GDYNIA MARITIME UNIVERSITY
FACULTY OF MARINE ENGINEERING

PROGRAMM OF STUDIES

Form of studies: Full time program, first cycle
Profile of education - practical

Field: Mechanical Engineering and Machine Design

Specialization: Marine Propulsion Plant and Offshore Construction Operation /ESOiOO/

GDYNIA 2015

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING
Field/Level of education: Mechanical Engineering and Machine Design
Profile of education: Practical
Specialization: Marine Propulsion Plant and Offshore Construction Operation

List of courses

*** - STCW 78/95 Courses ** - elective course**

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	1	Course :	**English**
Field/Level of education:			**Mechanical Engineering and Machine Design / first-degree**
Form of studies:			**full-time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in week					Number of hours in semester			
		L	C	Lab	P	S	L	C	Lab	P
II	1		2					30		
III	1		2					30		
IV	1		2					30		
V	1		2					30		
VII	2		2					30		
VIII E	2		2					30		
Total number during the studies:							**180**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

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. The course is in accordance with the model course for engineering department issued in annex no 8 of the Directive of the Ministry of Infrastructure and Development of 28th February 2014 , item 536

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course student can :	Reference to the field educational effects
EKP1	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
EKP2	analyze diagrams of selected engine room systems , explain the principles of their operation and make use of operating instructions	K_W05, K_U03
EKP3	describe the safe working procedures on board vessel specifically in the engine room with relation to machine maintenance and repair works (SMCP)	K_W09, K_U11
EKP4	use grammar structures and rules in writing and in speech , use the rules of commercial, ship and engine room correspondence	K_U06
EKP5	communicate in professional English (Maritime English) , make speeches and comment on engine room operation	K_U02, K_U04
EKP6	utilize literature and electronic sources to improve language competences with reference to Technical & Maritime English	K_U01, K_U05, K_U07
EKP7	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 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester II

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Basic rules of English grammar, revision of: verbs, cardinal numbers, ordinal numbers, personal pronouns, possessive pronouns, revision of tenses: Present Simple, Present Continuous, Present Perfect, Past Simple, Past Continuous, Future Simple		4		EKP4,EKP7
2.	Proper name of the university, faculty, specialization and other academic vocabulary		2		EKP1
3.	Terminology related to ship hull construction, ship data, deck facilities, types of vessel, table 8.14 point 1a,1b,6		8		EKP1,EKP6
4.	Ship crew, its duties, maritime alphabet, communication dealing with ship operation, table 8.14. point 5, 6		4		EKP1,EKP6
5.	Engineering materials, material properties, tests on materials, metals and alloys, table 8.14. point 1t, 2b		4		EKP1,EKP6
6.	Elements of conversation, revising: forms of introduction, small talk, asking for and giving instructions, describing interests, daily routines, past and future activities, telling the time, date, giving numbers, dimensions, fractions, percentages, prices, telephone numbers, mail addresses etc. Basics of English pronunciation		6		EKP5,EKP7
7.	Reading and understanding simplified articles within the scope of ship facilities, documents and procedures, table 8.14. point 2a,2d,2e		2		EKP6,EKP7

Semester III

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Terminology related to technological processes: machining metals, casting, forging, welding, turning, milling, grinding, heat treatment , table 8.14. point 2b		4		EKP1,EKP7
2.	Terminology related to tools and their application, table 8.14. point 2c		4		EKP1,EKP6
3.	Terminology related to internal combustion engines: engine types, their construction, principle of operation, 4 stroke engine, 2 stroke engine, functional systems, components, working parameters, table 8.14. point 1c		8		EKP1,EKP2
4.	Grammar areas covering English tenses, questions formation, Passive Voice introduction based on technical terminology related to ship installations operation, table 8.14. point 1r		7		EKP4
5.	Reading and understanding technical texts and technical correspondence related to repairs and failure description table 8.14. point 3b,3d		3		EKP6,EKP7
6.	Developing abilities of spoken English usage with respect to technical subject matter, table 8.14. point 4a, 4b		4		EKP1,EKP5

Semester IV

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Revision of terminology related to internal combustion engines table 8.14. point 1c		2		EKP1,EKP5
2.	Terminology related to functional systems of internal combustion engines: bearings, table 8.14. point 1c		3		EKP1,EKP6
3.	Terminology related to hydraulic devices and installation, pneumatic devices (fittings, valves), pumps , compressors in marine ballast system, cooling water system, bilge system and firefighting system, table 8.14. point 1f, 1g, 1i, 1j, 1r		8		EKP1 EKP2,EKP6
4.	Terminology related to marine sanitary sewage treatment plant, table 8.14. point 1p		3		EKP1,EKP2
5.	Grammar areas covering Passive Voice, Conditional Sentences type 1, noun compounds based on technical terminology related to marine communication on repairs range, repair report, checklists, failure description, complaints and requisitions, table 8.14. point 3a, 3b, 3c, 3d, 3f, 3i, 3l		10		EKP3,EKP4
6.	Communication related to engine room operation, ship crew interaction, reports of engine room monitoring devices, table 8.14. point 4a, 4b		4		EKP 5,EKP7

Semester V

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Terminology related to fuel system, fuel types, bunkering and fuel transfer, table 8.14. point 1r		7		EKP1, EKP2
2.	Terminology related to fuel separators , table 8.14. point 1k, 1r, 4a		4		EKP1, EKP2
3.	Terminology related to wastes incinerator , table 8.14. point 1q, 1r		3		EKP1,EKP2
4.	Grammar areas covering Passive Voice, imperatives in Reported Speech, Conditional Sentences type 2 based on technical terminology related to marine communication on repairs range, repair report and ship installations operation, table 8.14. point 1r, 3b, 3d,3f,3i,		6		EKP3,EKP4
5.	Activities developing communicative competence and reading articles from technical magazines dealing with safe work on board vessels, table 8.14. point 3d, 3e, 3j, 3k, 5, 6		6		EKP2, EKP5, EKP 6
6.	SMCP terminology, communication related to ship operation, table 8.14. point 5		2		EKP2,EKP5
7.	Terminology related to ISM and ISPS procedures, table 8.14. point 7		2		EKP5,EKP6

Semester VII

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Terminology related to fresh water generation, table 8.14. point 1l		4		EKP2, EKP5
2.	Terminology related to marine boilers and steam installations, table 8.14. point 1h		4		EKP2, EKP5
3.	Terminology related to bilge water separators, table 8.14. point 1o		4		EKP2, EKP5
4.	Terminology related to electric devices and systems, table 8.14. point 1d		4		EKP2, EKP5

5.	Elements of correspondence related to engine log book entries, repairs reports, accidents reports, repair scope, parts requisition, table 8.14. point 3a, 3b, 3d, 3e, 3f, 3h,3i,		3		EKP6, EKP7
6.	SMCP terminology, communication in alarm and emergency conditions, table 8.14. point 6		3		EKP1, EKP5
7.	Grammar areas covering Passive Voice, modal verbs, Reported Speech based on technical terminology related to marine communication on engine room operation, table 8.14.point 5a,5b		4		EKP4,EKP5
8.	Activities developing communicative competence based on students onboard experience related to engine room operation, table 8.14. point 4a,4b		4		EKP5, EKP7

Semester VIII

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Terminology related to steering gear systems, table 8.14. point 1m		4		EKP2, EKP7
2.	Terminology related to propellers, table 8.14. point 1p		3		EKP2, EKP6
3.	Terminology related to marine automatic systems, table 8.14. point 1e		3		EKP2,EKP6
4.	Elements of correspondence related to machine repair and maintenance, table 8.14. point 3a, 3b, 3c, 3j		4		EKP4,EKP6
5.	Elements of professional correspondence related to appraisal report, special work permits, job application, CV, table 8.14. point 3g, 3k		4		EKP1,EKP5
6.	Terminology related to engine room devices repair and maintenance, table 8.14. point 2a, 2e		5		EKP2,EKP3, EKP4
7.	Preparation for final exam of professional English, revision of terminology related to engine room systems operation, table 8.14. point 1c, 1r, 5a, 5b		5		EKP2, EKP4
8.	Terminology related to Bachelor thesis abstract		2		EKP4,EKP6

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1	x		x				x	x	x
EKP2	x		x				x	x	x
EKP3	x		x					x	x
EKP4	x		x					x	x
EKP5	x							x	x
EKP6							x		x

EKP7								**x**	**x**

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
I - VIII	Student achieved the planned educational effects and fulfilled the STCW requirements related to passing the course. Student attended classes. (2 missed classes are permitted in a semester whereas 5 missed classes = 30% hours absence results in an unclassified grade). Getting credits for particular semesters – tests, pass tests, oral demonstration, practical demonstration and other forms of assessing English language competence at the following grade levels: 60% - minimum satisfactory grade , 80% - good grade, 90%- very good grade. Final written exam at the end of the 8th semester of the course. Exemption from the exam can be granted on the basis of very good grades for five semesters and good grade for one semester of the course.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	180			
Reading literature	20			
Preparing for laboratories, project classes	30			
Preparing for the exam, the pass test	10			
Drafting documentation of a project/report	20			
Participating in pass tests and exams	20			
Participating in consultation hours	15			
Total number of hours	286			
Number of ECTS points	**8**			
Summary number of ECTS points for the course	**8**			
Student workload connected with practical classes				
Student workload during the classes involving direct participation of academic teachers	180+20+15=215			

Literature:

Primary literature
1. International Maritime Language Program , P. van Kluiyven, workbook + CD 2. English Course Materials for Marine Engineering Students , M.Ossowska Neumann, E,Żurawska – in preparation 3. English across Marine Engineering , W. Buczkowska , Gdańsk 2003 4. Internet DaVinci Programme: MarEng – Maritime English Learning Tool 5. Pdf files: engine room simulator files, Safety Digest reports, devices data sheets, engine room checklists, ship documents, operating manuals, formal letters, requisitions etc.

