat loss energy:* − *factors influencing the advisability of using energy loss utilization,* − *sources of energy losses and possibilities of their use,* − *the impact of the system solution on covering the energy needs of the power plant,* − *basic diagrams of single- and double-pressure steam-water systems,* − *integrated systems, system operating parameters, feed water heating and steam superheating;* **(8.5.2o)** *p) exhaust systems of engines and boilers:* − *basic diagrams of the systems, basic components description,* − *block diagrams and the working principle of the engine, oil fired boilers and incinerators systems,* − *system requirements,* − *exhaust gas recovery to steam production,* − *operational principle and the influence of the technical condition of the system on the marine engines and boilers work,* − *exhaust gas emissions from the marine devices, basic conditions to produce the toxic compounds in the exhausts,* − *exhaust gas toxic compounds description,* − *the possibilities to reduce the emissions in the marine engines,* − *technical requirements regarding the exhaust emissions,* − *methods and construction designs of the marine engines and boilers exhaust gas treatment,* − *technical issues regarding the reduction of the exhaust gas emissions and marine engines certification in this matter,* **(8.5.2p)** *q) bilge systems:* − *schematic diagram,* − *the requirements to the system,* − *the safeties against the ships compartments flooding,* − *location of the bilge wells, suction strainers and decanters, its connection with the bilge pipes and pumps,* − *emergency bilge level suction in engine room,* − *storage and dealing with the oily water,*				

	– *oil water separation in bilge water system,* – *storage and discharging of bilge and oily water, stripping of bilge wells and tanks,* **(8.5.2q)** *r) ballast systems:* – *basic diagram of the system,* – *the requirements to the system,* – *ballast pumps and valves operation,* – *pumping and stripping ballast tanks rules,* – *automatic ballast systems, working principle and operation,* **(8.5.2r)** *s) compressed air system:* – *basic diagram of the system,* – *the marine demand and receivers of the compressed air,* – *the marine engines demand to start, reverse and slow down with air,* – *construction and operation of the main and auxiliary air receivers, main, emergency and general service air compressors,* – *control and operation of other systems.* **(8.5.2s)** *t) domestic and potable water systems:* – *the requirements for the domestic and potable water,* – *potable, domestic and technical water demand,* – *loading, storage and treatment of domestic and potable water,* – *the use of water made in the evaporators for the domestic purpose,* – *basic diagrams of the domestic water supplied, its construction and operation,* – *the technical water requirements.* **(8.5.2t)**				
Total numbers of hours during semester:		**30**			

Semester V

No	Content description	No of hours			Reference to EP of the subject
		W	C	S	
1.	*Supervision and operation of internal combustion piston engines during operation:* *a) methodology for conducting operational supervision,* *b) "static" and "dynamic" operation of engines - characteristics,* *c) engine operation parameters and indicators:* – *methods of evaluating a set of values of engine operating parameters,* – *engine indication – ways of implementing and using indicator runs in the current operation of engines,* – *determination of engine operation indicators; average indicated and effective pressure, indicated and useful power, specific fuel and cylinder oil consumption, emissions of exhaust gas components,* *d) operating areas of the main engines,* *e) operational limitations of minimum and maximum engine loads,* f) *operating factors influencing the limitations, permissible overloads of the main engines.* **(8.5.4)**	10			EP1, EP4, EP5, EP6
2.	*Operational factors affecting fuel consumption in the engine room:* *a) power plant,*	5			EP1, EP4, EP5, EP6

	b) ship. **(8.5.5)**				
3.	*Planning stocks of the necessary fuel, lubricating oils, water and other operating factors of the engine room and ship.* **(8.5.6)**		10		EP1, EP2, EP3, EP4, EP5, EP6
4.	*Planning surveys and checks of all engines and equipment of the ship.* **(8.5.7)**		2		EP1, EP4, EP5, EP6
5.	*Development of current operational documentation of the ship: reports, fuel settlements, service and repair specifications.* **(8.5.8)**		3		EP1, EP4, EP5, EP6
	Total numbers of hours during semester:	**15**	**15**		

Semester VII

No	Content description	No of hours			Reference to EP of the subject
		W	C	S	
1.	*Influence of ship sailing conditions on human ability and activity.* **(8.5.10)**	1			EP5, EP6, EP7
2.	*Basic concepts of technical diagnostics (structure of the object, structure parameters, operating parameters, diagnostic parameters, state of efficiency, inefficiency, suitability and inoperability).* **(8.5.11)**	2			EP5, EP6, EP7
3.	*Diagnostic models: analytical, functional, topological. Diagnostic methods: parametric, vibroacoustic, pollution).* **(8.5.12)**	2			EP5, EP6, EP7
4.	*Diagnostics of a marine diesel engine.* *Evaluation of the mechanical and thermal load of the piston-cylinder group, evaluation of the tightness of the combustion chamber, evaluation of the conditions of cooperation of the piston and sleeve, evaluation of cylinder liner wear, evaluation of the condition of the piston rings. Diagnostics of the supercharging system, assessment of the condition of the air filter, assessment of the condition of the air compressor, assessment of the condition of the air cooler, assessment of the condition of the turbocharger. Diagnostics of the fuel injection process and assessment of the combustion process. Bearing diagnostics, measurements of bearing temperature and journal trajectory.* **(8.5.13)**	4		4	EP5, EP6, EP7
5.	*Diagnostics of boilers and steam turbines***. (8.5.14)**	2		2	EP5, EP6, EP7
6.	*Diagnostics of pumps and hydraulic devices.* **(8.5.15)**	2		2	EP5, EP6, EP7
7.	*Applied diagnostic systems - overview.* **(8.5.16)**	2		2	EP5, EP6, EP7
	Total numbers of hours during semester:	**15**		**10**	

Reference list of identification of the framework extended training course for operational and management level in engine department, in mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments, with the study program for first-cycle studies with a practical profile with major in Ship Propulsion Plant and Offshore Construction Operation of the Faculty of Mechanical Engineering of the Gdynia Maritime University.

No	Subject according to the framework extended training program	Subject No	Subject according to the program of first-degree studies with a practical profile (ESOiOO) at the GMU	Sem.	Subject No
1.	Marine Power plants (8.5)	**3**	Fundamentals of marine propulsion plant	V	2,5-14
2.	Marine Power plants (8.5)	**9**	Engine room symulator	VII	1
3.	Marine Power plants (8.5)	**11,12**	Technical diagnostics	V	1,2
4.	Marine Power plants (8.5)	**13**	Marine internal combustion engines	V	7
5.	Marine Power plants (8.5)	**14-16**	Technical diagnostics	V	3,4
6.	Marine Power plants (8.5)	**17-26**	Engine room symulator	VII	2-11

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1		x		x					
EP2		x		x					
EP3		x		x					
EP4		x		x					
EP5					x			x	
EP6					x			x	
EP7					x			x	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
IV	The student has achieved the expected learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. He attended lectures; 100% attendance at lectures. In the case of absence (max. 10% of classes) - consultation credit of the material from the lecture. Lecture: credit - colloquium from the lecture.
V	The student has achieved the expected learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. He attended lectures; 100% attendance at lectures. In the case of absence (max. 10% of classes) - consultation credit of the material from the lecture. **Lecture**: credit - colloquium from the lecture. **Classes**: pass - colloquium. Assessment for the student record book: after obtaining credit for the lecture and exercises.

VII	The student has achieved the expected learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. He attended lectures; 100% attendance at lectures. In the case of absence (max. 10% of classes) - consultation credit of the material from the lecture. **Lecture**: Written and oral exam. **Seminar**: Presentation of the report and presentation of the subject carried out during the sea practice. Assessment for the student record book: after obtaining credit for the lecture and seminar.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	60	15		10
Reading literature	15	5		5
Preparing for laboratories, project classes		10		
Preparing for exam, pass test	30			
Developing project/report				10
Participation in exam, pass test	7			3
Consultation with teacher	7	2		3
Total number of hours	119	32		31
Number of ECTS credits	**4**	**1**		**1**
Total number of ECTS credits for the subject	**6**			
Student's workload connected with practical classes	15+5+10+2+10+5+10+3+3=63h 2 ECTS			
Student's workload connected with classes involving direct participation of teacher	60+7+7+15+2+10+3+3= 107h 4 ECTS			

List of literature:

Required reading

1. Giernalczyk M., Górski Z.: Siłownie okrętowe. Część I. Podstawy napędu i energetyki okrętowej, Wydawnictwo Akademii Morskiej w Gdyni, Gdynia 2011.
2. Giernalczyk M., Górski Z.: Siłownie okrętowe. Część II. Instalacje okrętowe, Akademia Morska w Gdyni, Gdynia 2012.
3. Balcerski A.: Siłownie okrętowe, Politechnika Gdańska, Gdańsk 1990.

Recommended reading

1. Michalski R.: Siłownie okrętowe, Politechnika Szczecińska, Szczecin 1997.
2. Urbański P.: Gospodarka energetyczna na statkach, Wydawnictwo Morskie, Gdańsk 1978.
3. Urbański P.: Instalacje okrętów i obiektów oceanotechnicznych, Politechnika Gdańska, Gdańsk 1994.
4. Wojnowski W.: Okrętowe siłownie spalinowe, część I, Wydział Oceanotechniki i Okrętownictwa Politechniki Gdańskiej, Gdańsk 1991.
5. Wojnowski W.: Okrętowe siłownie spalinowe, część II, Wydział Oceanotechniki i Okrętownictwa Politechniki Gdańskiej, Gdańsk 1992.
6. Wojnowski W.: Okrętowe siłownie spalinowe, część III, Akademia Marynarki Wojennej, Gdynia 2002.
7. Górski Z. Hajduk T., Kluj S.: Procedury obsługi siłowni okrętowej, Akademia Morska w Gdyni, Gdynia 2005.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Mariusz Giernalczyk, PhD (Eng), Assoc. Prof.	Department of Marine Propulsion Plants
2. Other lecturers:	
Prof. Adam Charchalis, DSc (Eng)	Department of Marine Propulsion Plants
Olha Dvirna, PhD (Eng)	Department of Engineering Sciences

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	30	Name of subject:	**TECHNICAL DIAGNOSTICS***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
V	1	0,5		0,5			8		7		
Total numbers of hours during study:							**15**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the field of secondary school.

Course objectives

1.	The course aims to provide basic knowledge and skills in the field of technical diagnostics, necessary assessment of the technical condition of the ship engine-room equipment.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	characterize the essence of technical diagnostics in the operation of the engine-room	K_W04, K_W12
EP2	discuss physicochemical processes as carriers of information diagnostic	K_W04, K_W05
EP3	define the technical condition of the engine based on measurements vibroacoustic, endoscopic, etc.	K_U08
EP4	assess the technical condition of the engine on the basis of modern systems diagnostic	K_U09

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester V

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*Basic concepts of technical diagnostics (structure of the object, structure parameters, operating parameters, diagnostic parameters, state of operation and malfunction, fully operational condition, and partially operational condition).* **(8.5.11)**	2			EP1
2.	*Diagnostic models: analytical, functional, topological. Diagnostic methods: parametric, vibroacoustic, pollution.* **(8.5.12)**	2			EP2
3.	*Diagnostics of boilers and steam turbines. Pump diagnostics and hydraulic devices.* **(8.5.14, 15)**	2			EP2
4.	*Applied diagnostic systems - overview.* **(8.5.16)**	2			EP3
5.	Technical diagnostics of marine machinery and equipment: a) vibroacoustic diagnostics of the rotor and reciprocating machines, b) ship endoscopy, c) ultrasonic methods of material quality control and material thickness measurements, d) testing mechanical impurities in oil, e) acoustic emission tests.			7	EP3, EP4
	Total numbers of hours during semester:	**8**		**7**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1	x								
EP2	x								
EP3	x				x			x	
EP4					x			x	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
V	The student has achieved the expected learning outcomes. He attended lectures. **Lecture:** written test. **Laboratories:** Performing and passing all laboratory exercises, in accordance with schedule. A final grade average of grades for theoretical knowledge, from work in the laboratory, from the report. The grade for the student record book after successfully completing 2 forms of classes with an average grade from the received grades lecture and laboratory grades.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	8	7		
Reading literature	5			
Preparing for laboratories, project classes		6		
Preparing for exam, pass test	3			
Developing project/report				
Participation in exam, pass test	2			
Consultation with teacher	1	1		
Total number of hours	19	14		
Number of ECTS credits	**0,5**	**0,5**		
Total number of ECTS credits for the subject	**1**			
Student's workload connected with practical classes	7 + 6 + 1 = 14 h 1 ECTS			
Student's workload connected with classes involving direct participation of teacher	8 + 7 + 2 + 1 +1 = 19 1 ECTS			

List of literature:

Required reading
1. Charchalis A.: Diagnozowanie okrętowych silników turbinowych, Wydawnictwo AMW, Gdynia 1991. 2. ,,Kluj S.: Diagnostyka urządzeń okrętowych, Wydawnictwo WSM, Gdynia 1982. 3. Żółtowski B., Cempel Cz. (red.): Inżynieria Diagnostyki Maszyn, Instytut Technologii Eksploatacji BIP. Część 3, rozdz. 2, Radom 2004. 4. Piotrowski I., Witkowski K.: Eksploatacja okrętowych silników spalinowych, Akademia Morska w Gdyni, Gdynia 2002.
Recommended reading
1. Cempel Cz.: Podstawy wibroakustycznej diagnostyki maszyn, WNT, Warszawa 1982.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Marcin Frycz, PhD (Eng)	Department of Engineering Sciences
2. Other lecturers:	
Sebastian Drewing, PhD (Eng)	Department of Marine Propulsion Plants

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	31	Name of subject:	**SAFE SHIP OPERATION***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
VII	1					0,7					10
VIII	3	1,3	0,7				20	10			
Total numbers of hours during study:							**40**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the field of secondary school.

Course objectives

1.	The course aims to provide the basic knowledge and skills in the range of ship safety management, essential to safe maintenance of ship technical equipment
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	utilize knowledge concerning to ship safety management, organization and management of ship power plant reserves	K_W12
EP2	use computer and communication fundamentals technologies in the range of the obtaining and processing of information in ship power plant safety management; use technical standards and technical documentation; have a systematic knowledge concerning to analysis processes and risk management with especially taking into consideration human and material resources – specific for power plants of commercial sailing vessels	K_W09, K_U07, K_W15
EP3	work in a group accepting different roles in; understand co-operation rules	K_K05

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester VII

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	Presentation of seminar work done during sea training realized in VI semester. Instruction and training onboard. Familiarization with the ship. Check lists of dangerous works.			2	EP1
2.	Alarm signals. Crew duties during alarms. Arrangement of handy rescue and fire-fighting equipment, equipment of personal protection and first medical aid.			1	EP1
3.	Arrangement and destination of emergency generator set, emergency fire-fighting pump, buttons of alarm signaling, emergency bilge suction, quick-closing valves, closing system of watertight and flame-proof bulkheads, emergency exits, stationary fire-fighting control stations, emergency lighting system.			2	EP1
4.	Watch procedures, taking and passing the duties. Procedures of maintenance and monitoring of power plant ability for periodically unattended operation.			1	EP1
5.	Systems and marine environment protection equipment arrangement and destination. Oil Record Book. Ship Oil Pollution Emergency Plan.			1	EP1
6.	Fuel bunkering procedure (check lists: before, during and after fuel bunkering).			2	EP1
7.	Procedures of maintenance and monitoring of operation efficiency of fire-fighting equipment.			1	EP1
	Total numbers of hours during semester:			**10**	

Semester VIII

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*Crew competence partition required STCW Convention. Instruction and training onboard.* **(8.15.1)**	2			EP1
2.	*Crew organizing structure, structure of machinery department, machinery watch duties, unattended power plant operation.* **(8.15.2)**	2			EP1
3.	*Team management principles.* **(8.15.3)**	1	5		EP1
4.	*Acts, conventions and other certificates concerning to ship safe management.* **(8.15.4)**	2			EP3
5.	*ISM code onboard*. **(8.15.5)**	2			EP1
6.	*ISPS code onboard.* **(8.15.6)**	2			
7.	*Structure of ship technical supervision onboard*. **(8.15.7)**	2			EP1
8.	*Organization principles and navigation safety supervision and safety of live at sea in emergency situations* **(8.15.8)**	1	5		EP1
9.	*Risk analysis in ship technical operation.* **(8.15.9)**	2			EP2
10.	*Ship emergency plans.* **(8.15.10)**	2			EP2

11.	*Ship and crew ability to safe sea shipping.* ***(8.15.11)***	2			EP3
	Total numbers of hours during semester:	**20**		**10**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1			x						
EP2			x						
EP3							x	x	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
VII	Student obtained required educational effects. Final grade depends on grade of performed presentation and presence and activity during seminar.
VIII E	Student obtained required educational effects and fulfill requirements of STCW Convention. Required a 100% presence on course. Positive grade of written exam.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	30			10
Reading literature	20			
Preparing for laboratories, project classes				
Preparing for exam, pass test	15			
Developing project/report				20
Participation in exam, pass test	3			
Consultation with teacher	4			
Total number of hours	72			30
Number of ECTS credits	**3**			**1**
Total number of ECTS credits for the subject	**4**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	30+3+4+10=47h 2 ECTS			

List of literature:

Required reading
1. STCW Convention with amendments. 2. International Management Code (ISM Code) with amendments. 3. SOLAS Convention with amendments. 4. MEPC guidelines . 5. ISPS Code with amendments.

Recommended reading
1. Check lists. 2. Ship technical documentation.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Jerzy Herdzik, DSc (Eng), Assoc. Prof.	Department of Marine Propulsion Plants
2. Other lecturers:	
Andrzej Młynarczak, PhD (Eng), Assoc. Prof.	Department of Marine Propulsion Plants
Jacek Wysocki, PhD (Eng)	Department of Marine Propulsion Plants

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	32	Name of subject:	**MARINE INTERNAL COMBUSTION ENGINES***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
IV	2	2					30				
V	2	1		1			15		15		
VII E	3	1,3		1		0,7	20		15		10
Total numbers of hours during study:							**105**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Basic knowledge of such subjects as: materials science, technical thermodynamics, mechanics, strength of materials and basics of machine construction, automation.