Secondary literature
1. Ilustrowany angielsko – polski słownik marynarza, J.Puchalski , Trademar 2003 2. M. Sztramska. Wybrane Przykłady Korespondencji Handlowej w Języku Angielskim z Tłumaczeniami 3. CBT - Prof. Henry – grammar, tests, listening comprehension 4. Workshop on English Grammar for Mechanical Engineering Students, M. Gunia, K. Mastalerz, Szczecin 2004 5. English Basics for Marine Engineering Students , A. Augustyniak, K. Mastalerz, Szczecin 2011

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Małgorzata Ossowska-Neumann, M.A.	*Foreign Languages Department*
2. Other people conducting the course:	
Edyta Żurawska, M.A.	*Foreign Languages Department*
Magdalena Jakubczak-Sapała, M.A.	*Foreign Languages Department*
Wiesława Buczkowska, M.A.	*Foreign Languages Department*
Jowita Denc, M.A.	*Foreign Languages Department*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory,
P –project,
S – seminar,
E – exam,
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
STCW Convention – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 10th January 2015

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	2	Course :	**Fundamentals of Informatics**
Field/Level of education:			Mechanical Engineering /first degree studies
Form of studies:			Full-time
Profile of education:			Practical profile
Specialization:			Marine Propulsion Plant Engineering and Offshore Construction Engineering

Semester	**ECTS**	**Number of hours in the week**					**Number of hours in the semester**			
		L	**C**	**Lab**	**P**	**S**	**L**	**C**	**Lab**	**P**
II	3	1		2			15		30	
Total number during the studies:							**45**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

2.	Basic computer skills
3.	The basics of word processing and spreadsheet

Course objectives

2.	The aim of the course is to provide basic knowledge and skills in using computers, word processing, spreadsheet use and the basics of object-oriented programming.

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	**After completing the course a Student can :**	**Reference to the field educational effects**
EKP1	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
EKP2	use the correct method of complex word processing and data processing in a spreadsheet	K_W01, K_U07,
EKP3	explain and apply the basic principles of object-oriented programming	K_W01, K_U01, K_U07, K_K07

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester II

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Construction and operation of a PC computer.	2			EKP1
2.	Major operating systems.	1			EKP1
3.	Programming languages.	1			EKP1
4.	Binary and hexadecimal systems. Boolean algebra.	2			EKP1
5.	Edit the complex texts in a text editor.			4	EKP2
6.	Analysis of the data in the spreadsheet.			8	EKP2
7.	Borland Delphi - programming environment.	1			EKP3
8.	Fundamentals of visual programming - the structure of the program.	1		2	EKP3

9.	Data types, variables, global and local.	2		4	EKP3
10.	Controlling the program.	1		6	EKP3
11.	Procedures and Functions	2		2	EKP3
12.	Working with Files	1		2	EKP3
13.	Podstawy grafiki komputerowej.	1		2	EKP3

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1	**X**								
EKP2								**X** (during laboratory classes)	
EKP3								**X** (during laboratory classes)	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
II	Student achieved the expected learning outcomes. Lecture: method of assessment - test of the lecture. Laboratories: 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: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	15	30		
Reading literature	10			
Preparing for laboratories, project classes		20		
Preparing for the exam, the pass test	3	2		
Drafting documentation of a project/report				
Participating in pass tests and exams	2			
Participating in consultation hours		3		
Total number of hours	30	55		
Number of ECTS points	**1**	**2**		
Summary number of ECTS points for the course	**3**			
Student's workload connected with practical classes	30+20+2+3=44 - ECTS 3			
Student's workload during the classes involving direct participation of academic teachers	15+30+2+3=50 + ECTS 3			

Literature:

Primary literature
6. Wóblewski P., „ABC Komputera", Helion, 2010 7. Wrotek W., „Windows 7 PL. Podstawy obsługi systemu", Helion, 2010 8. Orłowski A., „Delphi 2006. Ćwiczenia praktyczne", Helion, 2006 9. Jaronicki A., „ABC MS Office 2007 PL", Helion, 2008
Secondary literature
6.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Dr inż. Stefan Kluj	*KSO*
2. The other people conducting the course:	
Dr inż. Rafał Pawletko	*KSO*
Dr inż. Jerzy Kreft	*KSO*
Dr inż. Andrzej Młynarczak	*KSO*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 22.12.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	3	Course :	**Labor Sociology**
Field/Level of education:			Mechanical Engineering /first degree studies
Form of studies:			Full-time
Profile of education:			Practical profile
Specialization:			Marine Propulsion Plant Engineering and Offshore Construction Engineering

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
I	2	2					30			
Total number during the studies:							30			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills in the secondary education

Course objectives

1.	The aim of the course is to provide basic knowledge and skills in relation to the phenomena occurring in the society and to understand the essence of the functioning of the classes, strata and social groups.
2.	The aim is also to show the organizational structures of the working environment on the example of Gdynia Maritime University, which is an example of the sociology of work.

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	list the basic elements of the structure of society and determine their characteristics	K_W02; K_W08
EKP2	specify the class definition, layers and social groups, and provide examples	K_W07; K_K02
EKP3	explain the mechanism of the effect of local communities in the decision making process	K_W02; K_W03; K_W05
EKP4	state the reasons for the diversity of society and determine their scale.	K_U08, K_U09, K_U12, K_U13, K_U18
EKP5	list the main features of the policy-making process and their social consequences.	K_W09, K_U21
EKP6	demonstrate the ability to use literature to interpret the results of sociological research	K_U01 K_U05
EKP7	demonstrate the ability to work in a team taking on different roles in it. Accept and know the rules of cooperation.	K_K05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester I

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	

1.	Subject, matter, sections and place of sociology among other sciences	2			EKP1
2.	Sociological research methods	2			EKP2
3.	The interdisciplinary nature of sociology.	2			EKP1
4.	Social groups as a system of units left in interactions with each other	2			EKP3
5.	Formal groups and anti-social. informal groups	2			EKP1
6.	Social conflicts and ways to solve them.	2			EKP1
7.	Motives and leadership in the organization	2			EKP6
8.	The organization and its staff	2			EKP1
9.	Personality of the manager and the effectiveness of management	2			EKP1
10.	The impact of incentive for employees in the organization of learning to manage people	2			EKP4
11.	Conduction efficiency of the working group, pragmatic leadership behaviors	2			EKP1
12.	The interests of groups and individuals within the organization	2			EKP1
13.	Group decision making	2			EKP1
14.	Human resources management styles and the criteria for their selection	2			EKP1
15.	Presentation of Gdynia Maritime University sociology as an example of the company.	2			EKP1

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1	X								
EKP2	X								
EKP3	X								
EKP4	X								
EKP5	X								
EKP6	X								
EKP7	X								

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
I	Student achieved the expected learning outcomes. Lecture: method of assessment - test of the lecture. Laboratories: Execution and completion of all laboratory, according to the schedule. Evaluation index after successful completion test.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	30			
Reading literature	15			
Preparing for laboratories, project classes				

Preparing for the exam, the pass test	5			
Drafting documentation of a project/report				
Participating in pass tests and exams	1			
Participating in consultation hours	2			
Total number of hours	53			
Number of ECTS points	**2**			
Summary number of ECTS points for the course	**2**			
Student's workload connected with practical classes				
Student's workload during the classes involving direct participation of academic teachers	30+3=33 - 2 ECTS			

Literature:

Primary literature
10. Szczepański J., Socjologia, PWN, Warszawa 2008 11. Wesołowski W., Klasy, warstwy, władza, PWN, Warszawa 2006 3. Dąbrowski J., Wstęp do socjologii, PWN, Warszawa 2009 4. Kozak St., Socjologia grupy, Wyd. AM w Gdyni, Gdynia 2003 5. Januszewski A., Socjologia pracy, Wyd. Difin, Warszawa 2004
Secondary literature
7. Szczepański J., Elementarne pojęcia socjologii, Warszawa 2000 8. Szacki J., Historia myśli socjologicznej, Warszawa 2001 9. Berger P., Zaproszenie do socjologii, Warszawa 2004

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Dr Bogusław Gałka	*KE i Z*
2. The other people conducting the course:	

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 22.12.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	4	Course :	**Fundamentals of Economics and Management**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree**
Form of studies:			**full-time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester		
		L	C	Lab	P	S	L	C	Lab
I	2	2					30		
Total number during the studies:							30		

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	No requirements

Course objectives

1.	Understanding the determinants of the behaviour of market participants, the effects of decisions taken by them and the state`s role in the modern economy.
2.	Introducing students to the system of managing organisation, relations between functions of management (planning, organising, motivating, control) and efficiency of organisation.

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	classify the basic types of economic systems and describes their main features using a language of economics	K_W11, K_K11
EKP2	identify and describe the relationships between actors in a market economy	K_W11, K_W13, K_K02
EKP3	explain the sense of elementary conceptions of management	K_W13, K_K08
EKP4	describe the mechanism of organisation' activity, relations and dependences between functions of management and efficiency of organisation	K_W11, K_W13, K_K01, K_K02

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester I

No	Content	Number of aching		
		L	C	Lab/P
1.	The nature of economics, opportunity cost, production possibility curve, circular flow of income	1		
2.	Basic categories of market. The market mechanism.	3		
3.	Costs of production. Private and social costs; real and alternatives; fixed and variable; in the short and in the long term.	2		
4.	The activities of the company in the market of perfect and imperfect competition. Market models.	2		
5.	National accounts.	1		

6.	Fiscal policy.	2		
7.	Money and monetary policy.	1		
8.	Inflation. Money and prices - relations.	1		
9.	The labour market and unemployment.	1		
10.	The labour market for seafarers.	1		
11.	Managing organisation - basic concepts. Management as a decision-making process.	3		
12.	Planning	2		
13.	Organising	2		
14.	Motivating	2		
15.	Control	2		
16.	Organisational changes - the essence and influence on efficiency of organisation, people reaction to the organisational changes	1		

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1	**X**								
EKP2	**X**								
EKP3	**X**								
EKP4	**X**								

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
I	The student receives a passing grade if the expected learning outcomes achieved. Confirmation will get good ratings in the written (at least 50% of points possible to win). Evaluation of the course EiZ = 50% E + 50% Z (E - test of economics, Z - test of management science), rounded to the nearest scale assessment contained in the applicable Rules of studies GMU.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity		
	L, C	Lab	P
Contact hours	30		
Reading literature	12		
Preparing for laboratories, project classes			
Preparing for the exam, the pass test	15		
Drafting documentation of a project/report			
Participating in pass tests and exams	2		
Participating in consultation hours	2		
Total number of hours	61		
Number of ECTS points	**2**		
Summary number of ECTS points for the course	**2**		
Student's workload connected with practical classes			

Student's workload during the classes involving direct participation of academic teachers	30+2+2+34

Literature:

Primary literature
1. *Podstawy ekonomii*, red. R. Milewski, Wyd. Nauk. PWN, Warszawa 2008. 2. R. W. Griffin, *Podstawy zarządzania organizacjami*, WN PWN, Warszawa 2007.
Secondary literature
1. Makro- i mikroekonomia, red. nauk. S. Marciniak, Wyd. Nauk. PWN, Warszawa 2013. 2. A. Czermiński, M. Czerska, B. Nogalski, R. Rutka, J. Apanowicz, Zarządzanie organizacjami, TNOiK, Toruń 2001.

Persons condcuting the course :

Title/degree, name and surname	Didactic unit
1. Person responsible for the course :	
dr Katarzyna Szelągowska-Rudzka	Dapartment of Economics and Managment Faculty of Entrepreneurship and Quality Science
2. The other people conducting the course:	
dr Katarzyna Skrzeszewska	Dapartment of Economics and Managment Faculty of Entrepreneurship and Quality Science

Explanation of the abbreviations used:

L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	5	Course :	**Intellectual Property Protection**
Field/Level of education:			**Mechanical Engineering and Machine Design/First-degree**
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
I	1	1					10			
Total number during the studies:							10			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills related to secondary school

Course objectives

1.	The course objective is providing a basic knowledge in the field of intellectual property protection and getting knowledge about procedures carried out in this area.

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	define the basic concepts, regulations in the range of legal protection of intellectual property	K_W14
EKP2	evaluate the activities on the trading market of items which are protected by intellectual property laws	K_U10; K_W14
EKP3	explain what is the activity of the Polish Patent Office and the European Patent Office, other public bodies and non-governmental organizations in the protection of the authors rights	K_W14
EKP4	obtain and understand information what proceedings are conducted in connection with the protection of intellectual property	K_U01, K_W14

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester I

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Protection of intellectual property – historical overview. Basic legal concepts in the field of intellectual property protection.	1			EKP1
2.	Industrial property rights - general characteristics.	1			EKP1
3.	Inventions, utility models, industrial designs - the common rules.	1			EKP2
4.	The application procedure of the invention, utility model and industrial designs. The structure, organization and objectives of the Patent Office.	1			EKP3
5.	Trademarks - preliminary provisions	1			EKP2

6.	Copyright - the subject and the range of copyright protection, circumstances of its application. Employer as the copyright holder. The protection of scientific works.	2			EKP1 EKP4
7.	The duration of copyrights and their transition to another person. Related rights - general issues.	1			EKP2
8.	Special protection of audiovisual works and computer programs.	1			EKP2 EKP4
9.	Protection of intellectual property in the journalistic activity.	1			EKP1

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1		**X**		**X**					
EKP2		**X**		**X**					
EKP3				**X**		**X**			
EKP4		**X**					**X**		

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
I	Student achieved the expected learning objectives. Attended lectures (acceptable - 3 absences). Lecture: test of the scope of the lecture.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	10			
Reading literature	10			
Preparing for laboratories, project classes				5
Preparing for the exam, the pass test	5			
Drafting documentation of a project/report				
Participating in pass tests and exams	2			
Participating in consultation hours	1			
Total number of hours	28			
Number of ECTS points	**1**			
Summary number of ECTS points for the course	**1**			
Student's workload connected with practical classes	5=5 h			
Student's workload during the classes involving direct participation of academic teachers	10+5+2+1=18 h - 1 ECTS			

Literature:

Primary literature
12. Lindberg V.: „Intellectual property and open source. A practical guide to protecting code", O'Reilly Media, 2008. 13. Bainbridge D.: „Intellectual property, 9/E", Pearson, 2012. 14. Derclaye E., Leistner M.: "Intellectual property overlaps. A European perspective'', Hart Publishing, 2011. 15. Hunter R., D.: „Contracts for engineers: intellectual property, standards, and ethics'', CRC Press, 2011.
Secondary literature
10. www.wipo.int 11. www.uprp.pl 12. www.epo.org

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
dr inż. Jan Rosłanowski	*KMOiTR*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	6	Course :	**Occupational Safety and Ergonomics**
Field/Level of education:			**Mechanical Engineering and Machine Design/First-degree**
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
1	1	1					15			
Total number during the studies:							**15**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills acquired in secondary school.
2.	

Course objectives

1.	The objective of the course 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.
2.	

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Specify basic polish and EU legislations concerning occupational safety; describe work protection system and its relationship with other systems.	K_W10; K_W11; K_W13
EKP2	Describe fundamental physical and psychological human abilities in manufacturing process.	K_W10; K_W11
EKP3	List the risk occupational assessment procedure; to specify the rules of creating checklist of energy.	K_W15; K_U17; K_K04; K_K06
EKP4	Identify dangers present at the work place; describe the procedures used in prevention of accidents cause by those dangers.	K_W06; K_U10; K_U11; K_U18
EKP5	Describe goals of ergonomics of manufacturing and ergonomics of exploitation.	K_W09; K_U18
EKP6	Appreciate the humanization of labor.	K_K01; K_K02
EKP7	Coexist in work teams on various positions; understands the rules of cooperation.	K_K05; K_K11

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester I

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	

14.	Legal basis of work protection in Poland. Fundamental terms, sourse of obligation of industrial safety.	1			EKP1
15.	Protection of work to International Labour Organization. System of work in the EU.	1			EKP1
16.	Human-Technical Object – Working Environment System.	1			EKP2
17.	Occupational health and safety management. Contemporary conceptions. Economic aspect. Risk occupational assessment.	2			EKP3
18.	Industrial accidents – causes and effects. Prosafe behaviours.	1			EKP3
19.	Crash and industrial breakdown. Disasters of the Deep Seas.	1			EKP3
20.	Basic terms of human-factor engineering. Humaneness of work.	1			EKP5
21.	Physiological factors. Physiological and energetic effort of physical work, dynamic and static. Thermoregulation. Biological rhythms.	1			EKP3
22.	Psychological and social factors. Social work environment. Social psychological stress.	1			EKP6, EKP7
23.	Working postures in relation to machinery.	1			EKP2
24.	Mechanical factors. The types of factors. Hazards. Measures of prevention.	1			EKP4
25.	Noise and vibrations.	1			EKP4
26.	Toxic chemical substance. Chemical hazard and their control.	1			EKP4
27.	Static electricity and electric energy. Countermeasures of electric shock.	1			EKP4