Course objectives

1.	The aim of the subject is to provide knowledge and skills in the construction and operation of marine piston engines, necessary for their safe operation.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	describe the construction and principle of operation of marine piston engines; characterize the processes of: charge exchange, supercharging, injection and combustion, taking into account their impact on engine operating parameters, including exhaust gas composition (impact on the environment), mechanics of the piston-crank system, operation of the control system, thermal loads, assess the technical condition of the engine	K_W02, K_W03, K_U01, K_U13, K_K02
EP2	analyze theoretical and real cycles of piston engines; calculate the basic energy and economic indicators of engine operation	K_W01, K_W08, K_U17
EP3	discuss the construction, manufacture and materials of the most important structural elements of marine piston engines, systems serving diesel engine	K_W03, K_W05, K_W09, K_U01, K_U22

EP4	prepare the engine for movement, start, supervise during operation and stop the marine engine; perform basic activities related to the static regulation of marine engines	K_W04, K_U01, K_U16, K_U17, K_U19, K_U20, K_U22
EP5	measure the basic operating parameters of a marine engine, analyze changes in their values and formulate diagnostic conclusions	K_W04, K_W08, K_U08, K_U09, K_U13, K_U17
EP6	make indicator diagrams with mechanical indicators; operate electronic type indicators; analyze chart changes and formulate diagnostic conclusions	K_W04, K_W08, K_U08, K_U09, K_U13, K_U17
EP7	use literature sources, databases, other sources of information; interpret information, formulate opinions and conclusions	K_U01, K_U05
EP8	work in a group assuming different roles in it, understands the principles of cooperation; is able to lead a small team taking responsibility for the results of its work	K_K05, K_K07

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester IV

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*Preliminary information:* *a) division of internal combustion engines,* *b) principle of operation of a piston internal combustion engine two-stroke and four-stroke.* **(8.4.1)**	2			EP1
2.	*Work process theory:* *a) comparative (theoretical) heat cycles:* − *types of comparative cycles,* − *operation indicators of the comparative heat cycles.* *b) practical (real) cycles:* − *indicator diagrams, analysis of indicator diagrams,* − *charging (the course of the cycle, parameters, timing setting, impact of speed and load),* − *compression (the course of the cycle, parameters),* − *creating a combustible mixture (atomization fuel, evaporating and mixing with air),* − *combustion (self-ignition delay, combustion phases, combustion rate, maximum combustion pressure),* − *expansion (the course of the cycle, parameters),* *c) exhaust (the course of the cycle, exhaust phase, parameters)* **(8.4.2)**	5			EP1,EP2, EP5, EP8
3.	*Charge exchange (exhaust/scavenge/air filling of the cylinder) process:* *a) charge exchange in 4-stroke engines,* *b) charge exchange in 2-stroke engines,* *c) indicators describing the quality of the charge exchange process,* *d) diagnostics of the charge exchange process* **(8.4.3)**	3			EP2
4.	*Supercharger ship engine:* *a) thermodynamic bases of supercharging processes,* *b) purpose and means of implementation of supercharging*	6			EP1

	processes, *c) use of exhaust gas energy: impulse and constant pressure systems, comparison of both systems,* *d) parameters of the supercharging air, cooling, water vapor condensation,* *e) the impact of operating factors on the operating parameters of supercharging systems,* *f) diagnostics of the supercharge process.* **(8.4.4)**				
5.	*Generation, ignition and combustion of the fuel-air mixture:* *a) thermodynamic basis of the combustion process,* *b) fuel injection process, fuel atomization process optimization,* *c) creating a fuel-air mixture, macro- and microstructure of the jet, fuel atomization parameters,* *d) the flow of the combustion process,* *e) the impact of injection and combustion on engine efficiency,* *f) the impact of injection and combustion on the composition of exhaust gases, toxic components of exhaust gases,* *g) the influence of fuel parameters on the process of creating a fuel-air mixture and combustion,* *h) the impact of operating parameters on the process of creating a fuel-air mixture and combustion,* *i) diagnostics of the injection and combustion process.* **(8.4.5)**	6			EP1, EP2, EP5, EP8
6.	*Energy and economic indicators of engine operation:* *a) definitions: torque, rotational speed, mean indicated and effective pressure, indicated and effective power, thermal (indicated) efficiency, mechanical efficiency and total efficiency, specific fuel and heat consumption,* *b) methods of measuring engine energy indicators on a ship* *c) heat balance and Sankey diagram of a marine engine.* **(8.4.6)**	4			EP5, EP6
7.	*Characteristics of marine engines:* *a) characteristics as a function of rotational speed,* *b) characteristics as a function of load,* *c) control (adjustment) characteristics,* *d) general characteristics.* **(8.4.7)**	4			EP1
	Total numbers of hours during semester:	**30**			

Semester V

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab	
1.	*Construction, making and materials of basic engine blocks elements:* *a) engine bedplate,* *b) crankcase,* *c) cylinder block,* *d) cylinder liner,* *e) head,* *f) tie bolts.* *g) foundation bolts.* **(8.4.8)**	2			EP3
2.	*Construction, making and materials of the basic elements of the crank-piston system:* *a) pistons,*	3			EP3

	b) piston pins, *c) piston rings,* *d) piston rod,* *e) crosshead, connecting rod,* *f) crankshaft,* *g) crankshaft bearings.* **(8.4.9)**				
3.	*Construction and operation of the valve timing gear mechanism:* *a) components of the timing system: cam, push rod, rocker arm, poppet valve assembly with a spring,* *b) characteristics of the valve spring,* *c) hydraulic exhaust valve drive system,* *d) the concept of valve looseness and its setting.* **(8.4.10)**	2			EP3
4.	*Rotational speed control system for internal combustion piston engine:* *a) purpose of use,* *b) types, principle of operation and construction of rotational speed controllers,* *c) operation of the engine speed control system under operating conditions.* **(8.4.11)**	2			EP3
5.	*Fuel Supply System:* *a) required properties of the marine fuel on inlet (viscosity and purity),* *b) the construction of a mechanically driven system and the principle of fuel dose control,* *c) construction and operation of injection pumps,* *d) construction of injectors,* *e) construction of the storage system and the principle of fuel dose control,* *f) high-pressure fuel lines,* *g) principle of fuel dose control in dual-fuel engines*. **(8.4.12)**	4			EP3,EP4
6.	*Engine cooling systems:* *a) the essence of cooling and the task of the coolant,* *b) parameters of cooling agents.* **(8.4.13)**	1			EP1,EP4
7.	*Diagnostics of a marine diesel engine.* *Evaluation of the mechanical and thermal load of the piston-cylinder group, evaluation of the tightness of the combustion chamber, evaluation of the conditions of cooperation of the piston and sleeve, evaluation of cylinder liner wear, evaluation of the condition of the piston rings.* *Diagnostics of the supercharging system, assessment of the condition of the air filter, assessment of the condition of the air compressor, assessment of the condition of the air cooler, assessment of the condition of the turbocharger.* *Diagnostics of the fuel injection process and evaluation of the combustion process.* *Bearing diagnostics, measurements of bearing temperature and journal trajectory.* **(8.5.13)**	1			EP1
8.	Introduction to the laboratory, health and safety regulations (OHS regulations).			1	EP1
9.	Drawing up diagrams of installations servicing the engine.			6	EP3
10.	*Basic maintenance of the internal combustion piston engine:*			4	EP4

	e) preparation of installations supporting the engine and the engine for operation, *f) starting the engine,* *g) regulation of the engine operating parameters,* *d) supervision during operation, parameter readings and interpretation,* *e) engine stop.* **(8.4.23)** *f) Rotational speed governors of internal combustion piston engines:* *g) settings of the main propulsion and generating sets governors,* *h) selection of governor settings: factory and service,* *i) repairs of governors.* **(8.4.24)**				
11.	*Assessment of the technical condition of injectors:* *a. visual assessment,* *b) assessment on the basis of a bench test.* **(8.4.26)**			4	EP4
	Total numbers of hours during semester:	**15**		**15**	

Semester VII

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ S	
1.	*Engine lubrication systems:* *a) functions of lubricating oil in the engine,* *b) engine lubrication system.* **(8.4.14)**	2			EP1, EP4
2.	*Supercharging air installation:* *a) examples of installation construction and components,* *b) types and construction of turbochargers,* *c) cooperation of the turbocharger with the charging air system,* *d) conditions for the phenomenon of turbocharger pumping, methods of preventing and removing their causes,* e) *operation of the engine with the turbocharger disconnected.* **(8.4.15)**	3			EP1, EP4
3.	*Security installations:* *a) oil mist,* *b) extinguishing the space under the piston.* **(8.4.16)**	1			EP1, EP4
4.	*Crank system mechanics:* *a) the equation of motion of the elements of the crank system,* *b) inertial forces and the principle of their balancing,* *c) examples of balancing forces and moments of inertia in multi-cylinder engines,* *d) non-uniformity of engine running,* *e) causes of engine unbalance,* *f) construction and operation of the flywheel,* *g) torsional vibrations of the crankshaft - determination of the degree of safety of a specific case of torsional vibration resonance,* *h) torsional vibration dampers - construction, operation and operating recommendations.* **(8.4.17)**	4			EP1, EP5
5.	*Starting system and engine control system:* *a) the principles of generating the torque during pneumatic start-up, operation of components in the pneumatic start-up system, operation of the starting-air distributor and the starting air*	2			EP4

	valve, *c) principles of camshaft override during start-up in two directions of engine rotation (reversing the engine),* *d) protections in the engine control system,* *e) operation of the control system during engine manoeuvering.* **(8.4.18)**				
6.	*Engine thermal loads.* **(8.4.19)**	2			EP1
7.	*Maintenance activities of the internal combustion engine (main and auxiliary drive):* *a) preparation for movement,* *b) supervision during work,* *c) supervision during manoeuvres* *d) stopping the engine.* **(8.4.20)**	2			EP4
8.	*Selected operational issues of a marine internal combustion piston engine:* *a) piston-crank system,* *b) injection system,* *c) lubrication system,* *d) cylinder surface lubrication system,* *e) starting and starting-reversing system,* *f) supercharging system.* **(8.4.21)**	2			EP3, EP7, EP8
9.	*Emergency states of ship engine operation.* **(8.4.22)**	2			EP4, EP5, EP7
10.	*Measurement or determination of basic indicators of engine operation:* *a) the course of the compression and combustion process as a function of the angle of rotation of the crankshaft,* *b) compression pressure,* *c) maximum combustion pressure,* *d) mean indicated pressure and mean effective pressure,* *e) indicated and effective power,* *f) torque on the propeller shaft,* *g) fuel consumption,* *h) specific fuel consumption,* *i) total engine efficiency.* **(8.4.27)**			6/-	EP5, EP6, EP7, EP8
11.	*Injection pump settings adjustment.* **(8.4.25)**			4/-	EP4
12.	Mechanical indication, calculation of indicated parameters.			4/-	EP6
13.	Final passing of the laboratory.			1/-	EP4,EP5
14.	Final passing of the training record book.			-/10	EP1, EP3, EP6
	Total numbers of hours during semester:	**20**		**15/10**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1			x	x			x		
EP2			x	x				x	

EP3			x	x					
EP4					x			x	
EP5					x			x	
EP6					x			x	
EP7							x		
EP8								x	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
IV	The student has achieved the expected learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. Attended lectures (3 absences allowed). Lecture: credit - colloquium from the lecture.
V	The student has achieved the expected learning outcomes. He attended lectures. Lecture: credit - colloquium from the lecture Laboratories: Performing and passing, according to the schedule, all laboratory exercises after submitting reports. Final grade average of grades for theoretical knowledge, laboratory work, reports. Grade for the student record book after successfully completing 2 forms of classes with an average grade from the grades received from the lecture and laboratory.
VII E	The student has achieved the expected learning outcomes. He attended lectures. Lecture: lecture exam Laboratories: Performing and passing, according to the schedule, all laboratory exercises after submitting reports. Seminar: preparation of a thematic presentation, positive assessment of the presentation. Final grade average of grades for theoretical knowledge, laboratory work, reports and seminar. Grade for the student record book after successfully completing 3 forms of classes with an average grade from the grades received from the lecture, laboratory and seminar.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	65	30		10
Reading literature	30			
Preparing for laboratories, project classes		15		10
Preparing for exam, pass test	25			
Developing project/report		20		
Participation in exam, pass test	5			
Consultation with teacher	5	5		
Total number of hours	130	70		20
Number of ECTS credits	**4**	**2**		**1**
Total number of ECTS credits for the subject	**7**			
Student's workload connected with practical classes	30+15+20+5+10+10=90			

	3 ETCS
Student's workload connected with classes involving direct participation of teacher	65+30+10+5+5+5=120 4 ETCS

List of literature:

Required reading
1. Woodyard D.: Marine diesel engine and gas turbines. Elsevier Ltd, GB, first edition 1984, reprinted 2006 2. Stinson K.W.: Diesel engineering handbook. Business Journals, INC, Norwalk, US of America, 1990 3. Kees Kuiken: Diesel engine part I. Parget Global Energy Training, Onnen, The Nedtherlands, 2008.
Recommended reading
1. Ciesielski S., Lus T.: Marine reciprocating internal combustion engines. Construction and working principles. Akademia Marynarki Wojennej, Gdynia, 2021

Teacher:

Title/degree, name and surname	**University unit**
1. Supervisor:	
Piotr Kamiński, PhD (Eng), Assoc. Prof.	Department of Marine Propulsion Plants
2. Other lecturers:	
Andrzej Młynarczak, PhD (Eng), Assoc. Prof.	Department of Marine Propulsion Plants
Jacek Wysocki, PhD (Eng)	Department of Marine Propulsion Plants

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	33	Name of subject:	**MARINE BOILERS***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
IV E	3	2,3	1				34	15			
VII	1					0,7					10
Total numbers of hours during study:							**59**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the field of secondary school.

Course objectives

1.	The aim of the course is to provide knowledge and skills in the field of construction and operation of the ship boilers.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	distinguish the various types and types of ship steam boilers, describe the individual structural elements of the boiler	K_W03, K_W04
EP2	present the method of starting and shutting down the boiler, list the service activities performed during watchkeeping	K_W04, K_U11, K_K03
EP3	carry out calculations of basic boiler processes	K_W03
EP4	assess the technical condition of the boiler, boiler burner, boiler control devices and plan possible repair and maintenance works	K_W04, K_W05, K_W07, K_U13, K_U16
EP5	work in a group assuming different roles in it, apply the principles of cooperation and take care of safety	K_W09, K_U21, K_K07, K_K08

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester IV

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*Theoretical basis of the ship boilers operation:* *a) thermodynamic properties of water and steam,* *b) the cycle of thermodynamic transformations taking place in the boiler and their visualization on the thermodynamic diagrams, i.e. i-s, T-s, i-p,* c) *physical and chemical properties of the diathermic oils.* **(8.7.1)**	2	2		EP1, EP3
2.	*Working processes carried-out within the boiler:* *a) combustion:* − *the impact of fuel and air parameters as well as the technical condition of the burner on the quality of the combustion process,* *b) heat exchange:* − *radiation,* − *convection,* − *sorts of impurities and their impact on heat transfer,* *c) aerodynamics:* − *influence of the boiler structure on flue gas flow resistance,* − *influence of pollutants on flue gas flow resistance,* − *exhaust fans,* *d) water circulation in the boiler:* − *natural circulation and its disturbances,* *e) forced circulation.* **(8.7.2)**	2	10		EP1, EP3
3.	*Classification and construction of auxiliary ship boilers:* *a) oil fired boilers,* *b) fire-tube boilers,* *c) water-tube boilers,* *d) two-circuits boilers,* *e) composite boilers,* *f) thermal oil boilers,* *g) review of the boilers design* **(8.7.3)**	3			EP1, EP2, EP5
4.	*Characteristic values, parameters and factors of the modern auxiliary ship boilers:* *a) unitary water capacity,* *b) heat load of the combustion chamber,* *c) heat load of the heat transfer surface,* *d) pressure ranges of the boiler,* *e) temperature ranges of the boiler,* *f) boiler accumulation capacity.* **(8.7.4)**	2			EP1, EP2
5.	*Construction and principle of operation of waste-heat boilers:* *a) examples of water-tube and fire-tube boiler constructions,* *b) the systems for the waste-heat boilers boiler.* **(8.7.5)**	2			EP1, EP2, EP5
6.	*Heat balance of the boiler:* *a) heat balance on the steam-water side,* *b) heat balance on the fuel side,* *c) determination methods of the boiler efficiency (the direct and the indirect one),*	2	3		EP1, EP2, EP5

	d) an impact of the boiler operating parameters on the boiler efficiency. **(8.7.6)**				
7.	*Structural elements of the ship's boilers:* *a) water and steam drums,* *b) main heating surfaces of boilers,* *c) the frame, the gas-tight coat, insulation,* *d) steam drying,* *e) air and water preheaters,* *f) steam superheaters.* **(8.7.7)**	3			EP1, EP2, EP5
8.	*Fittings and boiler accessories:* *a) shut-off, safety and check valves,* *b) water gauges,* *c) soot blowers,* *d) water level regulators, floaters, capacitive probes,* *e) pressure switches, thermostats, thermocouples, manometers,* *f) installation for boiler washing on the flue gas side,* *g) boiler skimming installations,* *h) technical requirements.* **(8.7.8)**	3			EP1
9.	*Boiler installations:* *a) water supply systems (continuous and periodic supply),* *b) steam systems,* *c) skimming and blowdown systems.* **(8.7.9)**	2			EP1, EP2, EP4
10.	*Fuel supply installations:* *a) by means of residual fuel,* *b) by distillation fuel,* *c) by petroleum waste.* **(8.7.10)**	2			EP1, EP2
11.	*Types of the ship's boiler burners:* *a) pressure burners,* *b) rotating burners,* *c) dual-fuel burners,* *d) steam spray burners,* *e) air spray burners*. **(8.7.11)**	1			EP1, EP2, EP4
12.	*Automation of auxiliary and heat-recovery boilers.* **(8.7.12)**	1			EP1, EP2, EP4
13.	*Operation of ship's boiler*: *a) putting boiler into operation,* *b) service of boiler during continuous running operation (preparation of water during boiler operation, water level control, daily maintenance, skimming of water gauges and level regulators),* *c) operation of the fuel, water and steam systems (overhaul of filters and heaters, inspection of thermodynamic steam traps, the heat box, condensate observation tank, condensate cooler and the steam excess condenser),* *d) stopping procedure for the boiler,* *e) burner shutdown,* *f) pressure reduction, boiler skimming,* *g) replenishing water,* *h) regulation of the efficiency of the utilization boiler,* *i) cooperation between the oil-fired boiler and exhaust gas boiler.* **(8.7.13)**	3			EP1, EP2, EP4
14.	*Boiler safety installations. Ship's boiler safety and emergency*	2			EP2

	procedures. **(8.7.14)**				
15.	*Boiler water properties:* *a) technical water in the steam-condensate circuit,* *b) required properties of water within the boiler system:* − *low pressure side,* − *high pressure side,* − *monotube (once-through) boiler,* *c) analysis of boiler water – interpretation of results and taking the operational decisions,* *d) chemical methods for marine boilers cleaning,* *e) practical requirements - the use of company instructions of the chemical agents for ship's boiler water treatment.* **(8.7.15)**	2			EP2
16.	*Requirements for diathermic oils used in marine power plants.* **(8.7.16)**	2			EP2
	Total numbers of hours during semester:	**34**	**15**		

Semester VII

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*Operation of ship's boiler:* *a) putting boiler into operation,* *b) service of boiler during continuous running operation (preparation of water during boiler operation, water level control, daily maintenance, skimming of water gauges and level regulators),* *c) operation of the fuel, water and steam systems (overhaul of filters and heaters, inspection of thermodynamic steam traps, the heat box, condensate observation tank, condensate cooler and the steam excess condenser),* *d) stopping procedure for the boiler,* *e) burner shutdown,* *f) pressure reduction, boiler skimming,* *g) replenishing water,* *h) regulation of the efficiency of the utilization boiler,* *i) cooperation between the oil-fired boiler and exhaust gas boiler.* **(8.7.13)**			2	EP2, EP5
2.	*Boiler safety installations. Ship's boiler safety and emergency procedures***. (8.7.14)**			2	EP5
3.	Operation of ship's boilers during normal and emergency conditions, shutdown and maintenance of boilers: *a)* supervision of the boiler during its continuous running, *b)* emergency procedures, *c)* shutdown of the auxiliary oil-fired boilers, *d)* maintenance of boilers which have been idled for short and long periods.			4	EP2, EP5
4.	*Boiler installations:* *a) water supply systems,* *b) steam systems,* *c) skimming and blowdown systems,* *d) fuel systems.* **(8.7.9, 10)**			2	EP1, EP5

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1		x	x						
EP2			x				x		
EP3				x					
EP4							x		
EP5							x		

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
IV E	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. The student attended lectures (3 absences allowed) and exercises (3 absences allowed). **Exercise** : final test. **Lecture**: written and oral exam. Grade for the student record book after successfully completing 2 forms of classes with an average grade from the lectures and exercises.
VII	The student completed a sea-going practice confirmed by relevant entries in the Practice Book. He showed a presentation based on the knowledge gained during sea-going practice and defended it. **Seminar**: oral exam

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	49			10
Reading literature	10			5
Preparing for laboratories, project classes	5			7
Preparing for exam, pass test	20			
Developing project/report				7
Participation in exam, pass test	3			
Consultation with teacher	3			2
Total number of hours	90			31
Number of ECTS credits	**3**			**1**
Total number of ECTS credits for the subject	**4**			
Student's workload connected with practical classes	10+5+7+7+2 = 31h 1 ECTS			
Student's workload connected with classes involving direct participation of teacher	49+10+3+3+2 = 67h 2 ECTS			

List of literature:

Required reading
1. Hodgkin A., *Marine Boilers {in:}* Cowley J. (edited by) *The Running and Maintenance of Marine Machinery*, The Institute of Marine Engineers, London, 1994. 2. Flanagan G.T.H., *Marine Boilers. Third Edition*, Butterworth-Heinemann, Printed and Bound by Athenaeum Press, Ltd., Gateshead, Tyne & Wear, 2000. 3. Górski Z., Perepeczko A., *Okrętowe kotły parowe*, Wydawnictwo Akademii Morskiej w Gdyni, Gdynia 2013 (in Polish). 4. Kowalski A., Krzyżanowski J., *Teoria okrętowych kotłów parowych*, Wydawnictwo Wyższej Szkoły Morskiej w Gdyni, Gdynia 1993 (in Polish).
Recommended reading
1. Jackson L., Morton Th.D., Reed's General Engineering Knowledge for Marine Engineers {in:} Boilers and Ancillaries, Thomas Reed Publications, Wiltshire, 1998. 2. Kowalski A., Krzyżanowski J., Okrętowe siłownie parowe. Wydawnictwo Wyższej szkoły Morskiej w Gdyni, Gdynia 1995 (in Polish). 3. Any book or scientific paper relating to ship's boilers. 4. The catalogues, websites of companies manufacturing marine boilers or their components.