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1				**X**					
EKP2				**X**					
EKP3				**X**					
EKP4				**X**					
EKP5				**X**					
EKP6				**X**					
EKP7				**X**					

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
I	Pass test
II	
III	

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity

	L, C	Lab	P	S
Contact hours	15			
Reading literature	5			
Preparing for laboratories, project classes				
Preparing for the exam, the pass test				
Drafting documentation of a project/report				
Participating in pass tests and exams				
Participating in consultation hours				
Total number of hours	20			
Number of ECTS points	**1**			
Summary number of ECTS points for the course	**1**			
Student's workload connected with practical classes				
Student's workload during the classes involving direct participation of academic teachers				

Literature:

Primary literature
16. Nauka o pracy – bezpieczeństwo, higiena, ergonomia. Praca zbiorowa, redakcja naukowa Koradecka D., wyd. CIOP Warszawa 2000r. 17. Ocena ryzyka zawodowego. Praca zbiorowa, redakcja naukowa Zawieska W. M., wyd. CIOP Warszawa 2000r. 18. Hempel L., Człowiek i maszyna. Techniczny model współdziałania. WKiŁ Warszawa 1984r.
Secondary literature
13. Sanders M. S., McCromick E.J., Human factors in engineering and design. McGRAW-HILL, INC. Singapore, 1993

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Leonard Hempel, PhD	*KPT*
2. The other people conducting the course:	

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2015r.

GDYNIA MARITIME UNIVERSITYFACULTYOF MARINE ENGINEERING			
No	7	Course:	**Physical Education**
Field/Level of education:			**Mechanical Engineering and Machine Design/First-degree**
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hoursin the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
2	0		1					15		
3	0		1					15		
4	0		2					30		
Total number during the studies:										

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	No medical limitations to perform physical effort, proper health conditions
2.	Suitable sports clothes

Course objectives

3.	Teaching a student the right swimming technics
4.	Improvement of motion skills conserning basing gimnastics, team games, athletice
5.	Forming particular motor abilities of student
6.	Forming a right attitude to phisical education and proper heating habits

Educational Effectsfor the whole Course(EKP) – after completingthe educational cycle

Symbol	After completing the courseaStudent can :	Reference to the field educational effects
EKP1	Recognizes, kows, describes and demonstrates eseential displacement and wather familiarizing exercises	
EKP2	Knows popular and right names of all swimming styles, knows thiere technics and can charakterize them	
EKP3	Knows, describes, and demonstrates different styles of starting jumps	
EKP4	Can make a right starting jumps	
EKP5	Can swim on a given dystans, using different swimming styles	
EKP6	Is aware of his swimming skills	
EKP7	Know the regulation of deferent sports disciplines	
EKP 8	Can describe the technique of deferent elements within Basic gimnastics, spotr team games and athletics	

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester II

No	Content	Number of aching	

		L	C	Lab/P	Reference to EKPof the
1.	forces affecting swimmer`s body moving in the water: exercises allowing to accustom to water				
2.	teaching the backstroke crawl swimming – errors in the legs` work and their elimination				
3.	teaching to swim backstroke crawl, exercises in teaching arms` movements – at the swimming pool wall, with a partner`s aid, a rope, a board, and unaided when laying on the water				
4.	teaching to swim breaststroke, exercises in teaching arms` movements on the land and in the water – when standing, marching, with a partner, a board and unaided when laying on the water				
5.	teaching to swim breaststroke, exercises in teaching legs` movements on the land and in the water – when standing, lying on the back and on the breast – at the wall, with a board, and unaided when laying on the water				
6.	exercises in teaching coordination of arms and legs movements and breathing – on the land and in the water				
7.	exercises improving coordination of arms and legs movements and breathing in the backstroke and breaststroke				
8.	teaching the dives from the starting post to the water				

Semester III

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	exercises improving coordination of arms and legs movements and breathing in the breaststroke				
2.	teaching the crawl stroke swimming, exercises in teaching the body positioning, arms` and legs` work - on the land, in the water, in place, with the board, and unaided when laying on the water				
3.	teaching the crawl stroke swimming - errors in the leg`s work technique and their elimination				
4.	teaching the crawl stroke swimming, exercises in teaching the arms` movements - on the land, in the water, standing, marching, with the board, and unaided when laying on the water				
5.	exercises improving coordination of arms and legs movements and breathing in the crawl stroke				
6.	exercises in teaching return in the breaststroke – swimming on, turn, rebound, full form				
7.	exercises in teaching return in the crawl stroke - swimming on, turn, rebound, full form				
8.	exercises improving returns in breast and crawl strokes				

Semester IV

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
	exercises improving coordination of arms and legs movements and breathing in the backstroke				

2.	exercises improving coordination of arms and legs movements and breathing in the breaststroke				
3.	exercises improving coordination of arms and legs movements and breathing in the crawl stroke				
4.	perfecting backstroke swimming – swimming with variable intensity extending the distances swum				
5.	teaching the butterfly stroke swimming, exercises in teaching the leg`s work on the land and in the water, in place, with the board and unaided when laying on the water				
6.	teaching the butterfly stroke swimming, exercises in teaching the leg`s work on the land and in the water, in place, with the board and unaided when laying on the water				
7.	exercises improving coordination of arms and legs movements and breathing in the butterfly stroke				
8.	preparation to efforts, meaning of an appropriate warm-up				
9.	heart rate measurement, rest and stress HR and BP result				
10.	volleyball – upper and lower ball rebound, overhand serve, game rules, court dimensions, basics of the game tactics				
11.	basketball – passes and catches, layup, throws to the basket from the distance, free throws, game rules, court dimensions, basics of the game tactics				
12.	football – ball control, passes and receptions, playing the first touch, kicking the ball with a straight flick up, basic game rules, basics of the game tactics				
13.	floorball – ball control with forehand and backhand, shots at goal, basic game rules				
14.	gymnastics – forward and backward rolls, shoulder stand, backbend				
15.	short distance race, classification of short distance races, crouch start				

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1		**X**						**X**	
EKP2		**X**							
EKP3		**X**						**X**	
EKP4								**X**	
EKP5								**X**	

EKP6								**X**	
EKP7								**X**	
EKP8		**X**						**X**	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass–Polish: dostateczny)
II	Student achieved the expected educational effects. The student attended practical classes (laboratory) and had 100 % attendance . Final evaluation is average of knowledge and the practical tests.The final evaluation is average of knowledge and practical tests.
III	Student achieved the expected educational effects. The student attended practical classes (laboratory) and had 100 % attendance . Final evaluation is average of knowledge and the practical tests.The final evaluation is average of knowledge and practical tests.
IV	Student achieved the expected educational effects. The student attended practical classes (laboratory) and had 100 % attendance . Final evaluation is average of knowledge and the practical tests.The final evaluation is average of knowledge and practical tests.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	**Estimated number of hours devoted to the activity**			
	L, C	Lab	P	S
Contact hours	60			
Reading literature				
Preparing for laboratories, project classes				
Preparing for the exam, the pass test				
Drafting documentation of a project/report				
Participating in pass tests and exams				
Participating in consultation hours				
Total number of hours	60			
Number of ECTS points	**0**			
Summary number of ECTS pointsfor the course	**0**			
Student's workload connected with practical classes	60			
Student's workload during the classes involving direct participation of academic teachers	60			

Literature:

Primary literature
1. E. Bartkowiak: Sportowa technika pływania. Biblioteka trenera; Warszawa 1995.
2. I. Malarecki: Zarys fizjologii wysiłku i treningu sportowego. Warszawa 1981.

3. J. Talaga: Technika piłki nożnej. Warszawa 1987.
4. L. . Łatyszkiewicz, M. Worobjew, M. Zaurbek M. Chromajew: Piłka ręczna, koszykówka, piłka siatkowa. Warszawa 1999.
5. K. Barański pr.zb.: Technika i metodyka nauczania podstawowych ćwiczeń gimnastycznych. Warszawa 1985.
6. Z. Mroczyński (red.): Lekkoatletyka. AWF Gdańsk 1995.
7. WOPR: Prawie wszystko o ratownictwie wodnym. Warszawa 1993.

Secondary literature

1. J. Talaga: A-Z sprawności fizycznej. Warszawa 1995.
2. R. Trześniowski: Gry i zabawy ruchowe. Warszawa 1972.
3. R. Karpiński: Nauczanie pływania. AWF Katowice 1995.