Teacher:

Title/degree, name and surname	**University unit**
1. Supervisor:	
Tomasz Hajduk, PhD	Department of Marine Propulsion Plants
2. Other lecturers:	
Grzegorz Sikora, PhD	Department of Marine Propulsion Plants

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	33	Name of subject:	**SHIP TURBINES***
Main field of study:			MECHANICAL ENGINEERING
Level of qualification:			first degree studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
V	4	2	1	1			30	15	15		
Total numbers of hours during study:							**60**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills of first degree courses in: thermodynamics, mechanics, strength of materials.

Course aims

1.	The aim of the course is to provide basic knowledge and skills in the safe turbine power plant operation

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	properly maintain, operate and exploit the equipment and ship installations, safely handle consumables used in shipbuilding shipbuilding, use knowledge of technical standards and norms related to construction and operation of machinery	K_W04, K_W06, K_W09
EP2	retrieve information from literature, databases (also in English) Integrate information from literature, databases (including English) and other sources, making interpret, draw conclusions and formulate and justify opinions	K_U01
EP3	identify the benefits of self-learning, inter alia, in order to improve professional competence, use analytical, simulation and experimental methods to formulate and solve practical engineering tasks engineering analytical, simulation and experimental methods, typical of a marine power plant	K_U05, K_U09
EP4	work in a group with different roles, apply the principles of cooperation	K_K05

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester V

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Energy conversion systems in the turbine stage. Operating principle Action stage, reaction stage and Curtis stage.	2			EP1
2.	Velocity triangles, forces arising in a step, torque, power.	2			EP2
3.	Circumferential and extra-circular losses in a turbine stage, Circumferential and internal efficiency of the turbine stage.	3			EP1
4.	Turbine internal efficiency, comparison circuit for a turbine power plant.	2	2		EP1
5.	Regenerative feedwater reheat, steam reheat, utilisation turbine circuits	2	3		EP1
6.	Principles of power regulation of marine steam turbines, types of regulation.	2			EP1
7.	Characteristics of marine steam turbines. Conversion issues in ship turbines.	2	4		EP1,EP2
8.	The basic thermal cycle and layout of a modern marine gas turbine .	2	2		EP1,EP2
9.	Characteristic indicators of a gas turbine, ways to increase.	4	4		EP1,EP2
10.	Working principle of the radial and axial compressor stage.	2			EP1
11.	Compression stage characteristics, turbocharger interaction with diesel engine.	2		4	EP1
12.	Components of rotating thermal machinery.	2			EP1
13.	Typical failures of rotating thermal machines.	2			EP3
14.	Classification societies' regulations for turbines.	1			EP1,EP2
15.	Steam turbine operation - commissioning, starting, loading and turbine shutdown.			7	EP3,EP4
16.	Balancing a turbocharger rotor			4	EP1
	Total numbers of hours during semester:	**30**	**15**	**15**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x				x	
EP2				x					
EP3				x					
EP4					x			x	

Assessment criteria:

Semester	Possitive grade (minimum passing grade in Polish: dostateczny)
V	The student achieved the expected learning outcomes, attended all lectures, exercises and laboratory classes in accordance with the study plan. The grade to be added to the course book after successful completion of 3 forms of classes with the average of the received marks from the lecture, exercises and laboratory.

Note: student gets higher than minimum passing grade if achived learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	45	15		
Reading literature	10			
Preparing for laboratories, project classes		20		
Preparing for exam, pass test	5			
Developing project/report		15		
Participation in exam, pass test	3			
Consultation with teacher	2	5		
Total number of hours	65	55		
Number of ECTS credits	**2**	**2**		
Total number of ECTS credits for the subject	**4**			
Student's workload connected with practical classes	15+20+15+5=55h 2 ECTS			
Student's workload connected with classes involving direct participation of teacher	45+15+3+2+5=70h 3 ECTS			

List of literature:

Required reading
1. Cwilewicz R., Perepeczko A.: Okrętowe turbiny parowe, Fundacja Rozwoju Akademii Morskiej w Gdyni, Gdynia 2002. 2. Perycz S.: Turbiny parowe i gazowe, Ossolineum, 1992. 3. Cwilewicz R.: Okrętowe turbiny gazowe, Fundacja Rozwoju Akademii Morskiej w Gdyni, Gdynia 2004. 4. Szewalski R.: Turbiny parowe, Poradnik techniczny, Mechanik t. IV, PWT, Warszawa 1960. 5. Lipka M.: Wytrzymałość maszyn wirnikowych, WNT, W-wa, 1967. 6. Tuliszka E.: Turbiny cieplne, zagadnienia termodynamiczne i przepływowe, WNT, Warszawa 1973.
Recommended reading
1. Nikiel T.: Elementy turbin parowych, PWT, Warszawa 1960. 2. Nikiel T.: Turbiny parowe, WNT, Warszawa 1980.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Prof. Pikotr Krzyślak, DSc (Eng)	Department of Marine Propulsion Plants

2. Other lecturers:	
Jerzy Herdzik, DSc. Eng), Ass. Prof.	MPPD

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	35	Name of subject:	**MARINE AUXILIARY MACHINES AND EQUIPMENT***
Main field of study:			MECHANICAL ENGINEERING
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
IV	2	2					30				
V	3	2		1			30		15		
VII	4	2		1		0,7	30		15		10
Total numbers of hours during study:							**130**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the field of secondary school

Course aims

1.	The aim of the course is to provide basic knowledge and skills in the field of construction and operation of ship machinery and equipment necessary for safe operation technical equipment of the ship.
2.	The program meets the requirements of the framework extended training program at the level operational and management in the machine department in the mechanical specialty specified in Annex No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 as amended, consolidated text Journal of Laws of 2017, item 775.

Intended key learning outcomes for the subject (EP):

Symbol	After completing the course, the student:	Reference to field learning outcomes
EP1	has structured general knowledge in the field of construction and operation of marine machinery	K_W03
EP2	has detailed technical knowledge necessary for proper maintenance, operation and operation of ship equipment and installations	K_W04
EP3	has a detailed knowledge of the life cycle of power plant and general ship machinery and equipment	K_W07
EP4	knows the basic methods, techniques, tools and materials used in solving simple engineering tasks related to marine power plants and ship operation	K_W09
EP5	has detailed knowledge of managing the safe operation of the ship, organization and management of marine engine room resources	K_W12
EP6	is able to plan and carry out experiments, including measurements and computer simulations, interpret the obtained results and draw conclusions	K_U08

EP7	is able to apply knowledge to interpret phenomena occurring in machinery, equipment and ship installations	K_U13
EP8	is able to make a critical analysis of the way of functioning ship mechanisms and devices and evaluate the existing solutions technical requirements necessary for the proper and safe operation of the marine power plants	K_U15
EP9	can identify and formulate a specification of simple lines engineering tasks of a practical nature, including: failure removal, inspections, planning and repair of equipment and installations energy (in particular ship installations)	K_U16
EP10	is able to assess the usefulness and apply the appropriate method (procedure) and tools to solve simple engineering tasks of a practical nature, related to the operation of mechanisms and devices of marine power plants	K_U18
EP11	is able and has experience in operating and maintaining machinery, installations, machinery and equipment of ship power plants (appropriate for the engineer officer diploma of a watch)	K_U20
EP12	knows how to use and use information on: construction and stability documentation of the ship, technical and operational documentation of ship equipment, diagrams of ship installations	K_U22
EP13	is aware of the importance of professional and ethical responsibility for decisions made in the field of operation of marine power plants	K_K01
EP14	in specific sea conditions, can act in an entrepreneurial way	K_K10

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester IV

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Pump systems: a) types of pump systems, b) characteristic values of the pump system, c) characteristics of pump systems. **(8.6.1)**	2			EP1, EP2, EP3, EP4, EP7, EP8, EP9
2.	Pumps: a) classification, characteristics and application of particular types of the pumps, b) types of pump drive, motor characteristics, c) centrifugal pumps: - construction and principle of operation, - pump operating parameters, - characteristic parameters, characteristic of speed (shape) of the impeller, - pump characteristics: flow, power and efficiency, complete, - cooperation of the pump with the pumping system, energy balance, selection of the type and power of the pump drive, - the impact of the pump system parameters on the pump efficiency, - methods of regulating the pumps efficiency, - series and parallel cooperation of pumps,	9			EP1, EP2, EP3, EP4, EP7, EP8, EP9

	- transverse and longitudinal forces acting on the rotor, methods of balancing, - the most important service activities (starting, supervision during operation, stopping), - the most common faults of centrifugal pumps during operation, symptoms and ways to eliminate them, d) positive displacement pumps: - construction and principle of operation, - characteristic parameters of the pump, - operating parameters of the pumps, - pump characteristics: flow, power and efficiency, - cooperation of the pump with the pumping system, energy balance, selection of the type and power of the pump drive, - influence of pumping system parameters pump efficiency, - methods of regulating the efficiency of pumps, - series and parallel cooperation of pumps, - the most important service activities (starting, supervision during operation, stopping), - the most common faults of displacement pumps during operation, symptoms and ways to eliminate them, e) the phenomenon of cavitation in pump installations, effects and methods of prevention, f) classification societies regulations for marine pumps. **(8.6.2)**				
3.	Influence of operating factors on pump characteristics. **(8.6.3)**	2			EP1, EP2, EP3, EP4, EP7, EP8, EP 9
4.	Jet pumps: a) construction and principle of operation, b) classification and application of the jet pumps, c) characteristic parameters of the jet pumps, d) operating parameters of jet pumps, e) cooperation of the jet pump with the installation, f) characteristics of jet pumps. **(8.6.4)**	2			EP1, EP2, EP3, EP4, EP7, EP8, EP 9
5.	Compressors: a) division, classification and application of compressors, b) positive displacement compressors: - construction and principle of operation, p(v), t(s) diagram, actual volumetric ratio, multi-stage compression, compression end temperature, compressor cooling and lubrication, - positive displacement compressors timing gear, - positive displacement compressors characteristic parameters, - positive displacement compressors working parameters, - cooperation with compressed air installation, - measurement and regulation of ship compressor capacity, - the most important service activities (starting, supervision during operation, stopping), - the most important activities during inspections of positive displacement compressors (measurement of clearance	6			EP1, EP2, EP3, EP4, EP7, EP8, EP 9

	volume, adjustment, adjustment of interstage pressure), - the most common faults of positive displacement compressors during operation, symptoms and ways to eliminate them, - protection of compressors and compressed air installations, - classification societies regulations for compressors starting air, c) centrifugal compressors: - construction and principle of operation, p(v), t(s) diagram, multi-stage compression, compression end temperature, compressor cooling and lubrication, - centrifugal compressors characteristic parameters, - centrifugal compressors characteristics, - centrifugal compressors working parameters, - cooperation with compressed air installation, - capacity adjustment, - phenomenon of pumping in centrifugal compressors and methods of prevention, d) blowers and fans: - characteristics, - cooperation with the ventilation system. **(8.6.5)**				
6.	Equipment for purification of fuels and oils: a) types of impurities in fuels and oils, impact on operation ship equipment and installations, b) gravity sedimentation and centrifugation: - theoretical basics, - construction of centrifuges, - selection of centrifuges in terms of efficiency for various ship power plant installations, - selection of methods and parameters for centrifugation of marine fuels, - selection of methods and parameters for centrifugation of lubricating oils, - the most important service activities (starting, supervision during operation, stopping), - the most common defects of centrifuges during operation, symptoms and ways to remove them, c) filtration: - theoretical basics, - filtration partitions, characteristic sizes of partitions, - construction and maintenance of fuel and oil filters. **(8.6.6)**	7			EP1, EP2, EP3, EP4, EP7, EP8, EP9
7.	Installations and devices for adjusting fuel viscosity before the engine: a) construction and installation tasks, b) construction and principle of operation of mixers and homogenizers, c) viscosity measurement methods in ship installations fuel, d) elements and settings of fuel viscosity control system devices, e) application of viscosity control systems in fuel mixing installations, f) procedures for changing the type of fuel supplying the engine: HFO/MDO and MDO/HFO, g) the most common faults during operation, symptoms and ways	2			EP1, EP2, EP3, EP4, EP7, EP8, EP9

	to eliminate them. **(8.6.7)**				
	Total numbers of hours during semester:	**30**			

Semester V

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Heat exchangers: a) theoretical basis of heat movement, conduction, heat penetration, heat transfer and radiation, characteristic parameters, b) division, construction and application of heat exchangers, c) co-current, counter-current, mixed-current heat exchangers, d) structural elements of heat exchangers, e) operating parameters of heat exchangers, f) operation of heat exchangers, systems for automatic temperature control of the flowing medium, g) types of corrosion and methods of prevention, h) cleaning, maintenance and tightness tests of heat exchangers, i) classification societies regulations for heat exchangers. **(8.6.1)**	8			EP1, EP2, EP3, EP4, EP7, EP8, EP9
2.	Devices for converting seawater to freshwater on a ship: a) construction, principle of operation and operation of vacuum evaporators, b) the most important service activities (starting, supervision during operation, stopping), c) the most common faults during operation, symptoms and ways to eliminate them, d) construction, principle of operation and operation of devices operating using the reverse osmosis phenomenon, e) the most important service activities (starting, supervision during operation, stopping), f) the most common faults during operation, symptoms and ways to eliminate them, g) classification societies regulations for fresh water generating equipment. **(8.6.9)**	5			EP1, EP2, EP3, EP4, EP7, EP8, EP9
3.	Marine hydraulic installations: a) theoretical basis for the operation of hydraulic systems, b) elements of hydraulic systems: - hydraulic pumps, - hydraulic motors, - actuators, - valves, - directional control valve, - hydraulic lines, - tanks, c) symbols used in the documentation of hydraulic systems, d) the most common faults during operation, symptoms and ways to eliminate them, e) the most important rules for operating hydraulic systems, supervision procedures during work, procedures for disassembly, assembly, flushing, changing the hydraulic fluid.	7			EP1, EP2, EP3, EP4, EP7, EP8, EP9

	(8.6.10) f) diagnostics of pumps and hydraulic devices. **(8.5.15)**				
4.	Steering gear of the ship: a) construction and operation of electro-hydraulic steering machines (piston, plunger, vane, toroidal), b) adjustment of electro-hydraulic steering gears, c) the most important service activities (starting, supervision during operation, stopping), d) the most common faults during operation, symptoms and ways to eliminate them, e) emergency steering gear operating procedure, f) classification societies regulations for steering gear. **(8.6.11)**	6			EP1, EP2, EP3, EP4, EP7, EP8, EP9
5.	Principle of operation and construction of thrusters and active thrusters. **(8.6.12)**	4			EP1, EP2, EP3, EP4, EP7, EP8, EP9
6.	Centrifugal pumps testing. *Cooperation of a centrifugal pump with a pumping system:* *a) preparation of the installation to start the pump,* *b) starting the pump, reading the values of operating parameters, adjusting the capacity,* *c) assessment of the correctness of the pump operating parameters on the basis of the pump manual, operating point,* *d) performing maintenance activities: checking the grounding of the electric motor, lubricating the bearings, replenishing the grease, checking the temperatures of the pump and motor bearings,* *e) shutdown of the pump and installation*. **(8.6.21)**			6	EP1, EP2, EP4, EP5, EP6, EP7, EP8, EP9, EP10, EP11, EP12
7.	Positive displacement compressor testing. *Performance measurement of the starting air piston compressor:* a) *familiarization with the starting air compressor equipment*, *b) familiarization with the starting air system equipment,* c) *preparation of the compressor and compressed air installation for operation*, d) *turning on the compressor*, *e) reading and interpretation of the compressor operating parameters, assessment of the correctness of the parameter values based on the manufacturer's recommendations,* *f) maintenance activities during compressor operation,* *g) measurement of compressor efficiency and comparison with the requirements of classification institutions*. **(8.6.22)** *h) study of changes in the indicator diagram of the compressor depending on the simulated failures.*			4	EP1, EP2, EP4, EP5, EP6, EP7, EP8, EP9, EP10, EP11, EP12
8.	Fan testing: a) determination of fan characteristics, b) determination of the characteristics of the ventilation system, c) cooperation of the fan with the installation.			1	EP1, EP2, EP4, EP5, EP6, EP7, EP8, EP9, EP10, EP11, EP12
9.	Heat exchanger testing: a) determination of heat transfer coefficient of the exchanger oil-			1	EP1, EP2, EP4, EP5,

	water, b) study of changes in the heat transfer coefficient as a function of the flow rate of the medium.				EP6, EP7, EP8, EP9, EP10, EP11, EP12
10.	Fuel centrifugation: a) selection of the centrifugation method (purification, clarification, series and parallel connection of centrifuges), b) selection of centrifugation parameters for a specific fuel, c) preparation of the fuel purification installation, d) preparation of the centrifuge for start-up, e) starting the centrifuge, setting centrifugation parameters, f) maintenance activities during the operation of the fuel separator, g) turning off the centrifuge and shutting down the fuel purification system. **(8.6.24)**			3	EP1, EP2, EP4, EP5, EP6, EP7, EP8, EP9, EP10, EP11, EP12
Total numbers of hours during semester:		**30**		**15**	

Semester VII

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Controllable pitch propellers: a) construction and principle of operation of the controllable pitch propeller, b) the most important maintenance activities (starting, supervision during operation, stopping) of the controllable pitch propeller mechanisms, c) the most common faults during operation, symptoms and ways to eliminate tchem. **(8.6.13)**	8			EP1, EP2, EP3, EP4, EP7, EP8, EP9
2.	Anchor devices: a) elements of the anchor device, b) construction and operation of electric capstans and windlasses, c) construction and operation of hydraulic capstans and windlasses, d) the most important service activities (starting, supervision during operation, stopping), e) the most common faults during operation, symptoms and ways to eliminate them, f) classification societies regulations for anchor devices. **(8.6.14)**	4			EP1, EP2, EP3, EP4, EP7, EP8
3.	Installations for opening and closing cargo hold hatch covers: a) hydraulic installations - construction and operation, b) the most common faults during operation, symptoms and ways to eliminate them, c) emergency closing and opening of the cargo hold **(8.6.15)**	2			EP1, EP2, EP4, EP7, EP8, EP9
4.	Hydraulic installations of watertight doors: a) construction and operation of watertight compartment doors, b) construction and operation of bow and stern gates, c) the most common faults during operation, symptoms and ways to eliminate them **(8.6.16).**	2			EP1, EP2, EP3, EP4, EP7, EP8, EP9
5.	Cargo-handling equipment: a) construction of cargo booms,	6			EP1, EP2, EP3, EP4,

	b) construction and operation of topping lift and grove rope hoist, c) construction and operation of electric cranes, d) construction and operation of hydraulic cranes, e) conditions of cooperation of cargo-handling equipment. **(8.6.17)**				EP7, EP8, EP9
6.	Ship stabilizer systems: a) types and applications of ship stabilizer systems, b) construction and operation of tilt stabilization devices and installations. **(8.6.18)**	2			EP1, EP2, EP3, EP4, EP7, EP8, EP9
7.	Boat Lifts: a) construction and operation of lifeboat lifts, b) construction and operation of lifeboat launcher. **(8.6.19)**	2			EP1, EP2, EP3, EP4, EP7, EP8, EP9
8.	Shaft lines: a) shaft lines: ship propeller shaft, intermediate shafts, thrust shafts, regulations for assembling the ship propeller with the engine, b) construction, lubrication systems and service of ship shaft bearings (stern, intermediate, thrust), c) construction and service of couplings, d) construction and operation of marine gearboxes. **(8.6.20)**	4			EP1, EP2, EP3, EP4, EP7, EP8, EP9
9.	Pumps and hydrophore installations operation simulation.			1L	EP1,EP13, EP14
10.	Compressor operation simulation.			1L	EP1,EP13, EP14
11.	Fresh water generator operation simulation.			1L	EP1,EP13, EP14
12.	Osmotic desalter operation simulation.			1L	EP1,EP13, EP14
13.	Steering gear operation simulation.			1L	EP1,EP13, EP14
14.	Controllable pitch propellers operation simulation.			1L	EP1,EP13, EP14
15.	Bilge water oil separator operation simulation.			1L	EP1,EP13, EP14
16.	Sanitary sewage treatment plant operation simulation.			1L	EP1,EP13, EP14
17.	Fuel viscosity adjustment: a) preparation of the installation of automatic fuel viscosity control for operation, b) checking the correctness of work parameters, c) making adjustments, d) shutdown of the installation, e) calibration of the components of the automatic fuel viscosity adjustment system. **(8.6.25)**			7L	EP1, EP2, EP4, EP5, EP6, EP7, EP8, EP9, EP10, EP11, EP12
18.	Operational analysis of the work of machines and auxiliary devices based on the skills acquired in the simulator and during sea practice.			10S	EP1,EP12, EP13, EP14

Total numbers of hours during semester:	**30**			

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1			x	x					
EP2				x					
EP3				x					
EP4				x					
EP5					x				
EP6					x				
EP7					x		x		
EP8					x		x		
EP9				x	x		x		
EP10					x		x		
EP11					x				
EP12					x				
EP13							x	x	
EP14								x	

Assessment criteria:

Semester	Possitive grade (minimum passing grade in Polish: dostateczny)
IV	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. Attended lectures (admissible - 3 absences). **Lecture**: passing the colloquium from the lecture.
V	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. Attended lectures (admissible - 3 absences). **Lecture**: passing the colloquium from the lecture. **Laboratory:** performing and passing all laboratory exercises according to the schedule. Final grade average of grades for theoretical knowledge, laboratory work, report. Grade for the student record book after successfully completing 2 forms of classes with the grade averaged from the grades received from the lecture and laboratory.
VII	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. Attended lectures (admissible - 3 absences). **Lecture:** passing the colloquium from the lecture. Final exam covering all material from the 4th, 5th and 6th semester. **Laboratory:** performing and passing all simulation exercises according to the schedule. **Seminar:** passing the Sea Practice Book and a presentation on the operation of selected machinery and auxiliary equipment of the ship. Grade for the student record book after successful completion of 3 forms of classes with the grade averaged from the grades received for passing the computer laboratory, seminar and final exam

Note: student gets higher than minimum passing grade if achived learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	90	30		10
Reading literature	30			
Preparing for laboratories, project classes		20		5
Preparing for exam, pass test	30			
Developing project/report		10		10
Participation in exam, pass test	10	2		
Consultation with teacher	4	2		
Total number of hours	164	64		25
Number of ECTS credits	**6**	**2**		**1**
Total number of ECTS credits for the subject	**9**			
Student's workload connected with practical classes	30+20+10+2+2=64h 2 ECTS			

Student's workload connected with classes involving direct participation of teacher	90+30+10+10+4+2+2= 148h 5 ECTS

List of literature:

Required reading
1. Fernandez E.A, Yadav L.S.: Equipment and Systems - Deck Machinery on Ships. Publisher Shroff Publishers, Navi Mumbai 2022. 2. Górski Z.: Construction and Operation of Marine Pumps, Publisher TRADEMAR, Gdynia 2010. 3. Górski Z.: Construction and Working of Marine Compressors, Blowers and Fans, Gdynia Maritime University Development Foundation, Gdynia 2006. 4. Górski Z.: Construction and Operation of Marine Cleaning Machinery, Publisher TRADEMAR, Gdynia 2009. 5. Górski Z.: Construction and Working of Marine Heat Exchangers, Gdynia Maritime University Development Foundation, Gdynia 2007. 6. Górski Z.: Construction and Operation of Hydraulic Machinery, Publisher TRADEMAR, Gdynia 2008. 7. Górski Z.: Construction and Operation of Marine Steering Gears, Controllable Pitch Propellers and Stern Tubes, Publisher TRADEMAR, Gdynia 2009. 8. Todorov D. M.: Ro-Ro Handbook: A Practical Guide to Roll-On Roll-Off Cargo Ships. Publisher Cornell Maritime Press, Chester 2016. 9. Guldogan E.U.: Port Operations and Container Terminal Management. Publisher Vdm Verlag, Riga 2011.
Recommended reading
1. Jackson L., Morton T., Russel P. A.: General Engineering Knowledge for Marine Engineers. Publisher Bloomsbury Publishing, London 2006. 2. Khetagurov M.: Marine Auxiliary Machinery and Systems. Publisher Pacific University Press, Forest Grove 2004. 3. McGeorge H.D.: Marine Auxiliary Machinery. Publisher Butterworth-Heinemann, Massachusetts 1999. 4. Taylor D.A.: Introduction to Marine Engineering, Publisher Elsevier Science & Technology, Amsterdam 1996.

Teacher:

Title/degree, name and surname	**University unit**
1. Supervisor:	
Dr inż. Rafał Krakowski	MPPD (KSO)
2. Other lecturers:	
Dr inż. Piotr Kamiński	MPPD (KSO)
Dr inż. Andrzej Młynarczak	MPPD (KSO)

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	36	Name of subject:	**REFRIGERATION, VENTILATION AND AIR CONDITIONING***
Main field of study:			MECHANICAL ENGINEERING
Level of qualification:			first degree studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
V	2	2					30				
VII	2			1		0,7			15		10
Total numbers of hours during study:							**55**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the following subjects: Thermodynamics, Fluid Mechanics, Ship Automation, Electrical Engineering, Ship Electronics.

Course aims

1.	The aim of the course is to provide basic knowledge and skills in the field of construction, operation and operation of ship refrigeration, ventilation and air conditioning equipment, necessary for the safe operation of ship technical equipment equipped with such systems.
2.	The program meets the requirements contained in the framework extended training program at the operational and management level in the machinery department of the mechanical specialty set out in Annex 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 as amended, consolidated text DZ. Laws of 2017, item 775.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	explain the theoretical basis of the construction and operation of a compressor refrigeration device and its main components: compressor, condenser, evaporator and expansion valve.	K_W04, K_W07
EP2	operate a refrigeration and air-conditioning device during its operation, check its basic parameters, assess the general technical condition of the system.	K_U02, K_U13
EP3	identify the basic transformations of moist air and assess their parametric effects.	K_ W04, K_W07
EP4	interpret the operating parameters of the device and system in comparison to the technical documentation of the ventilation or air-conditioning system.	K_U08, K_U13, K_U16, K_U22

EP5	work in a group assuming different roles in it, apply the principles of cooperation, actively participate in the assessment of tasks performed by individual members of the group.	K_K03, K_K05

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester V

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	*Fundamentals of refrigeration technology:* *a) storage and transport of food,* *b) storage and transport of other refrigerated cargoes. (8.8.1)*	1			EP1
2.	*Basic parameters of climatic comfort. (8.8.2)*	1			EP3
3.	*Thermodynamic basics of refrigeration cycles. (8.8.3)*	1			EP1
4.	*Refrigeration cycles used on ships:* *a) markings and symbols used in refrigeration schemes,* *b) classification and application of refrigeration circuits,* *c) refrigerants, properties, markings, application, interchangeability of refrigerants,* *d) household refrigerators and freezers,* *e) cold stores,* *f) refrigerated holds,* *g) refrigerated containers,* *h) air conditioning of rooms,* *i) operating parameters of refrigeration cycles. (8.8.4)*	3			EP1
5.	*Compressors and chillers:* *a) classification and application of refrigeration compressors,* *b) construction, principle of operation, operating parameters and operation of reciprocating compressors,* *c) construction, principle of operation, operating parameters and operation of screw compressors,* *d) construction, principle of operation, operating parameters and operation of scroll compressors,* *e) construction, principle of operation, operating parameters and operation of refrigeration units,* *f) construction, principle of operation, operating parameters and operation of household refrigerators and freezers,* *g) regulation of compressor capacity,* *h) measuring and controlling devices for compressors,* *i) the most common faults during operation, symptoms and ways to eliminate them. (8.8.5)*	3			EP1
6.	*Refrigeration apparatus:* *a) heat exchangers (condensers, coolers, heaters, evaporators),* *b) dehumidifiers,* *c) oil separators,* *d) degassers,* *e) air-purgers,* *f) refrigerant pumps,* *g) refrigerant and oil tanks. (8.8.6)*	2			EP1

7.	*Auxiliary installations of:* *a) refrigerant,* *b) oil,* *c) defrosting. (8.8.7)*	1			EP1
8.	*Cooperation of the compressor with the refrigeration system. (8.8.8)*	2			EP2
9.	*Automation of supervision of refrigeration equipment and installations:* *a) measuring and control devices,* *b) protection of refrigeration installations,* *c) pressure, temperature and level control systems. (8.8.9)*	2			EP1
10.	*Operating activities related to refrigeration installations, setting the operating parameters of refrigeration installations:* *a) preparation of the installation for operation and commissioning,* *b) temperature control and regulation,* *c) checking the tightness of the installation,* *d) control of the amount of refrigerant in the circuit and replenishment,* *e) control of the amount of oil in the circuit and replenishment,* *f) defrosting,* *g) shutdown of the installation,* *h) the most common faults during operation, symptoms and ways to eliminate them. (8.8.10)*	3			EP2
11.	*Ventilation and air conditioning of the inhabited rooms: regulation of temperature and air humidity. (8.8.11)*	3			EP3, EP4
12.	*Ventilation of refrigerated holds: regulation of temperature and air humidity. (8.8.12)*	3			EP3, EP4
13.	*Heat balance of a chilled chamber and the influence of external conditions on the components of the balance. (8.8.13)*	2			EP1, EP2
14.	*Work safety in operating refrigeration systems. (8.8.14)*	1			EP1, EP2
15.	*Maintenance activities in emergency states. (8.8.15)*	1			EP2
16.	*Regulations of classification societies for refrigeration systems, ship's documents. (8.8.16)*	1			EP2
Total numbers of hours during semester:		**30**			

Semester VII

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	*Use of refrigeration plant diagrams to explain operation, preparation for commissioning, shutdown, preparation for disassembly, component replacement, condenser cleaning, refrigerant charging, lubricating oil, refrigerant suction, overhaul, troubleshooting, and other typical maintenance activities. (8.8.17)*			4/-	EP1, EP2, EP5
2.	*Adjustment of the expansion valves. (8.8.18)*			2/-	EP1, EP2
3.	*Suctioning of the refrigerant from the circuit. (8.8.19)*			2/-	EP1, EP2
4.	*Replenishing the refrigerant in the circuit. (8.8.20)*			3/-	EP2, EP5
5.	*Refilling the lubricating oil in the compressor. (8.8.21)*			2/-	EP2, EP5
6.	*Leak detectioning in the refrigerant system. (8.8.22)*			2/-	EP2, EP5

7.	*Selected problems of operation of refrigeration equipment on ships specializing in the transport of liquefied gases.*			-/3	EP2, EP4, EP5
8.	*Selected problems of exploitation of marine power plant ventilation systems.*			-/2	EP2, EP4, EP5
9.	*Selected problems of operation of air-conditioning systems on sea-going ships and ocean-technical facilities.*			-/3	EP2, EP4, EP5
10.	*Legal aspects and requirements of classification institutions regarding the safe use of refrigeration equipment.*			-/2	EP2

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x					
EP2					x		x	x	
EP3				x					
EP4					x		x	x	
EP5								x	

Assessment criteria:

Semester	Possitive grade (minimum passing grade in Polish: dostateczny)
V	The student has achieved the assumed learning outcomes and meets the requirements of the STCW convention regarding the completion of the course. The student has attended lectures (3 unexcused absences are allowed). Lecture: written test within issues discussed during the lecture.
VII	The student has achieved the expected learning outcomes. The student completed and passed all laboratory and seminar classes in accordance with the study plan. Final evaluation consists of the work in the laboratory, the lab reports and the presentation presented during the seminar classes.

Note: student gets higher than minimum passing grade if achived learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	30	15		10
Reading literature	15			
Preparing for laboratories, project classes		7		10
Preparing for exam, pass test	15			
Developing project/report		7		10
Participation in exam, pass test	4			
Consultation with teacher		2		
Total number of hours	64	31		30

Number of ECTS credits	2	1		1
Total number of ECTS credits for the subject	**4**			
Student's workload connected with practical classes	15+7+7+2+10+10+10=61h 2 ECTS			
Student's workload connected with classes involving direct participation of teacher	30+4+15+2+10=61h 2 ECTS			

List of literature:

Required reading

1. Stera A. C. and Templeton J., *Marine Refrigerating Plant {in:}* Cowley J. (edited by) *The Running and Maintenance of Marine Machinery*, The Institute of Marine Engineers, London, 1994.
2. Bonca Z., Dziubek R.: *Selected problems of refrigerating engineering*, Wydawnictwo Wyższej Szkoły Morskiej, Gdynia 1992
3. Bonca Z.: Chłodnictwo okrętowe. Wyd. Akademii Morskiej w Gdyni, 2006 (in Polish).
4. Bonca Z.: Automatyka chłodnicza i klimatyzacyjna. Wyd. WSM w Gdyni, 2000 (in Polish).
5. Bonca Z., Depta A.: Wentylacja i klimatyzacja okrętowa. Wyd. WSM w Gdyni, 1999 (in Polish).
6. Bonca Z. Dziubek R.: Okrętowe urządzenia chłodnicze. Laboratorium, cz. II, Wyd. WSM w Gdyni, 1996 (in Polish).
7. Bonca Z. Dziubek R.: Budowa i eksploatacja kontenerów chłodniczych. Wyd. WSM w Gdyni, 1994 (in Polish).
8. Studziński A.: Eksploatacja chłodniowców. Wyd. TRADEMAR, Gdynia 2005 (in Polish).
9. Butrymowicz D., Baj P., Śmierciew K.: Technika chłodnicza. Wyd. PWN, Warszawa 2014 (in Polish).

Recommended reading

1. Any book or scientific paper relating to refrigeration, ventilation and air conditioning.
2. The catalogues, websites of companies manufacturing refrigeration, ventilation and air conditioning components or systems.
3. Ullrich H.J: Technika Chłodnicza. Poradnik. Tom I i II. Wyd. MASTA, Gdańsk 1998, 1999 (in Polish).
4. Ullrich H.J.: Technika Klimatyzacyjna. Wyd. MASTA, Gdańsk 2001 (in Polish).
5. Praca zbiorowa: Nowe czynniki chłodnicze i nośniki ciepła. Poradnik 2004. Wyd. MASTA, Gdańsk 2004 (in Polish).
6. Praca zbiorowa pod red. Z. Boncy: Amoniakalne urządzenia chłodnicze. Wyd. MASTA, Gdańsk 2000 (in Polish).
7. Targański W., Staniszewski D.: Odzysk ciepła w instalacjach chłodniczych i klimatyzacyjnych. Wyd. MASTA, Gdańsk 2007 (in Polish).
8. Chorowski M.: Kriotechnika. Podstawy i zastosowania. Wyd. MASTA, Gdańsk 2007 (in Polish).

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Ph.D. Eng. Marcin Frycz	ESD
2. Other lecturers:	
Ph.D. Eng. Grzegorz Sikora	MPPD
M.Sc. Tomasz Marut	MPPD

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	37	Name of subject:	**MARINE ELECTROTECHNICS AND ELECTRONICS***
Main field of study:			MECHANICAL ENGINEERING
Level of qualification:			first degree studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
V	2	2					30				
VII E	4	3,2		1		0,7	48		15		10
Total numbers of hours during study:							**103**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the secondary school.
2.	Knowledge and skills for previous semesters.

Course aims

1.	The aim of the course is to provide basic knowledge and skills in the field of electrical engineering and electronics necessary for the safe operation of technical equipment of the ship.
2.	The program meets the requirements contained in the framework extended training program at the operational and management level in the machinery department of the mechanical specialty set out in Annex 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 as amended, consolidated text DZ. Laws of 2017, item 775.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	discuss the design and operation of transformers and rotating machines	K_W03, K_W04, KW_07, K_U07
EP2	explain the basic concepts of electrical engineering and marine power engineering	K_W03, K_U15, K_U16
EP3	discuss Electric drives of machinery and deck devices	K_W09, K_U13, K_U22
EP4	maintain components, electronic systems and power electronics	K_W12, K_K02, K_U15, K_U21

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester V

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	*Transformers:* *a) single phase transformer, winding and core construction, classification, voltage ratio, basic relation, phasor diagram, short circuit and idling, voltage drop, nominal power of transformer, current and voltage transformers,* *b) three phase transformer, winding and core construction, windings connection, relations between voltages and currents in 3-phase transformer, group connections concept, parallel work of transformers, asymmetrical load of transformer* *c) special transformers,* *d) materials used in the construction of transformers.* **(8.11.6)**	6			EP1
2.	*Rotating machines:* *a) synchronous machine, design types, load and armature reaction, phasor diagram and characteristics of machine, basic relation, synchronous machine torque, field current and regulation characteristics, excitation systems (generally),* *b) asynchronous squirrel cage motor, working principle, equations and equivalent circuit, machine torque, mechanical characteristics, selected operating status: idle state, short circuit state, supply frequency change, start, generator work,* *c) asynchronous slip ring motor, selected work states of the machine,* *d) DC commutator machine, schematic overview of the machine, magnetic field in DC machine, generator work and armature reaction, load characteristics of generator, parallel work of DC generators,* *e) DC motors, winding diagrams, mechanical characteristics, control and start issues,* *f) special electrical machines,* *g) construction of rotating machines, components, construction materials, manufacturing technologies, repair and overhaul technologies.* **(8.11.7)**	22			EP1
3.	*Installations for voltages above 1 kV on ships:* *a) HV technologies,* *b) cables, switching and protection devices in high voltage systems,* *c) HV power electronic components,* *d) safe operation of high voltage installations.* **(8.11.15)**	2			EP1
	Total numbers of hours during semester:	**30**			

Semester VII E

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	*Electric drives of marine equipment:* *a) objectives and structure of the drive system, characteristics of the drive motor and load, the operating point of the drive set, the*	10		2/3	EP3

	dynamic characteristics of the drive, drive control tasks, types of control: contactor -relay , electronic, computer control, *b) drives with DC motor, the characteristics of a DC motor drive, the change in angular velocity, the issue of starting, reversing operation, types of control,* *c) examples of marine drives with DC motor, simple pump and fan drives, adjustable thyristor drive,* *d) squirrel-cage motor drives, the characteristics of the cage motor drive, cage motor control processes, start-up and security, control frequency, multi-speed motors,* *e) frequency drives with cage motor, the construction of the frequency inverter, control characteristics, startup and commissioning, control and security.* **(8.11.8)**				
2.	*Fundamentals of marine electrotechnics:* *a) generation of electrical power on shipboard, diesel generators, turbo-generators, shaft generators, parameters and characteristics, automatic voltage regulators (fundamentals),* *b) emergency source of electric power, batteries and their types, application of batteries, principles of batteries exploitation and charging,* *c) emergency generators and emergency switchboard,* *d) electric power balance, determining the installed power of ship electric power plant and its configuration,* *e) protection against electric shock on shipboard, human susceptibility for electric shock, safe voltages and currents, isolated and grounded networks, fundamental of electrical equipment grounding, monitoring of network insulation resistance,* *f) fundamentals of electric power sources operation in parallel, preparation, starting up and switching electric sources on for parallel work, changes of generators,* *g) electric power distribution onboard,* *h) high voltage marine networks (>1 kV), assignment, work parameters and protection.* **(8.11.10)**	10		-/4	EP2
3.	*Components and electronic systems and power electronics, maintenance and replacement:* *a) semiconductor elements* *b) diodes,* *c) transformer,* *d) thyristors,* *e) power transistors,* *f) resistors,* *g) capacitors,* *h) filters,* *i) integrated circuits,* *j) microprocessors,* *k) amplifiers,* *l) power supplies,* *m) uncontrolled rectifiers,* *n) stabilizers,* *o) controlled rectifier,* *p) inverters,* *q) drivers AC*	1		2/-	EP4

	r) direct and indirect frequency converters, cycloconverters. **(8.11.12)**				
4.	*Marine electric power engineering* *a) electric power systems on shipboard and distribution systems,* *b) sources of electrical energy,* *c) parallel work of marine generators:* *− systems for synchronization of marine generators,* *− protection of marine generators,* *− automatic voltage regulators,* *d) electric power switchboard and their equipment:* *− cables,* *− switches,* *− protection devices.* *e) sequential control of receivers and related equipment,* *f) preparation, starting up, synchronization, switching new generator on main switchboard bus bars and loading,* *g) structure and features of high voltage marine networks above 1kV,* *h) lighting installation,* *i) emergency supply and lighting,* *j) shore connection,* *k) electrical installation and equipment in hazardous areas.* **(8.11.13)**	10		-/2	EP2
5.	*Signaling and alarm systems on the ship.* **(8.11.17)**	1		1/-	EP2
6.	*Ship internal communication device.* **(8.11.18)**	1		1/-	EP2
7.	*Exploitation of marine electrical equipment: maintenance and repair of electrical equipment, switchgear, electric motors, generators, equipment and DC installations, in accordance with the operating instructions and good practice.* **(8.11.19)**	5		1/1	EP2
8.	*Exploitation of marine electrical equipment:* *a) oversight of electrical and electronic equipment,* *b) supervising the event of failure of repair, restoring to traffic electrical and electronic control systems, under technical, legal and safety procedures.* **(8.11.20)**	2			EP2
9.	*Guidelines for safe work with electrical equipment on the ship.* **(8.11.24)**				
10.	*The impact of work of electronic devices on the interference in the electric grid.* **(8.11.21)**	1			EP2
11.	*Technical documentation - wiring diagrams, symbols, interpretation, localization of faults.* **(8.11.22, 23, 31, 32)**	2		2/-	EP2
12.	*Characteristics of chemicals used in repairs and maintenance of electrical equipment, MSDS cards.* **(8.11.25)**	2		1/-	EP4
13.	*Security of motors and generators:* *a) checking of the thermo-bimetal relay,* *b) checking and analysis of the performance of the security of block synchronous generator, including security overcurrent protection, short circuit and reverse power,* *c) checking and analysis of the performance of triggers during overcurrent and overvoltage in circuit breakers.* **(8.11.28)**	1		1/-	EP4

14.	*Measurements and documentation of the insulation condition:* *a) insulation materials,* *b) insulation materials classes,* *c) protection degree of electrical machines.* **(8.11.16, 30)**	2		1/-	EP2
15.	*Software for control of equipment of ship engine room.* **(8.11.14)** *Control systems: operation of software support of digital control systems of engine room equipment.* **(8.11.29)**			2/-	EP4

Reference list of identification of the framework extended training course for operational and management level in engine department, in mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments, with the study program for first-cycle studies with a practical profile with major in Ship Propulsion Plant and Offshore Construction Operation of the Faculty of Mechanical Engineering of the Gdynia Maritime University.