Persons condcuting the course:

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course:	
mgr Tomasz Zięba	*SWFiS*
2. The other people conducting the course:	
mgr Mariusz Grabowski	*SWFiS*
mgr Romuald Grabowski	*SWFiS*
mgr Oskar Januszewski	*SWFiS*
mgr Andrzej Kowalski	*SWFiS*
dr Andrzej Lachowicz	*SWFiS*
mgr Henryk Szulga	*SWFiS*
mgr Marek Olszewski	*SWFiS*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S– seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) –an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.02.2015 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	8	Course :	**Mathematics**
Field/Level of education:			**Mechanical Engineering and Machine Design/First-degree**
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
I	8	2	4				30	60		
II	5	2	2				30	30		
Total number during the studies:							150			

Prerequisites regarding knowledge, skills and other competences (if they concern the course)

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

Course objectives

1.	The aim of the course is to provide basic mathematic knowledge and skills, necessary for studying other subjects.
2.	Application of acquired knowledge to create and analyze mathematical models to solve theoretical and practical issues in various fields of science and technology.

Educational Effects for the whole Course (EKP) – after completing the educational cycle:

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	apply mathematical calculus to solve typical, simple tasks associated with the operation of marine equipment,	KW_01;
EKP2	apply mathematical calculus to interpret the phenomena occurring in machines, equipment and installations of the ship,	KW_01 KU_13
EKP3	apply analytical methods to formulate and solve practical engineering tasks,	KW_01 KU_09
EKP4	has the skills of self-education, in order to continue professional development.	KU_05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester I

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Complex numbers. The definition of a complex number, algebraic, trigonometric and exponential form of a complex number.	2	4		EKP1,EKP2
2.	Vector algebra. Operations defined on vectors, dot, cross, mixed product. Analytic geometry. Line and plane in space.	5	10		EKP1,EKP2

3.	Calculus. Limits and continuous functions, derivative, differential, higher derivative, Taylor`s formula, local and absolute extrema.	8	16		EKP1,EKP2
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		EKP1,EKP2
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		EKP1,EKP2
6.	Differential calculus of function of several variables. The definition of the function of two variables, limits and continuity of function two variables. Partial derivatives, directional derivatives, gradient of the function. Extremes of function with two variables. Taylor`s formula.	3	6		EKP1,EKP2

Semester II

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Integral calculus of functions with several variables. Integral of a function over a region in the plane. Spherical coordinates. Integral of a function over a region in space. Cylindrical and spherical coordinates.	5	5		EKP1,EKP2
2.	Line integral of a scalar field. Line integral of a vector field. Green`s theorem. Surface integral of a scalar field. Surface integral of a vector field. Stokes` theorem. Divergence theorem.	6	6		EKP1,EKP2
3.	Differential equations. Definition of the differential equation and boundary problems. Selected methods for solving ordinary differential equation. Linear and nonlinear first and second order differential equations. Differential equations second order with constant coefficients.	10	10		EKP1,EKP2
4.	Series of numbers. Definition of a series of numbers, the convergence of series of positive terms. Criterions of convergence of numerical series: Cauchy's, d`Alembert's, integral, comparative criterion. Series of numbers any terms, alternating series, Leibniz criterion. Approximate values of sum of series, the approximation error.	3	3		EKP1,EKP2
5.	Laplace transform. Inverse Laplace transform. Application of the transform to solve differential equations.	6	6		EKP1,EKP2

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others

EKP1			X	X					
EKP2			X	X					
EKP3			X	X					
EKP4			X	X					

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
I	Obtaining abilities, skills sufficient to apply for STCW and achieved positive result of exam. Maximal 3 absences are allowed per semester. Classes: 2 pass test. Lecture: written exam. Final grade of the subject is the average of separate grades earned during the semester including student's participation.
II	Obtaining abilities and skills sufficient to apply for STCW and achieved positive result of exam. Maximal 3 absences are allowed per semester. Classes: 2 pass test. Lecture: written exam. Final grade of the subject is the average of separate grades earned during the semester including student's participation.

Note: A Student is credited with a grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	150			
Reading literature	10			
Preparing for laboratories, project classes				
Preparing for the exam, the pass test	60			
Drafting documentation of a project/report				
Participating in pass tests and exams	12			
Participating in office hours	5			
Total number of hours	237			
Number of ECTS points	**13**			
Summary number of ECTS points for the course	**13**			
Student's workload connected with practical classes				
Student's workload during the classes involving direct participation of academic teachers	150+12+5=167h-13 ECTS			

Literature:

Primary literature
1. Jankowska K. Jankowski T., Zbiór zadań z matematyki. Gdańsk: Wydawnictwo Politechniki Gdańskiej.

2. Jankowska K. Jankowski T., Zadania z matematyki wyższej. Gdańsk: Wydawnictwo Politechniki Gdańskiej.
3. Jankowska K., Jankowski T., Funkcje wielu zmiennych, całki wielokrotne, geometria analityczna. Gdańsk: Wydawnictwo Politechniki Gdańskiej.
4. Krysicki W., Włodarski L., Analiza matematyczna w zadaniach, cz.I,II, Warszawa,Wydawnictwo Naukowe PWN.
5. Stankiewicz W., Wojtowicz J., Zadania z matematyki dla wyższych uczelni technicznych, cz.A,B,Warszawa,Wydawnictwo Naukowe PWN.
6. Piskórz K., Zadania z rachunku całkowego, Wydawnictwo WSM w Gdyni.

Secondary literature

4. Proskuryakov I.V., Problems in linear algebra,1978,Mir Publishers,Moscow.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Mgr Edward Mieczkowski	*Department of Mathematics*
2. The other people conducting the course:	
Mgr Barbara Krawczyk	*Department of Mathematics*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	9	Course :	**Physics**
Field/Level of education:			**Mechanical Engineering and Machine Design/First-degree**
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
I E	7	2	3				30	45		
II	3	1		2			15		30	
Total number during the studies:							**120**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	The knowledge and skills in physics on a secondary school level
2.	The knowledge and skills in mathematics on a secondary school level

Course objectives

1.	Acquaint students with the basics of physics in the scope necessary to gain the knowledge of the vocational subjects
2.	Acquiring the ability in design and carrying out measurements as well as their development in the scope necessary for safe service of technical systems

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can:	Reference to the field educational effects
EKP1	describe the main physical phenomena, define their quantities and units in International System of Units as well as in operational practice accepted	KW_01;
EKP2	classify and describe the types of motion in terms of classical mechanics	KW_01 KU_13
EKP3	describe and discuss the thermal properties of matter and the quantities characterizing them as well as describe the laws relating to conversion of thermal and mechanical energy	KW_01 KU_13
EKP4	describe the values characterizing the electrical phenomena and processes associated with the presence and flow of electric charges, as well as describe the relationships between the magnetic and electric phenomena	KW_01 KU_13
EKP5	describe the wave and quantum properties of light, laws describing the emission of light energy and the effects of interactions with the matter	KW_01

EKP6	describe the nuclear model of the atom in terms of the quantum theory and the processes related to transformations of the atom energetic states	KW_01
EKP7	describe the theory related to the composition of the atom nucleus, its transformation processes and discuss the energetic processes which accompanying nuclear transformations	KW_01
EKP8	describe the types of electrical conductivity based on the band theory	KW_01
EKP9	plan and carry out experiments focused on verification of mathematical models of simple phenomena and determination of values of the parameters related to the course of these phenomena	KU_08
EKP10	prepare the reports of performed measurements	KU_03
EKP11	work in a team and take the responsibility for a team as an manager	KO_3
EKP12	analyze the functioning of technical devices taking into account the physical phenomena	KU_14

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester I

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Physical quantities and their units	2	4		EKP1
2.	Foundation of classical physics – conversion of Aristotle physics into Newtonian one	2	3		EKP2
3.	Kinematics and dynamics of the material point	2	6		EKP2
4.	Kinematics and dynamics of a rigid body in translational and rotational movement	4	6		EKP2
5.	Hydrostatics - pressure, Pascal's and Archimedes' principle, Hydrodynamics - continuity and Bernoulli equations, viscosity phenomenon	2	3		EKP2
6.	Oscillatory motion: simple harmonic, dumped, and forced; wave motion, sound as a wave	2	3		EKP2
7.	Molecular theory of thermal phenomena, internal energy, temperature scales, equations of the state of a gas	2	6		EKP3
8.	The first and second thermodynamic rules, transformation of an ideal gas, work of ideal heat engine	2	6		EKP3
9.	Entropy, phase transitions	2	2		EKP3
10.	Electrostatic field – Coulomb's and Gauss's laws, electric capacity	2	2		EKP4
11.	Electric current: mechanistic genesis of Ohm and Kirchhoff lows, circuits of direct and unstable current (including alternating one)	4	3		EKP4
12.	Magnetic field: Biot-Savart-Laplace law, electromagnetic induction	4	1		EKP4