No	Subject according to the framework extended training program	Subject No	Subject according to the program of first-degree studies with a practical profile (ESOiOO) at the GMU	Sem.	Subject No
1.	Marine electrotechnics and electronics (8.11)	**1-5, 11a-c, 11e**	Fundamentals of electrotechnics and electronics	I	1-6,7,8 2,
2.	Marine electrotechnics and electronics (8.11)	**9, 11d, 11f-g, 31, 32**	Fundamentals of electrotechnics and electronics	II	1,2, 1 14
3.	Marine electrotechnics and electronics (8.11)	**12a-g**	Fundamentals of electrotechnics and electronics	II	2,
4.	Marine electrotechnics and electronics (8.11)	**26**	Fundamentals of manufacturing engineering	III	12
5.	Marine electrotechnics and electronics (8.11)	**27**	Fundamentals of manufacturing engineering	III	13

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x					
EP2				x					
EP3					x			x	
EP4					x			x	

Assessment criteria:

Semester	Possitive grade (minimum passing grade in Polish: dostateczny)
V	Student achieved the expected learning outcomes and meets the requirements of the STCW convention relating to complete the course. He attended lectures (limit - 3 absences). Lecture: test - test of the lecture.
VIIE	The student achieved the expected learning outcomes. He attended the laboratory. Laboratory: Execution and pass of all laboratory, according to the schedule. Final evaluation: the average score for the theoretical knowledge with the work in the laboratory, with the report. Lecture: exam of the lecture.

Note: student gets higher than minimum passing grade if achived learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	78	15		10
Reading literature	20			5
Preparing for laboratories, project classes		10		
Preparing for exam, pass test	20			
Developing project/report		10		10
Participation in exam, pass test	4			
Consultation with teacher				
Total number of hours	122	35		25
Number of ECTS credits	**4**	**1**		**1**
Total number of ECTS credits for the subject	**6**			
Student's workload connected with practical classes	15+10+10+10+5+10= 60h 2 ECTS			
Student's workload connected with classes involving direct participation of teacher	78+4+15+10= 107h 4 ECTS			

List of literature:

Required reading
1. Electrotechnics&Electronics for Mechanicians PWN 2. Marine Electrical Engineering , P. Wyszkowski PWN
Recommended reading
1. Electrotechnics&electronics F.Przeździecki PWN

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Roman Kostyszyn, PhD (Eng) – 5th sem.	Department of Marine Electrical Power Engineering
Karol Listewnik, Phd (Eng) – 7th sem.	Department of Marine Electrical Power Engineering

2. Other lecturers:	

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	38	Name of subject:	**FUNDAMENTALS OF MARINE CONTROL ENGINEERING***
Main field of study:			MECHANICAL ENGINEERING
Level of qualification:			first degree studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
VIIE	3	1		1		0.7	15	4	11		10
Total numbers of hours during study:							**40**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills for first-degree studies with control and robotics, machine operation, as necessary to carry out the object.
2.	Knowledge and skills for first-stage studies from power plant, vessels piston engines, boilers, ship turbines, machinery and marine equipment, as necessary to carry out the object.

Course aims

1.	The purpose of subject is to convey basic knowledge and skills in control on the ship's main marine systems.
2.	The programme meets the requirements set out in the framework operation and management in the mechanical engineering department specified in Annex 8 of the Regulation of the Ministry for Infrastructure and Development on 28 February 2014y, par. 536 of the amended, full text in the Log Book from 2017y. paragraph 775

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	Describe the components and control systems and their characteristics	K_W04, K_W09, K_U08, K_U09, K_U13, K_U15
EP2	Discuss the development trends of components and marine control systems	K_W04, K_W09, K_U08, K_U09, K_U13, K_U15, K_U20
EP3	Describe the structure, selection and principle of the temperature controllers, pressure, level, speed of flow and fuel viscosity	K_W04, K_W09, K_U08, K_U09, K_U12, K_U15, K_U20

EP4	Discuss the control systems of marine piston engines drive with fixed and variable pitch propeller	K_W04, K_W09, K_U08, K_U09, K_U13, K_U15, K_U20
EP5	Discuss digital systems in the marine control process, marine signalize-alarm systems, integrated process control systems production and distribution of power on the ship, control systems on equipment cargo vessel.	K_W04, K_W09, K_U08, K_U09, K_U13, K_U15, K_U20
EP6	Characterise the control systems of the main combustion marine engines, control systems of auxiliary mechanisms and devices, power plant control and auxiliary boilers control system.	K_W02, K_W04, K_U05

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester I

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Control symbol used in marine diagrams, diagrams showing the operation of the control and automatic system. **(8.12.7)**	2			EP1
2.	Integrated control systems and electric power distribution on the ship, static and dynamic parameters process of the electric generators. **(8.12.10)**	4			EP1
3.	Construction and operation of selected installation control systems: a) producing steam, b) viscosity of the fuel, c) compressors and pumps, d) oily water separators, e) waste water treatment plants. **(8.12.11)**	5			EP2
4.	Control systems for cargo devices. **(8.12.15)**	3			EP3
5.	The control systems of marine piston engines drive with fixed pitch propeller. **(8.12.8)**		2	3S	EP4
6.	The control systems of marine piston engines drive with variable pitch propeller. **(8.12.9)**		2	3S	EP4
7.	Construction and operation of selected installation control systems: a) producing steam, b) viscosity of the fuel, c) compressors and pumps, d) oily water separators, e) waste water treatment plants. **(8.12.19)**			6L 2S	EP5, EP6
8.	PLC controllers used in marine control system. **(8.12.20)**	1		2L 2S	EP5, EP6
9.	Speed controllers of main combustion marine engines: a) mechanical, b) digital.			3L	EP5, EP6
	Total numbers of hours during semester:	**15**	**4**	**11L 10S**	

The programme meets the requirements set out in the framework operation and management in the mechanical engineering department specified in Annex 8 of the Regulation of the Ministry for Infrastructure and Development on 28 February 2014y, par. 536 of the amended, full text in the Log Book from 2017y. paragraph 775, with a study programme for 1st grade studies with a practical profile in the field of ESOiOO of the Mechanical Faculty of the Maritime University in Gdynia.

No	Subject according framework extended program	Number of subject	Subject according program first degree of practical profile (ESOiOO) in UMG	Semester	Number of subject
1	Fundamentals of marine control engineering (8.12)	**1 - 6**	Fundamentals of control engineering & robotics	IV	**1 - 6**
2	Fundamentals of marine control engineering (8.12)	**12 - 14**	Fundamentals of control engineering & robotics	IV	**7 - 9**
3	Fundamentals of marine control engineering (8.12)	**16, 17, 18**	Fundamentals of control engineering & robotics	IV	**5, 6, 8**

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1			**X**		**X**			**X** (during laboratory exercise)	
EP2			**X**				**X**		
EP3			**X**		**X**	**X**	**X**	**X** (during laboratory exercise)	
EP4			**X**		**X**	**X**	**X**	**X** (during laboratory exercise)	
EP5			**X**		**X**	**X**	**X**	**X** (during laboratory exercise)	
EP6			**X**		**X**	**X**	**X**	**X** (during laboratory exercise)	

Assessment criteria:

Semester	Possitive grade (minimum passing grade in Polish: dostateczny)
VII	The student gained the assumed effects of learning and meets the requirements of the STCW Convention on the passing of the subject. He attended lectures (admissible – 1 absence). He attended all laboratory exercises and all seminary exercises. **Lecture**: a written positive exam. **Laboratories**: practical execution, report and individual evaluation of all laboratory exercises, according to the schedule. Final assessment of average evaluations from work in the laboratory and from the reports. **Seminaries**: prepare a project or presentation of a selected ship installation and its group with a discussion at the end. Final assessment: average evaluations from 20% seminary, 40% laboratory exercises and 40% written exam.

Note: student gets higher than minimum passing grade if achived learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	19	11		10
Reading literature	6	10		
Preparing for laboratories, project classes		10		5
Preparing for exam, pass test	5			
Developing project/report		10		
Participation in exam, pass test	2			
Consultation with teacher	2	2		3
Total number of hours	34	43		18
Number of ECTS credits	**1**	**1.5**		**0.5**
Total number of ECTS credits for the subject	**3**			
Student's workload connected with practical classes	11+10+10+10+2+10+5+3=61 h **2 ECTS**			
Student's workload connected with classes involving direct participation of teacher	19+11+10+2+2+2+3=49 h **1.5 ECTS**			

List of literature:

Required reading
1. Technical documentation of selected shipbuilding equipment known companies as: Man, Wartsila, Alfa Laval, Westphalia, Saacke, Alborg, Kongsberg, Lyngso Marine, Norcontrol, Woodward and others.
Recommended reading
1.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
dr inż. Andrzej Mielewczyk, prof. UMG	KPT
2. Other lecturers:	
dr hab. inż. Hoang Nguyen, prof. UMG	KPT
mgr inż. Norbert Abramczyk	KPT

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	39	Name of subject:	**WATER, FUEL & LUBRICANTS***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
III	4	2		2			30		30		
Total numbers of hours during study:							**60**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of secondary school.

Course objectives

1.	The course objective is to transfer of basic knowledge in the field of chemistry of fuels, lubricants and water used on ships.
2.	The course objective is acquiring the ability to perform and interpret the results of selected analyses necessary for safe use of fuels, lubricants and water in shipbuilding.
3.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	safely use consumables used in shipbuilding	K_W02, K_W06, K_U01, K_U05
EP2	prepare a documented study of the problem with the scope of mechanical engineering	K_U03
EP3	apply standards related to technical materials and their testing	K_W09, K_U21
EP4	use literature sources to interpret research results	K_U01, K_U05
EP5	work in a group and apply the rules of cooperation	K_K05

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester III

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*Viscosity, density, definitions, units, basic measurement methods.* ***(8.9.1)***	1		2	EP1, EP4, EP5
2.	*Types of friction, lubrication, wear.* ***(8.9.2)***	1			EP1
3.	*Types of operating fluids used on the ship, their properties and basic classifications:* *a) natural waters,* *b) technical waters:* – *sea water,* – *boiler water,* – *engine cooling water,* – *sanitary water,* – *drinking water,* *c) fuels,* *d) lubricants,* *e) hydraulic fluids,* *f) refrigerants,* *g) thermal oils,* *h) chemicals used for cleaning and maintenance,* *i) additives to selected operating fluids, to:* – *boiler water,* – *cooling water,* – *evaporator water,* – *sea water,* – *fuel,* *j) air,* *k) exhaust gases*. **(8.9.3)**	8		4	EP1, EP4, EP5
4.	*Method of obtaining selected operating fluids:* *a) water,* *b) fuel,* *c) lubricants,* *d) hydraulic fluids,* *e) thermal oils.* **(8.9.4)**	2			EP2
5.	*Influence of origin and production processes of selected operating fluids on their properties:* *a) water,* *b) fuel,* *c) lubricants,* *d) hydraulic fluids.* **(8.9.5)**	1			EP2
6.	*Influence of fluids properties on the operation of installation:* *a) technical waters:* – *sea water,* – *boiler water,* – *engine cooling water,* – *sanitary water,* – *drinking water,* *b) fuels,*	8		4	EP1, EP3, EP4, EP5

	c) lubricants, *d) hydraulic fluids,* *e) refrigerants,* *f) thermal oils,* *g) chemicals used for cleaning and maintenance,* *h) additives to selected operating fluids, to:* – *boiler water,* – *cooling water,* – *evaporator water,* – *sea water,* – *fuel,* *i) air,* *j) exhaust gases.* **(8.9.6)**				
7.	*Operational issues of selected installations:* *a) fuel supply system,* *b) combustion chamber (piston engine, boiler),* *c) circulating oil system,* *d) cylinder oil system,* *e) hydraulic systems,* *f) systems with thermal oils*. **(8.9.7)**	2			EP1, EP2
8.	*Rules of operating fluids sampling and their influence on the results.* **(8.9.8)**	0,5		2	EP1, EP4, EP5
9.	*Aging and contamination of selected operating fluids:* *a) boiler water,* *b) cooling water,* *c) fuel,* *d) lubricants,* *e) hydraulic fluids,* *f) thermal oils.* **(8.9.9)**	1		2	EP1, EP3, EP4, EP5
10.	*Analysis of selected operating fluids:* *a) boiler water,* *b) cooling water,* *c) fuel,* *d) lubricants,* *e) hydraulic fluids,* *f) thermal oils.* **(8.9.10)**	1			EP1, EP4, EP5
11.	*Stages of the operating fluids using:* *a) selection,* *b) order,* *c) receipt,* *d) storage,* *e) control of operational properties,* *f) warning and limit values f operating fluids properties,* *g) restoring of operational properties,* *h) exchange,* *i) utilization.* **(8.9.11)**	1		2	EP2, EP4 EP5
12.	*Issues concerning interchangeability and miscibility of selected operating fluids.* **(8.9.12)**	0,5			EP1
13.	*Selection of substitutes for selected operating fluids:* *a) fuel,* *b) lubricating oils,* *c) hydraulic fluids,*	1			EP1

	d) greases, *e) thermal oils.* **(8.9.13, 8.9.17)**				
14.	*Identification of operating fluids based on commercial specification and their suitability for the intended use.* **(8.9.14)**			1	EP1, EP4, EP5
15.	*Interpretation of the samples basic analysis of selected operating fluids.* **(8.9.15)**			2	EP3, EP4, EP5
16.	*Making operational decisions based on selected fluids analysis results, using the instructions:* *a) boiler water,* *b) cooling water,* *c) fuel,* *d) lubricating oils,* *e) hydraulic fluids,* *f) thermal oils.* **(8.9.16)**	1		2	EP3, EP4, EP5
17.	*Selection of personal protective equipment and necessary security measures during use or contact with selected operating fluids or chemicals, the use of MSDS (Material Safety Data Sheet).* **(8.9.18)**	1		1	EP1, EP3, EP4
18.	*Basic analysis of selected operating fluids using ship portable kits and choice of corrective means:* *a) boiler water,* *b) cooling water,* *c) fuel,* *d) lubricating oils,* *e) hydraulic fluids,* *f) thermal oils.* **(8.9.19)**			8	EP1, EP4, EP5
Total numbers of hours during semester:		**30**		**30**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x					
EP2				x					
EP3					x			x	
EP4					x			x	
EP5					x			x	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
III	The student has achieved the assumed learning outcomes and meets the requirements of STCW convention regarding the completion of the course. Attended lectures (admissible 3 absences). **Lecture:** pass lecture colloquium. **Laboratories:** performing and passing all laboratory exercises according to schedule. Final grade is average of grades for theoretical knowledge, work in laboratory and reports. The final grade after passing two forms of classes is the average grade received from lecture and laboratory grades.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	30	30		
Reading literature	5			
Preparing for laboratories, project classes		30		
Preparing for exam, pass test	10			
Developing project/report		10		
Participation in exam, pass test	3			
Consultation with teacher		5		
Total number of hours	48	75		
Number of ECTS credits	**2**	**2**		
Total number of ECTS credits for the subject	**4**			
Student's workload connected with practical classes	30+30+10+5= 75h 2 ECTS			
Student's workload connected with classes involving direct participation of teacher	30+30+3+5= 68h 2 ECTS			

List of literature:

Required reading
1. Barcewicz K.: Laboratory exercises in the chemistry of fuels, lubricants and water. Academy Maritime Publishing House, Gdynia 2006. 2. Stańda J.: Water for steam boilers and cooling circuits of thermal power plants. WNT, Warszawa 1999. 3. Urbański P.: Fuels and lubricants. Foundation for the development of the Gdynia Maritime University, Gdynia 1999.
Recommended reading
1. Podniało A.: Fuels, lubricating oils and greases in ecological operation. WNT, Warszawa 2002. 2. Czarny R.: Plastic grease. WNT, Warszawa 2004. 3. Żmijewska S., Trześniowski W.: Research of the quality of water used on ships. Publishing House of Szczecin Maritime University, Szczecin 2005.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Magda Morawska, DSc (Eng), Ass. Prof.	Department of Industrial Products Quality and Chemistry
2. Other lecturers:	
Andrzej Młynarczak, PhD (Eng), Ass. Prof.	Department of Marine Propulsion Plants
Grzegorz Sikora, PhD (Eng)	Department of Marine Propulsion Plants

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	40	Name of subject:	**LAW AND MARINE INSURANCE***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
VIII E	2	1					15				
Total numbers of hours during study:							**15**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of secondary school.