Semester II

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Maxwell's laws. electromagnetic waves	2			EKP4
2.	Elements of the theory of relativity: Galileo and Lorentz transformations	2			EKP2
3.	Wave and quantum properties of light	2			EKP5
4.	Bohr model and its complement quantum numbers	4			EKP6
5.	Structure of atomic nucleus and nuclear transformations. Elementary particles.	2			EKP7
6.	Solid state physics: crystal structures, electrical properties of solids	2			EKP8
7.	Environmental physics: planet Earth and its energy balance, climate and weather formation	1			EKP2 EKP3
8.	Introduction to laboratory classes, health and safety regulations			1	EKP11
9.	Measurements, its accuracy, development of measurement results			1	EKP9 EKP10
10.	Solids and fluids density determination			2	EKP1, EKP2 EKP9 EKP10
11.	Determination of intensity of the gravity field			2	
12.	Harmonic motion analyse, determination of dumping coefficient			2	
13.	Rigid body rotational motion analyse, determination of the moment of inertia			2	
14.	Verifying of ideal gas laws			2	EKP3 EKP9 EKP10
15.	Determination of the heat of fusion and the heat of condensation			2	
16.	Verifying the theoretical dependence of the boiling point of water on the atmospheric pressure			2	
17.	Determination of the electrical capacity by the discharge method			2	EKP4 EKP9 EKP10 EKP12
18.	Study of magnetic properties of materials, measurement of permeability			2	
19.	Verifying of the Snell law, determination of the refractive index			2	EKP5 EKP9
20.	Determining the focal length of lenses			2	
21.	Determination of the efficiency of light sources			2	EKP4, EKP5
22.	Verifying the Einstein-Millikan equation, determination of the Planck's constant by means of photocell			2	EKP8
23.	Statistical processing of the measurement results			2	EKP10

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1		**X**	**X**	**X**					
EKP2		**X**	**X**	**X**					
EKP3		**X**	**X**	**X**					
EKP4		**X**	**X**	**X**					
EKP5		**X**	**X**						
EKP6		**X**	**X**						
EKP7		**X**	**X**						
EKP8		**X**	**X**						
EKP9					**X**			**X** (During the labs.)	
EKP10					**X**				
EKP11								**X** (During the labs.)	
EKP12								**X** (During the labs.)	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass – Polish: dostateczny)
I	Student achieved the expected effects of education He attended lectures and class exercises (allowed - 3 absences) He obtained positive evaluation from colloquia covering the scope of the class exercises He obtained positive evaluation from written and oral examination covering the scope of the lectures The final grade is the waited average from class exercises and lectures (exam -2/3, colloquia – 1/3)
II	Student achieved the expected effects of education He attended lectures (allowed - 2 absences) He attended laboratory classes and performed exercises according to the schedule He obtained positive evaluation from colloquia covering the scope of the lectures The final grade is the average of positive notes from both lecture and laboratory classes

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	90	30		
Reading literature	60	15		
Preparing for laboratories, project classes		55		
Preparing for the exam, the pass test	30			
Drafting documentation of a project/report		20		
Participating in pass tests and exams	5			
Participating in consultation hours	10	5		
Total number of hours	200	85		
Number of ECTS points	**7**	**3**		
Summary number of ECTS points for the course	**10**			
Student's workload connected with practical classes	55+20+5+5=85h - 4ECTS			
Student's workload during the classes involving direct participation of academic teachers	90+30+10=130 h - 6ECTS			

Literature:

Primary literature

1. Massalski J., Massalska M., Fizyka dla inżynierów, Wyd.: WNT 2006.
2. Resnick R., D. Halliday, Fizyka, t. I, PWN, 1997
3. Holiday D., Resnick R., Walker J., Podstawy fizyki. PWN Warszawa 2003.
4. Orear J. Fizyka. WNT Warszawa 1998.

Secondary literature

5. Jewett J. W., Sewrway R. A. Physics for scientists and engineers. Broocs/Cole. Kanada, 2010.
6. Bobrowski C. Fizyka - Krótki kurs. WNT Warszawa 1998
7. Hewitt T P. G. Fizyka wokół nas. WNT Warszawa 2001.
8. Wróblewski A. K. Historia Fizyki WN PWN Warszawa 2007
9. Jaworski B. M., Dietłaf. Fizyka - Poradnik encyklopedyczny WNT 2004
10. Breuger H., Atlas Fizyki. Prószyński i S-ka Warszawa 2000
11. Dryński T., Ćwiczenia laboratoryjne z fizyki, PWN, Warszawa, 1978.
12. Druga pracownia fizyczna, red, F. Kaczmarek, PWN, Warszawa, 1976.

13. Kohlrausch F., Fizyka laboratoryjna, PWN, Warszawa 1961
14. Piotrowski B., B. Wojciechowski, J. Zimnicki, II Pracownia Fizyczna, skrypt PŁ, Łódź, 1982

Literatura podstawowa
Literatura uzupełniająca
15. A, H. Hofmokl, Laboratorium fizyczne, PWN, Warszawa, 1964.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Dr hab. prof. AMG Bogusław Pranszke	*Katedra Fizyki*
2. The other people conducting the course:	
Dr Emilia Baszanowska	*Katedra Fizyki*
Dr Włodzimierz Freda	*Katedra Fizyki*
Mgr Jolanta Kamińska	*Katedra Fizyki*
Mgr Kamila Rudź	*Katedra Fizyki*
Mgr Adam Taszner	*Katedra Fizyki*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 23.12.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	10	Course :	**Technical Mechanics**
Field/Level of education:			**Mechanical Engineering and Machine Design/First-degree**
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
II E	4	2	1				30	15		
III E	4	2	1				30	15		
Total number during the studies:							**90**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills in the range of collage

Course objectives

1.	Transmittal of basic knowledge and skills in the range of technical mechanic is a target of the course. The knowledge and skills have to be sufficient to the safe operation of technical equipment of the ship.
2.	The Program is consistent with the framework extended training program at the operational level and management in the machines division with a mechanical specialization.

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Knowledge of: ideas and principles of statics; supports and their reactions forces.	K_W01; K_W04
EKP2	Skills of: calculations of structures' forces necessary for strength analysis.	K_W01; K_W04
EKP3	Skills of: analysis of realistic structures and systems of forces acting on static balanced constructions.	K_U01; K_U08; K_U13
EKP4	Knowledge of: basic laws of general mechanics and skills of: formulating and solving equations for kinematics and dynamics of mechanical systems.	K_U01, K_U08, K_U13, K_U21
EKP5	Skills of: analysing of vibrations of mechanical structures	K_U01, K_U08, K_U13, K_U21
EKP6	Skills of: applying the laws of mechanics and using them to the operation of ship mechanisms.	K_W01, K_U21
EKP7	Skills of: using of modern technical literature to the current interpretation of the existing problems of a technical nature.	K_U01, K_U05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester II

No	Content	Number of aching	

		L	C	Lab/P	Reference to EKP of the
1.	Introduction: lectures organisation, treatment of Technical Mechanics subjects, historical overview, essentials of vectorial analysis, literature.	1			EKP1
2.	**I STATICS**				
3.	Statics basic concepts and principles (**8.1.1. p. 2., 3., 4., 5., 6.)**. Vector and scalar values. Type of forces systems and resultant force determination. Concepts of object perfectly rigid and deformable. Types of supports and supports' reactions. Types and kinds of constraints. Force concepts, types of forces, internal and external forces. Static principles of rigid mechanical systems.	2	1		EKP1, EKP2
4.	Convergenced forces system (**8.1.1. p. 7.)**. Planar convergenced forces system, spatial convergenced forces system, equilibrium conditions and equations. Sample problems.	3	2		EKP1, EKP2
5.	Parallel forces. Forces' torque – theorems. Equilibrium condition of parallel forces system.	2			EKP2, EKP3
6.	Any balanced forces system. Main vector and moment of forces system. Planar forces system, spatial forces system, equilibrium conditions and equations. Sample problems.	4	2		EKP2, EKP3
7.	Friction (**8.1.1. p. 12., 13., 14.)**. Types of sliding friction. Terms of occurrence. Coulomba-Morena laws of sliding, dry friction. Their practical significance. Coefficient of sliding, dry friction. Rolling friction. Friction of rolling bearings. Coefficient of rolling friction. Mechanical systems with frictions.	2	2		EKP3
8.	Centre of gravity. Centre of parallel forces, mass centre, Guldina theorem. Calculations of centers of gravity.	3	2		EKP2, EKP3
9.	**II KINEMATICS**				
10.	Vector function and its derivative. Vector function with scalar arguments, derivation rules of vector function in time, derivation of unit vector.	2			EKP1
11.	Mathematical methods of describing the particle movement (**8.1.1. p. 15., 17.)**. Equations of motions and equations of trajectory of particle. Conductive vector. Particle speed and acceleration. Normal and tangential acceleration. Speed and acceleration in the polar coordinates. Particle movement on the circle. Kinematics of reciprocating system (piston and rod system) in the typical engine. Inertia forces of the reciprocating system.	3	2		EKP4, EKP5
12.	Some cases of rigid body motions. Translatory motion of rigid body and its speed and acceleration. Rotary motion around constant axis. Equation of angular motion. Angular velocity and acceleration, rotational speed. Kinematics of gear transmissions, belt transmissions and friction gears. Speed and acceleration calculation in the rotary motion of rigid body.	2	1		EKP5, EKP6
13.	Plane motion of rigid body. Equation of plane motion. Velocity and acceleration of any point of the rigid body in plane motion. Instantaneous centre of speed and acceleration; centroid movable and immovable. Kinematics of planetary gears. Speed and acceleration calculation in the plane motion of rigid body.	4	2		EKP5, EKP6
14.	Resultant motion of particle. Particle's transportation, relative motion and absolute motion. Particle's velocity and acceleration in	2	1		EKP1, EKP4

	resultant motion. Coriolis theorem. Speed and acceleration calculation in the resultant motion.				