Course objectives

1.	The course objective is the basic knowledge and skills in the range of marine laws and insurances, essential to safe maintenance of ship technical equipment.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	describe basic notions in the range of marine law, marine administration	K_W03, K_W04
EP2	discuss international requirements of navigation safety, international conventions and regulations concerning to marine environment protection	K_W09, K_U09, K_U15, K_U20
EP3	explain matters concerning to marine insurances	K_W04, K_U13, K_U16

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester VIII

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*Basic notions, range of regulation and sources of marine law.* **(8.16.1)**	1			EP1
2.	*Vessel notion:* *a) vessel state flag,* *b) vessel register,* *c) ship owner,* *d) ship's operator,* *e) ship time charterer.* **(8.16.2)**	1			EP1
3.	*Marine administration: competences, inspections, certificates:* *a) control of ship navigation ability,* *b) responsibility of law offending.* **(8.16.3)**	1			EP1
4.	*Sanitary, custom and passport clearance.* **(8.16.4)**	1			EP1
5.	*Ship law status at sea:* *a) sea area partition,* *b) consequences of law offending for ships and crew responsibility.* **(8.16.5)**	1			EP1
6.	*Ship and crew certificates and documents required international conventions (enumerated in pp. 7 and 8).* **(8.16.6)**	2			EP1
7.	*International requirements of navigation safety:* *a) law regulations concerning to shipment status,* *b) law regulations concerning safety of live at sea (SOLAS Convention),* *c) law regulations concerning training standards, issuing certificates and watchkeeping.* **(8.16.7)**	4			EP2
8.	*International conventions and regulations concerning to marine environment protection (MARPOL Convention).* **(8.16.8)**	2			EP2
9.	*International and domestic regulations of labour law.* **(8.16.9)**	1			EP2
10.	*Ship's insurance:* *a) marine insurance matter* *b) insurance risk,* *c) exceptions,* *d) preparing of after accident documentation.* **(8.16.10)**	1			EP3
	Total numbers of hours during semester:	**15**			

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1			x						
EP2			x						
EP3			x						

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
VIII	The student has achieved expected learning outcomes and meets the requirements of the STCW Convention for passing the course (100% attendance at lectures). In case of absence (max. 10% of classes) - consultation credit of the lecture material. Lecture: written examination.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	15			
Reading literature	20			
Preparing for laboratories, project classes				
Preparing for exam, pass test	10			
Developing project/report				
Participation in exam, pass test	5			
Consultation with teacher				
Total number of hours	50			
Number of ECTS credits	**2**			
Total number of ECTS credits for the subject	**2**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	15+5= 20h 1 ECTS			

List of literature:

Required reading
1. STCW Convention with amendments. 2. International Convention for the Safety of Live at Sea, SOLAS Convention with amendments. 3. MARPOL Convention with amendments. 4. International Ship and Port Facility Security Code, 2002, ISPS Code with amendments. 5. Maritime Labour Convention, 2011, and amendments.
Recommended reading
1. Ship technical documentation. 2. Check lists. 3. Popowska H., „Prawo i ubezpieczenia morskie", Gdańsk 2009.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Magda Śniegocka-Dworak, PhD (Eng)	Department of Quality Management
2. Other lecturers:	
Jerzy Herdzik, DSc (Eng), Ass. Prof.	Department of Marine Propulsion Plants

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	41	Name of subject:	**ENGINE ROOM SIMULATOR***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
VII	2			2,9					44		
Total numbers of hours during study:							**44**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills for previous semesters, especially in the field of professional subjects.

Course objectives

1.	The aim of the course is to provide practical knowledge and skills in the field of operation and maintenance of ship power plants, necessary for the safe operation of the ship's technical equipment and engine crew.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	list the basic elements and devices of the marine engine room; describe the control and measurement equipment.	K_W03, K_W04
EP2	prepare the ship's engine room for operation, prepare, start and shut down of ME and auxiliary systems of engine room, apply standards and procedures during engineering watchkeeping.	K_W09, K_U09, K_U15, K_U20
EP3	diagnose different systems and subsystems of a marine engines, recognize, and remove malfunctions.	K_W04, K_U13, K_U16
EP4	work in a group with assignment of different roles in it and apply the teamwork rules.	K_U02, K_K03, K_K05

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester VIII

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	*Introduction - construction and operation of the ship engine room simulator:* *a) start and basic operation of the simulator programs,* *b) design and functional structure of the ship engine room simulator,* *c) basic familiarization with the procedures of piping systems and machinery:* *− graphic symbols, types of parameters and methods of them markings, setting options,* *− functional operation of working and control devices, operation of the ship's engine room with engine room having class, A, UMS,* *− simulator components of Data Chief system,* *d) characteristics of ship-engine operating conditions:* *− cold or stop ship, port stay, ER in stand-by mode, manoeuvres, sea voyage, anchoring, unloading, and loading operations.* *− preparation for ER start from cold condition,* *− general familiarization with the ship's engine room systems enough to start the procedure start of systems and machinery,* *e) checking the basic solutions of the systems and their condition:* *− arrangement of tanks,* *− filling level,* *− electric power supply for the power plant from the shore and from the emergency generator,* *− list of ER machinery operating on shore power and emergency,* *− use of both forms of power supply,* *− starting the Emergency Generator.* **(8.5.9)**			4	EP1
2.	*Preparing, start and operation of the ER systems:* *a) preparation and start of the Diesel Generators:* *− start of the sea and Fresh Water cooling systems,* *− preparation of the starting air system,* *− preparation of other system for start Diesel Generators,* *− start of the Diesel Generator engine from local control panel,* *− generator excitation, synchronization with the power grid, change control location, remote control of generators,* *− activities to connection of the generator to the MSB,* *− operating modes of diesel generators on remote control,* *− single and parallel work of diesel generators,* *b) commissioning and operation of the cooling system - Sea Water:* *− familiarization with the pipeline of the cooling system,* *− SW system operating parameters, preparing, and operating during work and shutdown,* *− adjusting the operating parameters of the system to the current operating condition conditions: port manoeuvrings, sea voyage under full and partial load, sailing in special conditions (tropical zone, ice condition),*			12	EP2, EP3, EP4

	− *use of Sea Water cooling to ER auxiliary systems - characteristics,* − *single and parallel operation of Sea Water pumps,* *c) preparation and operation of the engine cooling system – Fresh Water:* − *preparation to operation,* − *factors affecting proper cylinder cooling – operating parameters of the system,* − *control modes: manual and automatic,* − *operational issues; engine heating, system venting, preparing and shutdown of FWG, thermostatic valves settings, heat exchangers of the WHR system,* − *system safety devices and priorities of correct operating parameters,* − *use of cooling in ER auxiliary systems – rules of operation,* *d) preparation and operation of the compressed air system:* − *system design and its preparation for operation,* − *operation parameters setting,* − *correct operating parameters control,* − *starting the system,* − *operation of air compressors during manoeuvres of ME - single and parallel,* − *operation of the system during sea voyage,* *e) preparation for the operation of the steam system:* − *system design and principle of operation,* − *design and operation principle of the fuel-fired boiler,* − *design and operation principle of the WHR boiler,* − *principles of operation of the basic elements of the system,* − *steam system operation in various operating conditions,* − *system initial preparation for the first starting as cold boiler,* − *boiler operation safety system,* − *methodology for adjustment of settings in the boiler feed water system,* − *boiler burner principle of operation,* − *determination of settings in the boiler combustion system,* *f) steam and water system - preparing and control during operation and shutdown:* − *boiler start process methodology,* − *boiler heating up from cold state,* − *carrying out the initial start-up process in manual mode – settings of the combustion process and water supply,* − *operational conditions and procedure for change over the fuel type supply distilled/residual,* − *boiler control during operation; manual, semi-automatic work and automatic,* − *pressure increasing, burner parameters control and setting,* − *boiler efficiency regulation for various ship's operational conditions,* − *fired and WHR boiler cooperation, selection of settings,* − *preparation to the boiler shutdown,* − *operating activities on the steam system after boiler shutdown,* *g) preparation and operation of Fuel Oil system - transfer system:* − *HFO and DO transfer system - design and operation*				

	principle, − *system operating parameters,* − *system preparation for operation,* *h) preparation and operation of Fuel Oil system - purification system:* − *treatment system; fuel purification method,* − *purification system preparation,* − *control and supervision during fuel transport and purification process,* − *error prevention – tank topping up and overflows,* *i) preparation and operation of Fuel Oil system - supply system:* − *designed and operation principle of FO supply system for ME,* − *system preparation for operation,* − *changeover of the fuel type: HFO/DO,* − *system operating parameters,* − *safety devices for proper working conditions,* *j) start and operation of the Lubricating Oil system:* − *LO transfer system - design and pipeline,* − *ME LO circulation systems - design and pipeline,* − *components of LO system; sump tanks, circulation pumps, coolers, filters, and temperature regulators - operating parameters,* − *LO system preparation to operation, control during ME operation,* − *safety devices and correct operating parameters of the system,* − *LO purification system preparation and start,* − *lubrication, hydraulic and auxiliary oil systems – in various equipment in ER: auxiliary engines, gears, steam turbines, controllable peach propeller, stern tube, and steering gear,* − *Cylinder Oil system - start and control during operation of ME.* **(8.5.17)**				
3.	*Preparation for starting of the main propulsion system:* *a) procedure for preparing of ME in the system with direct propulsion and with gearbox,* *b) the process of verifying the readiness of all systems necessary for ME operation,* *c) activities related to start of ME, work on idle mode and increasing the load,* *d) operation of control programs and ME protection systems,* *e) methods of ME start:* − *local/emergency,* − *remote.* **(8.5.18)**			4	EP2, EP3, EP4
4.	*Operation of ME remote control system:* *a) main propulsion system remote control structure,* *b) basic functions performed from different control stations: local, remote - CMK (UMCS), bridge,* *c) operation of s ME protection programs: slow-down, shut-down,* *d) dangerous and prohibited loads ranges,* *e) ME protection programs (load program, torque control, scavenge air limiter, over-speed),* *f) principles of ME loading and unloading,* *g) ME operation.* **(8.5.19)**			4	EP3,EP4

5.	*Control and operation of ME during operation:* *a) methodology for conducting operational supervision,* *b) "static" and "dynamic" operation characteristic of ME,* *c) operation parameters and indicators of ME:* − *methods for evaluating a set of engine performance values engine indication,* − *methods of implementation and use of indicator diagrams in engines operation,* − *determination of engine operation indicators; mean pressure indicated and effective, indicated power and useful life, specific fuel oil consumption and cylinder oil consumption, emission of exhaust gas components,* *d) operating fields of ME,* *e) operating limits of minimum and maximum ME loads,* *f) operating factors affecting the limitations,* *g) acceptable overloads of ME.* **(8.5.20)**			3	EP3,EP4
6.	*Cooperation of the main propulsion system elements: ME - propeller - hull:* *a) selection of ME operating load,* *b) operation assessment of the engine-propeller system based on the ME parameters and indicators of,* *c) possibilities of shaping the cooperative characteristics of the propulsion system during its operation,* *d) optimum efficiency characteristics of the propulsion system with controllable peach propeller and fixed propeller,* *e) the effect of operating conditions on the course of the ship's propulsion characteristics,* *f) steady-state and transient operation of the main propulsion system,* *g) ship manoeuvring operations:* − *starting movement of ship,* − *increasing the speed of ship,* − *slowing down the ship,* − *stopping the movement of ship,* − *direction change of ship movement.* **(8.5.21)**			3	EP3, EP4
7.	*Marine environment protection during ship operation:* *a) bilge systems:* − *system preparation for operation,* − *start and control of oily water separator during operation,* − *methods of oily waste utilization on the ship,* *b) biologic-mechanical sewage treatment plants:* − *preparation and operation of the system,* − *service activities during operation,* − *operating parameters of the sewage treatment plant.* **(8.5.22)**			2	EP3, EP4
8.	*Taking over and keeping the engineering watch in ER:* *a) activities related to taking over the engine room watch: time to take over the watch and check all machineries in operation, auxiliary mechanisms, and systems, recording deviations from normal values, explanation of reasons for deviations; control: the level of liquids (fuel, oil, water, etc.), various operating parameters, checking the level of ER bilges; checks the Engine Logbook and control machine; engine watch changeover procedure,*			4	EP3, EP4

	b) watchkeeping activities: regular inspection all working mechanisms and devices; control and recording of the ME and other devices operating parameters; checking the level of ME load; fuel consumption; using internal communication system. **(8.5.23)**				
9.	*Detection of failure of the ME, AE, boilers, and other engine room equipment:* *a) the use of modern diagnostic and trend analysis techniques to recorded operating parameters of any device,* *b) identification and location of ME failures: fuel injection, piston-cylinder system, air charging system, piston-crank system,* *c) identifying and repairing malfunctions of AE: (piston engine, steam turbine),* *d) identification and repairing of malfunctions of boilers and steam system,* *e) identification and repairing of malfunctions of other machinery and systems: fuel and oil purifiers, compressors, pumps, heat exchangers, filters, etc.* **(8.5.24)**			4	EP3, EP4
10.	*Operation of ship's propulsion systems:* *a) procedures for limited operation ability of ship's propulsion system, auxiliary engines, and other important systems in ER,* *b) limitation of ME power in various conditions and situations,* *c) operation of ship Engine Room in conditions particularly abnormal climatic conditions.* **(8.5.25)**			2	EP3, EP4
11.	*Engine Room operation in emergency:* *a) ship's electric power system emergency shut-off (Black-Out);* *− most common reasons and safety elements which protect against black-out,* *− methods and procedures for rectifying after black-out,* *b) ME operation in emergency:* *− ME one unit cut-off operation,* *− ME one turbocharger cut-off operation.* **(8.5.26)**			2	EP3, EP4
	Total numbers of hours during semester:			**44**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1		x						x	
EP2		x						x	
EP3		x						x	
EP4								x	

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
VIII	The student has achieved the expected learning outcomes. He completed and passed all simulator classes in accordance with the schedule. Final grade: average grade for theoretical and practical exercises and knowledge checks and work during simulator exercises.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours		44		
Reading literature				
Preparing for laboratories, project classes		5		
Preparing for exam, pass test		2		
Developing project/report				
Participation in exam, pass test		2		
Consultation with teacher				
Total number of hours		53		
Number of ECTS credits		**2**		
Total number of ECTS credits for the subject	**2**			
Student's workload connected with practical classes	44+5+2+2=53h 2 ECTS			
Student's workload connected with classes involving direct participation of teacher	44+2= 46h 2 ECTS			

List of literature:

Required reading

1. Giernalczyk M., Górski Z.: Siłownie okrętowe. Część I. Podstawy napędu i energetyki okrętowej, Wydawnictwo Akademii Morskiej w Gdyni, Gdynia 2011.
2. Giernalczyk M., Górski Z.: Siłownie okrętowe. Część II. Instalacje okrętowe, Akademia Morska w Gdyni, Gdynia 2012.
3. Balcerski A.: Siłownie okrętowe, Politechnika Gdańska, Gdańsk 1990.

Recommended reading

1. Urbański P.: Instalacje okrętów i obiektów oceanotechnicznych, Politechnika Gdańska, Gdańsk 1994.
2. Wojnowski W.: Okrętowe siłownie spalinowe, część I, Wydział Oceanotechniki i Okrętownictwa Politechniki Gdańskiej, Gdańsk 1991.
3. Wojnowski W.: Okrętowe siłownie spalinowe, część II, Wydział Oceanotechniki i Okrętownictwa Politechniki Gdańskiej, Gdańsk 1992.
4. Wojnowski W.: Okrętowe siłownie spalinowe, część III, Akademia Marynarki Wojennej, Gdynia 2002.
5. Górski Z. Hajduk T., Kluj S.: Procedury obsługi siłowni okrętowej, Akademia Morska w Gdyni, Gdynia 2005.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Piotr Kamiński, PhD (Eng), Ass. Prof.	Department of Marine Propulsion Plants
2. Other lecturers:	
Jacek Wysocki, PhD (Eng)	Department of Marine Propulsion Plants

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	42	Name of subject:	**FUNDAMENTALS OF MARINE PROPULSION PLANT***
Main field of study:			MECHANICAL ENGINEERING
Level of qualification:			first degree studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
V E	2	2					30				
Total numbers of hours during study:							**30**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and competences of secondary school.

Course aims

1.	The general objective is to provide basic knowledge and skills necessary for safe exploitation of ships technical equipment, in scope of ships propulsion systems.
2.	The program meets the requirements of the framework extended training course for operational and management level in engine department, in the mechanical specialty, specified in Appendix No. 8 of the Regulation of the Minister of Infrastructure and Development of February 28, 2014, item 536 including further amendments.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	describe ship's propulsion and energetic system	K_W03, K_W08
EP2	describe components of ships' resistance and influence of outer conditions at resistance	K_W04
EP3	explain the basis of cooperation of the set: engine – hull – screw propeller	K_W03
EP4	explain basis of work of ships propulsors	K_W03
EP5	present kinds of ship's maintenance surveys and its organisation	K_W05, K_W09, K_W12
EP6	discuss the principles of conducting and results of sea trials	K_W05, K_W09, K_W12

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester V

No	Content description	No of hours			Reference to EP of the subject
		L	C	Lab/ P	
1.	Ship's energetic and propulsion systems. *Power required to ships movement.* **(8.3.4)** Efficiency of propulsion system elements. Drive system and its efficiency.	2			EP1
2.	*Resistance of hull's resistance.* **(8.5.3a)** *Types of ship resistance; in the submerged part – towing, hydrodynamic, wave, residual and aerodynamic resistance.* **(8.3.3a)**	2			EP2
3.	*Ship resistance characteristics: design resistance, changes in hull resistance during operation, methods of determination of hull's resistance.* **(8.3.3b)**	2			EP2
4.	*Methods of ships steering;* *a) propellers:* − *types of propellers and principles of operation,* − *screw propellers: theory of blade, cavity,* − *rotary and hydrodynamic characteristics of screw propellers,* − *relation hull – screw propeller,* − *efficiency of a hull and propeller,* − *thrust force and propulsion power demand.* **(8.3.5a)**	2			EP4
5.	*Screw propellers:* − *rotary and hydrodynamic characteristics of a screw,* − *efficiency of a hull and screw,* − *cooperation between hull and screw,* − *cavity,* − *thrust force and propulsion power demand.* **(8.5.3b)**	2			EP3, EP4
6.	*Propulsion systems:* − *engines for main and auxiliary, propulsion systems, types and characteristics,* − *overview of contemporary solutions for main propulsion,* − *definition of nominal parameters of an engine,* − *rules of main engine selection and matching.* **(8.5.3c)**	2			EP1
7.	*Propulsion systems:* − *engine's load diagrams,* − *exploitation limits of maximal and minimal loads of the engine, reasons of that limitations, allowed overloading states of main engines,* − *basics of cooperation between engine, propeller and hull under constant and transient working conditions.* **(8.5.3c)**	2			EP1, EP3
8.	*Propulsion systems:* − *characteristics of propulsion systems with fixed pitch propellers (FPP),* − *matching of propulsion system elements i.e. piston engine – FPP,* − *redundancy of power and revolutionary speed of the engine in direct propulsion system,* − *evaluation of effective load of the engine,* − *propulsion efficiency, possibilities for improving the cooperation of the engine-propeller system.* **(8.5.3c)**	2			EP1

9.	*Methods of ships steering:* − *rudders, construction and mode of operation,* **(8.3.5b)** − *course bearing and course changing,* **(8.3.5c)** − *manoeuvring,* **(8.3.5d)** − working of propulsion system under manoeuvring – Robinson's curves.	2			EP4
10.	*Reduction gears systems, influence of gear ratio at propulsion system's exploitation.* **(8.5.3c)**	2			EP1
11.	*Characteristics of propulsion systems with controllable pitch propeller (CPP):* − *engine layout and running point for propulsion with CPP,* − *characteristic of optimal efficiency for propulsion with CPP and impact of operational condition on it.*	2			EP1
12.	*Modern propulsion systems with shaft generators and rules of its operation. Rules of operation of PTO and PTI systems, operation rules of turbo generators.* **(8.5.3c)**	2			EP1
13.	*Sea trials and Bollard test, how to conduct and evaluate the results:* − *assessment of the engine-propeller system selection on the basis of sea trials and model prediction, the impact of the selection of this system on its operation.* **(8.5.3c)**	2			EP6
14.	*Failures of main engines, rules of conduct.* **(8.5.3c)**	2			EP5
15.	*Ship's inspections and surveys, ranges and aims, docking.* **(8.3.19)** *Rules for the inspection of the hull, propellers and bottom valves.* **(8.3.20)** *Typowe uszkodzenia kadłuba, kryteria oceny.* **(8.3.21)** *Role of IMO and Classification Societies.* **(8.3.24)**	2			EP5
	Total numbers of hours during semester:	**30**			

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1			x						
EP2			x						
EP3			x						
EP4			x						
EP5			x						
EP6			x						

Assessment criteria:

Semester	Possitive grade (minimum passing grade in Polish: dostateczny)
V E	The student has achieved the assumed learning outcomes and meets the requirements of the STCW Convention for passing the course. 100% attendance at lectures. In case of absence (max. 10% of classes) - consultation credit of the lecture material. Lecture: written exam.