Semester III

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	**III Dynamics**				
2.	Dynamics of particles. Newton laws. D'Alembert's principle. Two basic problems of dynamics. The tasks of the dynamics of a particle. Oblique projection.	2	1		EKP4, EKP5
3.	Mass moments of inertia (**8.1.1. p. 18.)**. Definitions and types of mass moments of inertia. Stainer's statement. Deviant moments, main and main central axes of inertia. Calculations of mass moments of inertia.	3	2		EKP4, EKP5, EKP6
4.	Momentum law for particle and for rigid body. Theorem of the centre of mass motion. Applications of the momentum law - tasks.	2	1		EKP4, EKP5, EKP6
5.	Moment of momentum law for particle and for rigid body. Dynamic equation of rotational motion. Applications of the moment of momentum law - tasks.	2	1		EKP4, EKP5, EKP6
6.	Work and energy (**8.1.1. p. 20.)**. Work and power of force. Kinetic energy of particle and rigid body. Law of equivalence of work and energy. Force field, field of potential energy. Mechanical energy conservation law. Kinetic energy of particle and rigid body in the translatory and rotary motion.	4	2		EKP4, EKP5, EKP6
7.	Dynamics of rotary motion (rotation, turning, angular motion) (8.1.1. p. 19., 22., 24.). Translatory motion (e.g. of engine piston) and rotary motion (e.g. crankshaft) of rigid body. Dynamic equation of rotational motion with bearings reactions and free body axis. The concept of a rigid rotor unbalance. Bearings' loads of unbalanced rotor. Dynamic and static balancing of rigid rotors. Dynamics bearings reactions determination.	2	1		EKP4, EKP5, EKP6
8.	Approximate theory of gyroscopic phenomena. Gyroscopic moment, approximated equation of gyroscopic law. Gyroscopic reactions of machines' bearings and marine engines.	2	1		EKP4, EKP5, EKP6
9.	Impacts. Instantaneous forces. Straight, skew and eccentric impact. Restitution coefficient. Impact's centre. Determination of basic types of impacts.	2	1		EKP4, EKP5, EKP6
10.	Basic theory of vibration **(8.1.1. p. 16., 21.)**. Equation of oscillating motion. Harmonic motion of particle, harmonic vibrations. Definition of vibration period, frequency and amplitude. Harmonic vibrations summation. Vibrations' classification. Free and forced vibrations with one degree of freedom. Vibration resonance - resonance curve. Marine vibrations. Flywheel and its function and size selection. Subcritical and supercritical vibrations, vibrations' norms.	8	4		EKP4, EKP5, EKP6
11.	Fundamentals of computational mechanics. Calculation methods of structures dynamics. Measure-calculations verification of structures analysis. Measuring and calculations errors. mechanics issues in shipbuilding.	3	1		EKP6

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1			X	X					
EKP2			X	X					
EKP3			X	X					
EKP4			X	X					
EKP5			X	X					
EKP6			X	X					
EKP7			X						

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
II	Student achieved the expected learning outcomes and meets the requirements of the STCW Convention relating to complete the course. He attended at the classes and lectures (limit - 2 absences). Exercises: pass two tests positive. Lecture: pass written exam positive.
III	Student achieved the expected learning outcomes and meets the requirements of the STCW Convention relating to complete the course. He attended at the classes and lectures (limit - 2 absences). Exercises: pass two tests positive. Lecture: pass written exam positive.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	90			
Reading literature	80			
Preparing for laboratories, project classes				
Preparing for the exam, the pass test	50			
Drafting documentation of a project/report				
Participating in pass tests and exams	10			
Participating in consultation hours	10			
Total number of hours	240			
Number of ECTS points	**8**			
Summary number of ECTS points for the course	**8**			
Student's workload connected with practical classes				
Student's workload during the classes involving direct participation of academic teachers	110			

Literature:

Primary literature
1. WilliamsJ., JamesH.: Fundamentals of Applied Dynamics, John Wiley 1996. 2. KrasowskiP., PowierżaZ.: Mechanika ogólna - Statyka, Wydawnictwo Akademii Morskiej w Gdyni, Gdynia, 2002. 3. Powierża Z., Świtek J.: Mechanika ogólna – Dynamika, Wydawnictwo Akademii Morskiej w Gdyni, Gdynia, 2012. 4. OsińskiZ.: Mechanika ogólna,Wydawnictwo Naukowe PWN, Warszawa, 2000. 5. NiezgodzińskiT.: Mechanika ogólna,Wydawnictwo Naukowe PWN, Warszawa, 2012. 6. Kurnik W.: Wykłady z mechaniki ogólnej, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2012. 7. MisiakJ.: Zadania z mechaniki ogólnej - Statyka, WNT, Warszawa, 1995. 8. MisiakJ.: Mechanika techniczna - Kinematyka i Dynamika, WNT, Warszawa, 1996.
Secondary literature
1. Murawski L.: Static and dynamicanalyses of marinepropulsionsystems, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2003.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
dr hab. inż. Lech Murawski, prof. nadzw. AM	*KPT*
2. The other people conducting the course:	
dr hab. inż. Zbigniew Powierża, prof. nadzw. AM	*KPT*
dr inż. Waldemar Król	*KPT*
dr inż. Paweł Krasowski	*KPT*
mgr inż. Marian Stachowiak	*KPT*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.12.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	11	Course :	**Strength of Materials**
Field/Level of education:			**Mechanical Engineering and Machine Design/First-degree**
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
III E	4	2	1				30	15		
IV	4	1	1	2			15	15	30	
Total number during the studies:							**105**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills in the range of mathematics and technical mechanics in the field of university degree.

Course objectives

2.	Transmittal of basic knowledge and skills in the range of strength of materials is a target of the course. The knowledge and skills have to be sufficient to the safe operation of technical equipment of the ship.
3.	Applying the knowledge to interpret the phenomena of the strength of materials
4.	The Program is consistent with the framework extended training program at the operational level and management in the machines division with a mechanical specialization.

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Knowledge of: basic subject of strength of materials, materials classification, definition of deformable body.	K_W01; K_W04
EKP2	Skills of: determination of state of strains and stresses, application of the Hooke's low for statically determinate systems.	K_W04
EKP3	Skills of: determination of strains and stresses of statically indeterminate systems, making of charts of bending moments and shear forces in the statically indeterminate beams.	K_U01; K_U08; K_U13
EKP4	Skills of: determination of strains and stresses of torsional, statically indeterminate systems.	K_U01, K_U08, K_U13, K_U21
EKP5	Skills of: determination of deformations and strains in the beams with strain energy methods.	K_W01, K_U21
EKP6	Skills of: using of modern technical literature to the current interpretation of the existing problems of a technical nature.	K_U01 K_U05
EKP7	Skills of: working in a group assuming different roles in it, understanding the cooperation principles.	K_K05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester III

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
15.	Definition of deformable body. Solid mechanics as part of continuum mechanics. Materials classification.	2			EKP1
16.	Base of strength of materials, loadings and stresses definitions, allowable stress, units and tests methods of: a) tensile load **(8.1.p.1a)**. b) compressive load **(8.1.p.1b)**. State of strains and stresses. Hooke's low. Issues of statically determinate and indeterminate single rod.	2	2		EKP1, EKP2
17.	Statically determinate and indeterminate rod systems. Tensile and compressive allowable stresses **(8.1.p.1)**.	4	2		EKP2, EKP3
18.	Geometric characteristics of plane figures. Moments of inertia and deviation moments in the Cartesian coordinate system.	2	2		EKP2, EKP3
19.	Steiner's statement. Main and main central axes and moments of inertia.	2			EKP2, EKP3
20.	Bending loads **(8.1.p.1c)**. Differential equations of bending moments, shear forces and continuous loads.	4	3		EKP2, EKP3
21.	Stresses distribution in supported, loaded beams **(8.1.p.8)**.	2	2		EKP2, EKP3
22.	Differential equation of diffracted beam axis. Analytical determination method of beam axis deflection. Clebsch's method of beam axis deflection determination.	2	2		EKP2, EKP3
23.	Shear loadings **(8.1.p.1e)**. Theory of pure shear. Allowable shear stresses **(8.1.p.1)**.	2			EKP4
24.	Torsional loadings **(8.1.p.1d)**. Allowable torsional stresses **(8.1.p.1)**. Torsion of circular bars with any cross-section.	4	2		EKP4
25.	The definition of normal and tangential stresses in the shaft's cross-section **(8.1.p.23)**. Fatigue loadings **(8.1.p.1.f)**.	4			EKP, EKP4