Note: student gets higher than minimum passing grade if achived learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	30			
Reading literature	10			
Preparing for laboratories, project classes				
Preparing for exam, pass test	10			
Developing project/report				
Participation in exam, pass test	2			
Consultation with teacher	2			
Total number of hours	54			
Number of ECTS credits	**2**			
Total number of ECTS credits for the subject	**2**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	30+2+2= 34 h 1 ECTS			

List of literature:

Required reading
1. Charchalis A., Opory i pędniki okrętów wojennych. Wydawnictwo Akademii Marynarki Wojennej w Gdyni, Gdynia 2002. 2. Giernalczyk M., Górski Z., Siłownie okrętowe, część I. Wydawnictwo Akademii Morskiej w Gdyni, Gdynia 2011.
Recommended reading
1. Molland A. F., The Maritime Engineering Reference Book. Elsevier 2008.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Prof. Adam Charchalis, DSc (Eng)	Department of Marine Propulsion Plants
2. Other lecturers:	

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	43A	Name of subject:	**MARINE INTERNAL COMBUSTION ENGINE OPERTION NAD MANTENANCE****
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
VIII	3	2					30				
Total numbers of hours during study:							**30**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Basic knowledge of such subjects as: marine diesel engine, ship propulsion plant, chemistry of water, fuels and lubricants.

Course objectives

1.	The aim of the subject is to provide basic knowledge and skills in the field of operation of marine piston engines, including: procedures for preparing them for operation, start-up, loading, ongoing operational control, engine operation in various operational states.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	describe the process of preparing the engine for operation, its start-up, and operation in various operating states	K_W03, K_W04
EP2	describe the most important control activities carried out during the operation of a marine engine and evaluate the importance of selected parameters for engine operation control	K_W04, K_U11, K_K03
EP3	indicate the connections between typical faults in the operation of marine engines and the errors of maintenance	K_W03
EP4	use literature sources, databases, other sources of information; interprets information, formulates opinions and conclusions	K_W04, K_W05, K_W07, K_U13, K_U16
EP5	make the right decisions in unusual operating conditions	K_W09, K_U21, K_K07, K_K08

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester VIII

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	Preparation and commissioning of installations and systems: lubrication, cooling, fuel, compressed air. Other preparatory activities. Preparing the engine for operation after a longer period standstill.	4			EP1
2.	Starting of marine engines.	1			EP1
3.	Engine operation during port exit maneuvers.	2			EP1
4.	Current and periodic operations activities of marine engines. Operations activities of the systems: piston-crank, scavenging, fuel, lubricant and cooling.	4			EP1
5.	Supervising the work the ship engine. Parameters routinely controlled. Evaluation of engine work. Correction and regulation of settings - static and dynamic regulation. Recording of engine operating parameters.	4			EP2,
6.	Defects and faults in the operation of marine engines as a result of operating errors. Remedies.	2			EP3
7.	Entry manoeuvres, engine stop and engine shutdown.	1			EP1
8.	Influence of external conditions on engine work.	2			EP1
9.	Particular operational conditions of marine engines. Emergency maneuver. Engine operation in special operating conditions (in a storm, in limited waters, in waters is ice, with a damaged ship propeller).	4			EP1, EP5
10.	Engine operation with load other than nominal.	2			EP1, EP5
11.	Work engine with cylinder/cylinders off.	1			EP1, EP5
12.	Engine operation with faulty charging system.	1			EP1, EP5
13.	Selection of operating parameters of the main engine for a limited fuel reserve.	2			EP1, EP4, EP5
	Total numbers of hours during semester:	**30**			

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x					
EP2				x					
EP3				x					
EP4				x					
EP5				x					

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
VIII	The student achieved the expected learning outcomes, attended lectures (3 absences allowed) Completion of the subject based on the grade from the colloquium.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	30			
Reading literature	25			
Preparing for laboratories, project classes				
Preparing for exam, pass test	15			
Developing project/report				
Participation in exam, pass test	5			
Consultation with teacher	5			
Total number of hours	80			
Number of ECTS credits	**3**			
Total number of ECTS credits for the subject	**3**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	30+5+5= 40h 2 ECTS			

List of literature:

Required reading
1. Technical and operational manuals for marine engines 2. Piotrowski I., Witkowski K.: Eksploatacja okrętowych silników spalinowych. Balic Surveyors Grup Ltd. Sp z o.o Gdynia 2012.
Recommended reading
1. Włodarski J.K.: Stany eksploatacyjne okrętowych silników tłokowych. Wydawnictwo uczelniane WSM, Gdynia 1998.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Piotr Kamiński, PhD (Eng), Ass. Prof.	Department of Marine Propulsion Plants
2. Other lecturers:	
Jerzy Herdzik, DSc (Eng), Ass. Prof.	Department of Marine Propulsion Plants

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	43B	Name of subject:	**MACHINE OF OFFSHORE DRILLING UNITS****
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
VIII	3	2					30				
Total numbers of hours during study:							**30**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the field of professional subjects, including marine machinery and equipment, marine power plants, marine turbines, marine piston engines, protection of the marine environment, safe operation of the ship.

Course objectives

1.	The aim of the course is to provide basic knowledge of equipment on drilling platforms, necessary for their safe operation.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	list the types of offshore mining units	K_W03
EP2	define and described systems and equipment of drilling rigs for liquid and gaseous hydrocarbons extraction	K_W04
EP3	discuss code requirements regarding the type and quantity of installed equipment for MODU (Mobile Offshore Drilling Units)	K_W10

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester VIII

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	Types of offshore drilling platforms: – fixed platform, – submersible platform, – jack-up platform, – semi-submersible platform,	8			EP1

	− drillship				
2.	Power system of drilling platform: − main, − emergency.	4			EP1
3.	Systems and equipment for extraction of liquid and gaseous hydrocarbons, their initial storage and preparation for external transfer: − boilers and compressors of production systems, − main fuel systems with tanks, − general platform systems: compressed air, sea water, fresh water, sewage system, etc., − diving systems to operate the platform: hyperbaric chambers, diving bell, organization of diving works, − fire protection systems, − other on-board systems and auxiliary mechanisms of drilling platforms.	14			EP2
4.	MODU (Mobile Offshore Drilling Units) requirements - a code regarding the type and quantity of installed devices.	2			EP3
5.	Unit lifting-up and stabilization systems.	2			EP2
	Total numbers of hours during semester:	**30**			

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x					
EP2				x					
EP3				x					

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
VIII	Student achieved the expected learning outcomes, attended lectures (3 absences allowed). Completion of the subject based on the grade from the test.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	30			
Reading literature	25			
Preparing for laboratories, project classes				
Preparing for exam, pass test	15			
Developing project/report				
Participation in exam, pass test	5			

Consultation with teacher	5			
Total number of hours	80			
Number of ECTS credits	**3**			
Total number of ECTS credits for the subject	**3**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	30+5+5= 40h 2 ECTS			

List of literature:

Required reading
1. Cydejko J., Puchalski J., Rutkowski G.: Statki i technologie off-shore w zarysie, Trademar. Gdynia 2011. 2. Hann M.: Wybrane zagadnienia bezpieczeństwa i niezawodności obiektów górnictwa morskiego, Wydawnictwo Uczelniane Politechniki Szczecińskiej, 1988.
Recommended reading
1. Mather A.: Offshore engineering and production, Livingston, Witherby Publishing Group Ltd., 2011. 2. Requirements concerning mobile offshore drilling units, Polski Rejestr Statków, Gdańsk 2007.

Teacher:

Title/degree, name and surname	**University unit**
1. Supervisor:	
Piotr Kamiński, PhD (Eng), Ass. Prof.	Department of Marine Propulsion Plants
2. Other lecturers:	

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	43C	Name of subject:	**MARINE TURBINES OPERATION AND MAINTENANCE****
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
VIII	3	2					30				
Total numbers of hours during study:							**30**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the field of professional subjects, including: thermodynamics, steam turbines, steam boilers.

Course objectives

1.	The aim of the course is to provide basic knowledge and skills in the field of construction and operation of steam turbine power plants.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	use general knowledge in the field of construction, production and operation of marine machinery, use the technical knowledge necessary for the proper maintenance, operation and operation of ship equipment and installations, to manage the safe operation of the marine power plant	K_W03, K_W04
EP2	use self-learning skills, e.g. in order to improve professional competences, use analytical, simulation and experimental methods typical for marine power plants to formulate and solve practical engineering tasks, apply knowledge to the interpretation of phenomena occurring in machinery, equipment and ship installation	K_U05, K_U09, K_U13
EP3	work in a group assuming different roles in it, apply the principles of cooperation	K_K05

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester VIII

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	Overview of the design of the main boilers. Structural elements of boilers: water and steam drums; radiant and conventional heated surfaces; steam dryers; supply pipelines; water and air heaters; steam superheaters.	2			EP1
2.	Control methods: superheated steam temperature, steam pressure, water level in the boiler.	2			EP2
3.	Boilers with fluidized bed furnaces. Steam superheating methods in fluidized bed heaters.	2			EP1
4.	Start-up, constant and variable load operation and shutdown of the boiler. Putting the boiler into operation.	2			EP1, EP3
5.	Boiler operation control. Maintenance. Boiler skimming.	2			EP2
6.	Boiler maintenance for short-term and long-term shutdowns.	1			EP2
7.	Overview of modern auxiliary, fired, utilization and combined boilers.	4			EP1, EP2, EP3
8.	Operation of ship steam turbines - steam turbine service installation: − lubricating oil installation, − installation of heating steam and turbine blowing, − steam installation for sealing, − installation of hydraulic valve control, − turbine automatic regulation and protection systems.	7			EP2
9.	Operation of marine steam turbines - typical work regimes: preparation for start-up, turbine heating, start-up, proper loading, stopping and shutting down of the turbine. Typical inspections: working, classification.	4			EP3
10.	Regulations of classification societies for marine turbine propulsion.	4			EP3
	Total numbers of hours during semester:	**30**			

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1				x					
EP2				x					
EP3				x					

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
VIII	The student achieved the expected learning outcomes, attended lectures (3 absences allowed). Completion of the subject based on the grade from the pass test.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours	30			
Reading literature	25			
Preparing for laboratories, project classes				
Preparing for exam, pass test	15			
Developing project/report				
Participation in exam, pass test	5			
Consultation with teacher	5			
Total number of hours	80			
Number of ECTS credits	**3**			
Total number of ECTS credits for the subject	**3**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	30+5+5= 40h 2 ECTS			

List of literature:

Required reading
1. Jaswal R., Purohit R. K., Steam Turbines and Steam Power Plant, Scientific Publishers (India), 2012. 2. McBirnie S. C., Marine, Steam Engines, and Turbines, Marine Engineering Series, 1980, ISBN: 9781483101989.
Recommended reading
1. any book or scientific publication relating to marine steam turbines and marine steam boilers. 2. catalogues of companies producing marine boilers and steam turbines.

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Jerzy Herdzik, DSc (Eng), Ass. Prof.	Department of Marine Propulsion Plants
2. Other lecturers:	
Tomasz Hajduk, PhD (Eng)	Department of Marine Propulsion Plants
Jacek Wysocki, PhD (Eng)	Department of Marine Propulsion Plants

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	44	Name of subject:	**ONBOARD TRAINING***
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
IV	2										
VI	30										
Total numbers of hours during study:							**min. 6 months totally**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the field of professional subjects, consistent with STCW convention, pursued in the course of study to date.
2.	The student must keep valid: – international health certificate, – vaccination booklet, – certificates of training in: - Personal Safety and Common Responsibility, - Fire Protection - basic level, - Elementary Rules for Providing Medical Assistance, - Individual Rescue Techniques, - Ship Security (basic level), – seaman's book, – passport, – registered in the dean's office Practice Book.

Course objectives

1.	The purpose of the onboard trainings is to acquire the competence and skills necessary to safely operate the technical equipment of the ship and to take up positions in the engine department, in the mechanical specialty.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	use the basic methods, techniques, tools and materials used to solve simple engineering tasks related to the operation of the engine room and ship, and use the detailed knowledge of managing the safe operation of the ship, the organization and management of resources of the ship's engine room	K_W08, K_W12

EP2	apply basic information and communication technologies in the acquisition and processing of information in the safe operation of power plants, use the skills necessary to work in an industrial environment (in particular, offshore power plants), and apply safety rules related to the performance of professional duties, apply knowledge to interpret phenomena occurring in ship machinery, equipment and installations	K_U07, K_U11, K_U13
EP3	identify and formulate specifications for simple engineering tasks of a practical nature, among others: troubleshooting, inspection, planning and execution of overhaul of power plant equipment and installations (especially ship power plants), assess the suitability and apply the appropriate method (procedure) and tools to solve simple engineering tasks of a practical nature, related to the operation of marine power plant mechanisms and equipment, use the experience, gained during the course of maritime practice, related to the use of appropriate tools, materials and procedures to solve practical engineering tasks	K_U18, K_U19
EP4	make use of experience in operating and maintaining machinery, installations, machinery and equipment of ship's engine room (appropriate for the diploma of officer of the watch), handle and use information on: ship's structural and stability documentation, technical and operating documentation of ship's equipment, schematics of ship's installations.	K_U20, K_U22
EP5	work in a group assuming different roles in it, apply the principles of cooperation	K_K05

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester IV

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	Acquiring ship's engine room operation skills at the level of engineer and in the duties of engineer officer. Job training in: Occupational Safety and Health, fire protection, medical first aid, individual and collective rescue techniques. Detailed requirements and scope of classes are specified in the Maritime Practice Book (implementation on a school ship).				EP1, EP2
	Total numbers of hours during semester:	min. 2 months			

Semester VI

No	Content description	No of hours			Reference to EP of the subject
		W	C	Lab/ P	
1.	Acquisition of ship's engine room operation skills in the scope of duties of an engineer officer in accordance with the competence standards of the STCW Code 1978/95 - Section A-III/1. Detailed requirements and scope of classes are specified in the Maritime Practice Book approved, as a binding document, by the Maritime Administration of the Republic of Poland.				EP1, EP2, EP3, EP4, EP5

Total numbers of hours during semester:	min. 6 months

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1					x				
EP2					x				
EP3					x				
EP4					x				
EP5					x				

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
IV	Student uzyskał zakładane efekty uczenia się, obył 2-miesięczną praktykę morską i uzyskał zaliczenie przedmiotu w oparciu o Książkę Praktyk.
VI	Odbycie minimum 60 dni praktyki morskiej na statku o mocy maszyn głównych 750 kW i powyżej. Zaliczenie Książki Praktyk.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours				
Reading literature				
Preparing for laboratories, project classes				
Preparing for exam, pass test				
Developing project/report				
Participation in exam, pass test				
Consultation with teacher				
Total number of hours				
Number of ECTS credits				
Total number of ECTS credits for the subject	**32**			
Student's workload connected with practical classes	32 ECTS			
Student's workload connected with classes involving direct participation of teacher	32 ECTS			

List of literature:

Required reading
1. Practice Book.
Recommended reading

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Mariusz Giernalczyk, PhD (Eng), Ass. Prof. – Representative of the Dean of Faculty for practical training	Department of Marine Propulsion Plants
2. Other lecturers:	

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	45	Name of subject:	**DIPLOMA THESIS SEMINAR**
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	**ECTS credits**	**Number of hours per week**					**Number of hours per semester**				
		L	**C**	**Lab**	**P**	**S**	**L**	**C**	**Lab**	**P**	**S**
VII	1					1					15
VIII	1					1					15
Total numbers of hours during study:							**30**				

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the subjects covered in the previous course of study.
2.	Ability to use Microsoft Office or "open source" programs to write a diploma thesis and make drawings, graphics, etc.

Course objectives

1.	The aim of the course is to acquire the ability to write a diploma thesis in accordance with the editorial requirements in force at the Faculty of Mechanical Engineering of the Gdynia Maritime University, learn the rules of writing diploma theses, the structure of the work, the order of chapters, the selection and use of information sources along with the rules of quoting, elaboration, etc. infringement of third party copyrights and suspicion of plagiarism.

Intended key learning outcomes for the subject (EP):

Symbol	**upon completion of the course student is able to:**	**Reference to field learning outcomes**
EP1	prepare a study of a problem in the field of the studied discipline.	K_U03
EP2	perform orally presenting issues related to the studied engineering discipline.	K_U04
EP3	use engineering norms and standards.	K_U12

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester VII

No	Content description	No of hours			Reference to EP of the subject
		W	C	S	
1.	Methodology of conducting research/design works. Discussion of the rules for writing diploma theses in force at the Faculty of Mechanical Engineering of Gdynia Maritime University. The structure of the diploma thesis - purpose, genesis, hypothesis, problem solving, conclusions. Selection of literature. Searching for news.			15	EP1, EP2, EP3
Total numbers of hours during semester:				**15**	

Semester VIII

No	Content description	No of hours			Reference to EP of the subject
		W	C	S	
1.	Discussion of the rules of diploma, preparation for the diploma exam, rules of preparing the self-presentation of the diploma thesis. Presentation by students of proposals for solving tasks resulting from the topic and scope of a given diploma thesis. Presentation of extracurricular knowledge acquired in order to solve the given task. Discussing the difficulties and problems arising during the implementation.			15	EP1, EP2, EP3,
Total numbers of hours during semester:				**15**	

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1					x				
EP2					x		x		
EP3					x				

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
VII	The student has achieved the expected learning outcomes. Completion of the subject based on the grade from the report.
VIII	Completion of the subject based on the grade from the presentation.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours				30
Reading literature				20

Preparing for laboratories, project classes				
Preparing for exam, pass test				
Developing project/report				15
Participation in exam, pass test				
Consultation with teacher				
Total number of hours				65
Number of ECTS credits				**2**
Total number of ECTS credits for the subject	**2**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	30h 1 ECTS			

List of literature:

Required reading
1. Rules for writing diploma theses at the Faculty of Mechanical Engineering. 2. Diploma rules at the Faculty of Mechanical Engineering. 3. Title page and statement template.
Recommended reading

Teacher:

Title/degree, name and surname	**University unit**
1. Supervisor:	
Jerzy Herdzik, DSc (Eng), Ass. Prof.	Department of Marine Propulsion Plants
2. Other lecturers:	
Kazimierz Witkowski, DSc (Eng), Ass. Prof.	Department of Marine Propulsion Plants
Mariusz Giernalczyk, PhD (Eng), Ass. Prof.	Department of Marine Propulsion Plants

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	46	Name of subject:	**DIPLOMA THESIS**
Main field of study:			MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:			first-cycle studies
Mode of study:			full-time
Profile of study:			practical profile
Specialization:			**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Semester	ECTS credits	Number of hours per week					Number of hours per semester				
		L	C	Lab	P	S	L	C	Lab	P	S
VIII	15										
Total numbers of hours during study:											

Prerequisities relating to knowledge, skills and other competences (if applicable)

1.	Knowledge and skills in the subjects covered in the previous course of study.

Course objectives

1.	The aim of the course is to submit an engineering thesis approved by the tutor.

Intended key learning outcomes for the subject (EP):

Symbol	upon completion of the course student is able to:	Reference to field learning outcomes
EP1	obtain information from literature and other sources, make interpretations, draw conclusions.	K_U01
EP2	independently study issues related to a given engineering topic.	K_U05, K_K01
EP3	plan and carry out experiments, including measurements and computer simulations, interpret the results and draw conclusions.	K_U08
EP4	apply knowledge to the interpretation of phenomena occurring in machinery, equipment and ship installations.	K_U13
EP5	design a simple device, object, system or process typical for the construction and operation of machines.	K_U18

K_W02, K_U08; K_K05 – symbols for learning outcomes for the field of study (W-knowledge, U-skills, K-social competences)

Course content:

Semester VIII

No	Content description	No of hours			Reference to EP of the subject
		W	C	S	
1.	The way of writing the work: division into chapters, maintaining proportions, unambiguity and clarity of the text, correct language, quotes, references, inserting figures and tables, indexes, preparing a				EP1, EP2, EP3, EP4, EP5

	bibliography. Copyright.				
Total numbers of hours during semester:					

Methods of the assessment of each particular learning outcomes:

Symbol of EP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EP1									x
EP2									x
EP3									x
EP4									x
EP5									x

Assessment criteria:

Semester	Positive grade (minimum passing grade in Polish: dostateczny)
VIII	Completion of the subject based on the engineering thesis submitted to the dean's office, approved by the thesis supervisor and reviewer and accepted for defence.

Note: student gets higher than minimum passing grade if achieved learning outcomes exceed the required minimum

Student's workload:

Learning activities	Estimated number of hours for activity			
	L, C	Lab	P	S
Teaching hours				
Reading literature				
Preparing for laboratories, project classes				
Preparing for exam, pass test				
Developing project/report				
Participation in exam, pass test				
Consultation with teacher				
Total number of hours				
Number of ECTS credits	**15**			
Total number of ECTS credits for the subject	**15**			
Student's workload connected with practical classes	0 ECTS			
Student's workload connected with classes involving direct participation of teacher	15 ECTS			

List of literature:

Required reading
1. Rules for writing diploma theses at the Faculty of Marine Engineering 2. Rules for diplomas at the Faculty of Marine Engineering 3. Template of the title page and statement.
Recommended reading

1. Regulations of studies at the Gdynia Maritime University

Teacher:

Title/degree, name and surname	University unit
1. Supervisor:	
Tutors of engineering thesis	
2. Other lecturers:	

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	47	GRADUATE PROFILE
Main field of study:		MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:		first-cycle studies
Mode of study:		full-time
Profile of study:		practical
Specialization:		**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

A graduate of a first degree program with a practical profile has the basic knowledge and skills necessary to understand issues in the construction, manufacture and operation of marine machinery and equipment. He or she has a thorough knowledge of the principles of technical mechanics, strength of materials as well as detailed knowledge profiled in the operation of ship machinery and installations. Able and experienced in operating and maintaining the machinery and power equipment of ship's power plants (appropriate to the diploma of mechanical officer).

The aim of the training is for the graduate to obtain qualifications at level 6 of the Polish Qualification Framework (PRK) and to prepare for safe work on a ship as a ship's engineer officer at the operational and management levels.

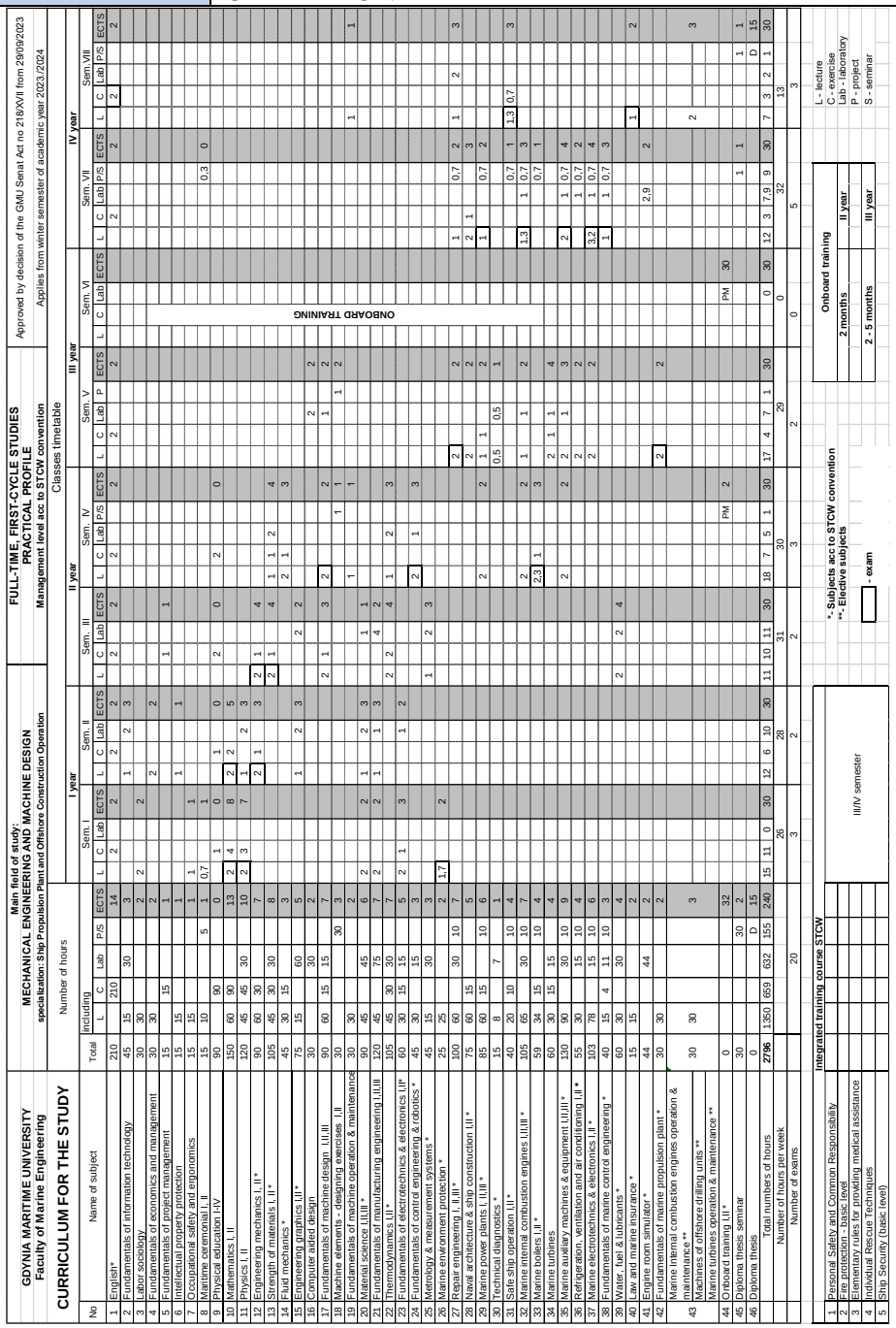
The graduate is prepared to: (1) carry out the processes of manufacturing, assembly and operation of machinery, (2) work in support of the design of simple engineering tasks, selection of engineering materials used as machine components and supervision of their operation, (3) work in a team, (4) diagnose the technical condition of individual machines and power equipment and industrial installations, (5) organizing, managing and performing overhauls of power equipment and industrial installations, (6) coordinating work related to operations, (7) undertaking second degree studies, and in addition to (8) operating ship's engine rooms at the operational level, confirmed by a diploma as an officer of the watch engineer issued by the relevant maritime administration.

Graduates are predisposed to work in: (1) crews of floating objects as ship mechanic officers, (2) shipbuilding and other enterprises engaged in the manufacture and operation of machinery and ship mechanic systems, (3) production and repair shipyards, (4) technical services of classification societies, (5) shipowners' technical supervision services, (6) other economic, administrative and educational units requiring technical and information technology knowledge. Graduates obtain a qualification at PRK level 6, receive the professional title of engineer, and are qualified to obtain the diploma of ship mechanic at the management level.

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	48	**CURRICULUM FOR THE STUDY**
Main field of study:		MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:		first-cycle studies
Mode of study:		full-time
Profile of study:		practical
Specialization:		**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**



GDYNIA MARITIME UNIVERSITY
Faculty of Marine Engineering

Main field of study: MECHANICAL ENGINEERING AND MACHINE DESIGN
specialization: Ship Propulsion Plant and Offshore Construction Operation

FULL-TIME, FIRST-CYCLE STUDIES
PRACTICAL PROFILE
Management level acc to STCW convention

Approved by decision of the GMU Senat Act no 218/XVII from 29/09/2023
Applies from winter semester of academic year 2023./2024

CURRICULUM FOR THE STUDY — Classes timetable

No	Name of subject	Number of hours: Total	including: L	C	Lab	P/S	ECTS	I year Sem. I: L	C	Lab	ECTS	Sem. II: L	C	Lab	ECTS	II year Sem. III: L	C	Lab	ECTS	Sem. IV: L	C	Lab	P/S	ECTS	III year Sem. V: L	C	Lab	P	ECTS	Sem. VI: L	C	Lab	ECTS	IV year Sem. VII: L	C	Lab	P/S	ECTS	Sem. VIII: L	C	Lab	P/S	ECTS
1	English*	210		210			14		2		2		2		2		2		2		2			2										2				2				2
2	Fundamentals of information technology	45	15		30		3																																			
3	Labor sociology	30	30				2	2																																		
4	Fundamentals of economics and management	30	30				2					2			2																											
5	Fundamentals of project management	15		15			1									1			1																							
6	Intellectual propety protection	15	15				1					1			1																											
7	Occupational safety and ergonomics	15	15				1	1			1																															
8	Maritime ceremonial I, II	15	10			5	1	0,7			1																		0,3			0									
9	Physical education I-IV	90		90			0		1		0		1		0		2		0																						
10	Mathematics I, II	150	60	90			13	2	4		8	2	2		5																										
11	Physics I, II	120	45	45	30		10	2	3		7	1		2	3																										
12	Engineering mechanics I, II*	90	60	30			7					2	1		3	2	1		4																						
13	Strength of materials I, II*	105	45	30	30		8									2	1		4	1	1	2		3																
14	Fluid mechanics *	45	30	15			3													2	1																				
15	Engineering graphics I,II*	75	15		60		5					1		2	3			2	2																						
16	Computer aided design	30			30		2																						2			2								
17	Fundamentals of machine design. I,II,III	90	60	15	15		7									2	1		3	2				2					1			2								
18	Machine elements - designing exercises I,II	30				30	3																																	
19	Fundamentals of machine operation & maintenance	30	30				2													1				1															1	
20	Material science I,II,III*	90	45		45		6	2			2	1		2	3				1																					
21	Fundamentals of manufacturing engineering I,II,III	120	45		75		7	2			2	1		1	3		2		4	1		2		3															
22	Thermodynamics I,II*	105	45	30	30		7									2	2		4																					
23	Fundamentals of electrotechnics & electronics I,II*	60	30	15	15		5	2	1		3			1	2																									
24	Fundamentals of control engineering & robotics *	45	30		15		3													2			1	3																
25	Metrology & measurement systems *	45	15		30		3									1		2	3																					
26	Marine environment protection *	25	25				2	1,7			2																													
27	Repair engineering I, II, III *	100	60		30	10	7																		2							2								
28	Naval architecture & ship construction I,II *	75	60	15			5																		2							2	1	2						
29	Marine power plants I, II,III *	85	60	15		10	6									2									2	1	1		0,5			0,5		3						
30	Technical diagnostics *	15	8		7		1																																	
31	Safe ship operation I,II *	40	20	10		10	4																																	
32	Marine internal combustion engines I,II,III *	105	65		30	10	7													2	1		1	2					1,3										
33	Marine boilers I,II *	59	34	15		10	4													3																				
34	Marine turbines	60	30	15	15		4																						0,7			1								
35	Marine auxiliary machines & equipment I,II,III *	130	90		30	10	9													2					2	1	1		0,7			4								
36	Refrigeration, ventilation and air conditioning I,II *	55	30		15	10	4																		2				0,7			2								
37	Marine electrotechnics & electronics I,II *	103	78		15	10	6																		2				0,7			4								
38	Fundamentals of marine control engineering *	40	15	4	11	10	3																		3,2				0,7			3								
39	Water, fuel & lubricants *	60	30		30		4									2		2	4						1															
40	Law and marine insurance *	15	15				2																													1				2
41	Engine room simulator *	44			44		2																						2,9			2								
42	Fundamentals of marine propulsion plant *	30	30				2													2																				
43	Marine Internal combustion engines operation & maintenance **	30	30				3																																	3
	Machines of offshore drilling units **																																			2				
	Marine turbines operation & maintenance **																																							
44	Onboard training I,II *	0					32																					PM				30				1				1
45	Diploma thesis seminar	30				30	2																													1				1
46	Diploma thesis	0				D	15																																	D
	Total numbers of hours	2796	1360	659	682	155	240	15	11	0	26	12	6	10	28	10	11	10	31	18	7	5	1	30	17	4	7	1	29	0		0	0	12	3	7,9	9	30	7	3	2	1	13	30
	Number of hours per week					20			3				2				2				3					2									5							
	Number of exams																																							

Integrated training course STCW

1	Personal Safety and Common Responsibility
2	Fire protection - basic level
3	Elementary rules for providing medical assistance
4	Individual Rescue Techniques
5	Ship Security (basic level)

III/IV semester

*- Subjects acc to STCW convention
**- Elective subjects

- exam

Onboard training	
2 months	II year
2 - 5 months	III year

L - lectures
C - exercises
Lab - laboratory
P - project
S - seminar

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code:	49	LEARNING OUTCOMES FOR THE STUDY PROGRAM
Main field of study:		MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:		first-cycle studies
Mode of study:		full-time
Profile of study:		practical
Specialization:		**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

EXPLANATION OF DESIGNATIONS IN SYMBOLS FOR LEARNING OUTCOMES (K):

- before underscore:

K – learning outcomes for the study program,

- after underscore:

W – knowledge competence,
U – skills competence,
K – social competence,
01, 02, 03, et seq. – number of learning outcome

MATRIX FOR LINKING THE LEARNING OUTCOMES FOR THE STUDY PROGRAM WITH THE CHARACTERISTICS OF THE LEARNING OUTCOMES OF THE POLISH QUALIFICATION FRAMEWORK (LEVEL 6 OF QUALIFICATIONS)

first-cycle studies, full-time program with practical profile,

with major in **SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Learning outcome designation	**LEARNING OUTCOME DESCRITPION** Upon completion of the first-cycle program with a practical profile with major in Ship Propulsion Plant And Offshore Construction Operation, the graduate:
KNOWLEDGE (W)	
K_W01	has general knowledge of mathematics, physics, engineering mechanics, strength of materials and other areas of science, necessary to formulate and solve typical, simple tasks related to the operation of marine equipment
K_W02	has a general knowledge of the spectrum of engineering disciplines related to mechanical engineering: materials engineering, marine electrical engineering and automation, chemistry
K_W03	has a structured general knowledge of the construction, manufacture and operation of marine machinery
K_W04	has the detailed technical knowledge necessary for the proper maintenance, operation and operation of marine equipment and installations, electrical, electronic equipment and automatic control systems, and to direct the safe operation of a ship's engine room
K_W05	has detailed knowledge of manufacturing technology, repair of ship machinery and equipment and ship systems, necessary to undertake planned and incidental work in this area
K_W06	has detailed knowledge of the properties and safe handling of shipbuilding consumables
K_W07	has detailed knowledge of the life cycle of engine and general ship machinery and equipment
K_W08	knows the basic methods, techniques, tools and materials used in solving simple engineering tasks related to the operation of a power plant and a ship
K_W09	has a basic knowledge of technical standards and norms related to the construction and operation of machinery
K_W10	has a basic knowledge of maritime law and ceremonial, and is familiar with and experienced in the use of safety standards and norms related to working on a ship
K_W11	has the basic knowledge necessary to understand the economic, legal and other non-technical conditions of engineering activities

K_W12	has detailed knowledge of managing the safe operation of a ship, organization and management of ship engine room resources
K_W13	has a basic knowledge of management, including quality management and business management
K_W14	knows and understands the basic concepts and principles of industrial property protection and copyright law
K_W15	has a structured knowledge of the processes of risk analysis and management, with particular emphasis on human resources and material resources - specific to the power plant of floating commercial facilities
K_W16	knows the general principles of creation and development of forms of individual entrepreneurship, using knowledge from the area of technical sciences
SKILLS (U)	
K_U01	obtains information from literature, databases (including in English) and other sources, integrates them, interprets them, draws conclusions and formulates and justifies opinions
K_U02	is able to communicate in professional English (Maritime English) and is able to communicate using various techniques in shipboard conditions
K_U03	is able to prepare in Polish and English a well-documented study of a problem in the discipline "mechanical engineering"
K_U04	has the ability to give oral speeches in Polish and English on specific issues of the studied engineering discipline
K_U05	has the ability of self-education, among other things, to improve professional competence
K_U06	has language skills in the field of the studied discipline, in accordance with the requirements specified in the Regulation of the Minister responsible for maritime affairs on framework training programs and examination requirements for professional qualifications of seafarers (level B2 of the Common European Framework of Reference for Languages)
K_U07	is able to apply basic information and communication technologies in the acquisition and processing of information in the safe operation of an engine room
K_U08	is able to plan and conduct experiments, including measurements and computer simulations, interpret the obtained results and draw conclusions
K_U09	is able to use analytical, simulation and experimental methods, typical for ship power plant, to formulate and solve practical engineering tasks
K_U10	is able - when formulating and solving engineering tasks - to see their system and non-technical aspects

K_U11	has the skills necessary to work in an industrial environment (in particular, offshore power installations), including teamwork, and knows the safety rules related to the performance of professional duties
K_U12	knows how to apply manufacturing technologies to shape the form, structure and properties of materials and use measuring apparatus, workshop metrology used on ships
K_U13	is able to apply knowledge to interpret phenomena occurring in ship machinery, equipment and installations
K_U14	is able to make a preliminary economic assessment of engineering actions taken
K_U15	is able to make a critical analysis of the functioning of ship mechanisms and equipment and evaluate the existing technical solutions necessary for the proper and safe operation of the ship
K_U16	is able to identify and formulate the specification of simple engineering tasks of a practical nature, among others: troubleshooting, inspection, planning and execution of overhaul of power equipment and installations (especially ship power plants)
K_U17	is able to assess the suitability and apply the appropriate method (procedure) and tools to solve engineering tasks of a practical nature, related to the operation of mechanisms and equipment of ship power plants
K_U18	is able - in accordance with the given specification (using the appropriate technique and tools) - to design and implement a simple device, object, system or process typical for the construction and operation of machinery, with particular emphasis on ship conditions and principles of teamwork. Can verify the correctness of the task and determine the degree of fulfillment of other design requirements.
K_U19	has experience, gained during maritime apprenticeship, related to the use of appropriate tools, materials and procedures to solve practical engineering tasks, including working in a team
K_U20	is able to and has experience in operating and maintaining machinery, installations, machines and equipment of ship's engine rooms (appropriate to the diploma of officer of the watch)
K_U21	has the ability to use and experience in the use of engineering standards and norms
K_U22	knows how to handle and use information on: structural and stability documentation of the ship, technical and operational documentation of ship equipment, schematics of ship installations
K_U23	understands the need for and knows the possibilities of continuous training (second degree studies, doctoral school education, postgraduate studies, professional courses) - improving professional, personal and social competence

K_U24	is able to work in a group assuming various roles in it, especially related to the specific maritime working conditions, understands the principles of cooperation and management of multicultural human teams
K_U25	is able to lead a small team accepting responsibility for the results of its work
SOCIAL COMPETENCES (K)	
K_K01	is aware of the importance and understanding of the non-technical aspects and consequences of engineering activities, including their impact on the environment
K_K02	is aware of the importance of professional and ethical responsibility for decision-making in the operation of marine power plant equipment
K_K03	is aware of the risks of the profession, knows the principles of personal safety and joint responsibility
K_K04	is aware of the responsibility for jointly performed tasks associated with teamwork on a ship
K_K05	is able to appropriately determine the priorities for the implementation of a task defined by himself or others, in particular the management of ship engine room resources
K_K06	correctly identifies and resolves dilemmas related to the performance of the profession
K_K07	in specific maritime conditions, is able to act in an entrepreneurial manner
K_K08	is aware of the social role of a graduate of a maritime university, and especially understands the need to communicate to the public - including through the mass media - information about the achievements of maritime technology and other aspects of the marine engineer's activity
K_K09	is aware of and cares for physical fitness

GDYNIA MARITIME UNIVERSITY

FACULTY OF MARINE ENGINEERING

Code: 48	**CURRICULUM FOR THE STUDY**
Main field of study:	MECHANICAL ENGINEERING AND MACHINE DESIGN
Level of qualification:	first-cycle studies
Mode of study:	full-time
Profile of study:	practical
Specialization:	**SHIP PROPULSION PLANT AND OFFSHORE CONSTRUCTION OPERATION**

Educational profile:	practical
Number of semesters required for graduation	8 semesters
Number of ECTS credits required for graduation	240 ECTS
Total number of class hours in the study program	2796 hours
Total number of ECTS credits to be obtained by the student in classes with direct participation of academic teachers or other instructors	162 ECTS (68%)
Total number of ECTS credits to be obtained by the student in the humanities or social sciences	20 ECTS
Total number of ECTS credits a student earns in elective courses	111 ECTS (46%)
Total number of class hours/ECTS points allocated to physical education classes	90 hours / 0 ECTS
Total number of ECTS credits to be obtained by the student in practical skills classes	165 ECTS (69%)