Semester IV

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Determination of normal, tangential and substitute stresses in the shaft's cross-section **(8.1.p.23)**.		2		EKP2, EKP3
2.	Determination of beam axis deflection.		2		EKP2, EKP3
3.	Examples of the various states of the loads and stresses for the parts of ship structures.		2		EKP2, EKP3, EKP4
4.	Secure attachment and transport of elements of equipments in marine power plant **(8.1.p.11)**.	2	2		EKP3, EKP4, EKP5,
5.	Strength hypothesises and combined stress.	2	3		EKP4
6.	Strain energy methods. Energy of elastic systems. Castigliano's and Menabrei's statements.	3			EKP5
7.	Typical devices for vertical and horizontal transport in marine power plant. Distribution of loading forces **(8.1.p.9)**.	2	2		EKP3, EKP4, EKP5
8.	Thin plates (shells). Stress distribution in loaded, supported plates **(8.1.p.8)**.	3	2		EKP5
9.	Allowable loads. Using condition of devices for vertical and horizontal transport **(8.1.p.10)**.	3			EKP5

10.	Electrical strain gauges measurements of shear stresses and torsional moments on the driving shafts **(8.1.p.25)**.			3	EKP5
11.	Static and dynamic balancing of rigid rotors **(8.1.p.24)**.			4	EKP5, EKP6 EKP7
12.	Detailed tensile test.			4	EKP4, EKP6
13.	Determination of material constants by electrical strain gauges.			4	EKP2, EKP6
14.	Stresses determination in I-beam bending beam.			4	EKP2, EKP6
15.	Determination of coefficient of direct elasticity (Young's modulus) and shear modulus (Coulomb's modulus).			4	EKP2,EKP6 EKP7
26.	Impact bending test.			4	EKP2, EKP5 EKP7
17.	Ropes testing.			3	EKP2, EKP7

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1			X	X	X		X (laboratory classes)		
EKP2			X	X	X		X (laboratory classes)		
EKP3			X	X	X		X (laboratory classes)		
EKP4			X	X	X				
EKP5			X	X					
EKP6					X		X (laboratory classes)		
EKP7					X		X (laboratory classes)		

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
III	Student achieved the expected learning outcomes and meets the requirements of the STCW Convention relating to complete the course. He attended at the classes and lectures (limit - 1 absence). Lecture: pass written exam positive.
IV	Student achieved the expected learning outcomes and meets the requirements of the STCW Convention relating to complete the course. He attended at the classes and lectures (limit - 1 absence). Exercises: pass two tests positive. Laboratory: (without any absence) execution and completion of all laboratory according to the schedule.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	75	30		
Reading literature	20			
Preparing for laboratories, project classes		60		
Preparing for the exam, the pass test	20			
Drafting documentation of a project/report		20		
Participating in pass tests and exams	4			
Participating in consultation hours	2			
Total number of hours	121	110		
Number of ECTS points	**4,5**	**3,5**		
Summary number of ECTS points for the course	**8**			
Student's workload connected with practical classes	30+60+20=110 h – 3,5 ECTS			
Student's workload during the classes involving direct participation of academic teachers	75+30+4+2=111 h – 4,5 ECTS			

Literature:

Primary literature
1. Niezgodziński M. E., Niezgodziński T., "Wytrzymałość materiałów". PWN, Warszawa 2009. 2. Jakubowicz A., Orłoś Z., "Wytrzymałość materiałów". WNT, Warszawa 2005. 3. Niezgodziński M. E., Niezgodziński T., "Zadania z wytrzymałości materiałów". PWN, Warszawa 2010. 4. Banasiak M., Grosman K., Trombski M., "Zbiór zadań z wytrzymałości materiałów". PWN, Warszawa 1992. 5. Jastrzębski P., Mutermilch J., Orłowski W., Wytrzymałość materiałów, t. 1 i 2, Arkady 1986.
Secondary literature
1. Timoshenko S.,Goodier J. N., "Teoria sprężystości". Wydawnictwo Arkady, Warszawa 1962. 2. Lechnicky S. G.,"Theory of elasticity anisotropic media". Nauka - Moscow 1977. 3. Tarnowski A.," Wytrzymałość materiałów", Wydawnictwo AM Gdynia, 1999. 4. Kruszewski J. i in., " Metoda elementów skończonych w dynamice konstrukcji", Arkady, Warszawa 1984.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
dr hab. inż. Lech Murawski, prof. nadzw. AM	*KPT*
2. The other people conducting the course:	
dr hab.inż. Lesław Kyzioł, prof. nadzw. AM	*KPT*
dr inż. Waldemar Król	*KPT*
dr inż. Paweł Krasowski	*KPT*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 27.12.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	12	Course :	**Fluid Mechanics**
Field/Level of education:			**Mechanical Engineering and Machine Design/First-degree**
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
IV	3	2	1				30	15		
Total number during the studies:							**45**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	The knowledge and skills acquired in secondary school and gained from the mathematic and physic lectures during the first-level studies

Course objectives

1.	The goal of the course is to provide basic knowledge and skills in the field of fluid mechanics, which are necessary for the safe operation of industrial plants, machinery and technical equipment, which also operate in ships power plant systems.
2.	

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	describe the basic properties of fluids (adhesion, cohesion, compressibility, density, thermal expansion, dynamic and kinematic viscosity, etc.), and the basic types of flow (laminar, turbulent, steady, unsteady, potential), and the basic concepts of kinematics of fluid (streamlines, stream surfaces, pathlines, circulation);	K_W01; K_W04;
EKP2	discuss and apply the basic laws of fluid mechanics (stream continuity equation, the equation of conservation of momentum, the energy conservation equation, the Navier-Stokes equations, the Bernoulli equation, the Pascal's law, the law of Archimedes, etc.);	K_W01; K_W04; K_U08
EKP3	solve problems of hydrostatics (hydrostatic pressure, combined vessels, hydrostatic pressure force, center of pressure, floating bodies) and hydrodynamics (filling tanks, emptying tanks, the Torricelli equation, pressure losses in the pipeline);	K_W01; K_W04; K_U08, K_U21
EKP4	work in a group taking various tasks and understand the principles of cooperation within the group.	K_U01, K_K01

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester IV

No	Content	Number of aching	

		L	C	Lab/P	Reference to EKP of the
1.	Introduction. Basic definitions and properties of fluids: viscosity, compressibility, density, thermal expansion. Classification of fluids. Issues of the field theory: the scalar field, vector and tensor fields, gradient, divergence, curl. The Lame's coefficients.	2	1		EKP1, EKP4
2.	The basic concepts of fluids kinematics: streamlines, stream surfaces, pathlines, circulation, rotational and irrotational flows, types of fluid flow.	2	1		EKP1
3.	The conservation of mass principle. The stream continuity equation. Determination of flow rate. Time of tank filling.	2	2		EKP2
4.	The principle of conservation of momentum and angular momentum and their application.	2	1		EKP2, EKP4
5.	The conservation of energy principle. Interpretation of the parts of the conservation of energy equation. An example of determination of the temperature distribution.	2	1		EKP2, EKP4
6.	Examples of constitutive relationships for selected models of liquid. General classification of relationships and their properties.	2			EKP2, EKP4
7.	The hydrostatics: general information, definition of pressure, hydrostatic pressure distribution, hydrostatic force of liquid acting on the solid walls. The pressure force and the centre of pressure. The Archimedes' principle, floating bodies.	4	2		EKP3
8.	The equations of motion of a real fluids: general description, basic equations, additional equations, boundary and initial conditions. The basic equations of viscous fluid dynamics: the Navier-Stokes, Prandtl equations, the Poiseuille and Couette flows.	2	1		EKP2, EKP4
9.	Steady and unsteady flows, laminar and turbulent: the classification of flows, critical flow, the effect of viscosity, density and diameter of the pipe on the critical velocity, the Reynolds number. **(8.2.13)**	4	1		EKP1
10.	The similarity of flow phenomena. Similarity and analogy and criterial numbers: the criterial dynamic, thermal, electro-magneto-dynamic numbers.	1	1		EKP2
11.	The motion of thermally non-conductive, non-viscous fluid: the equation of motion of viscous fluids, the Euler equation, the Bernoulli equation: potential, kinetic and pressure energy. Application of Bernoulli equation for practical flow measurements with Venturi tube. Emptying the tanks, the Torricelli equation. **(8.2.13)**	4	2		EKP2, EKP3
12.	Flows in pipes: the Hagen-Poiseuille law, pressure and energy loss, the hydraulic radius, flow resistance. The flow of fluids through the energy system components (pipes, nozzles, reducers, elbows, valves, etc.), the characteristics of the hydraulic element, the characteristics of the pipeline. Flows through the open and closed channels. **(8.2.13)**	2	1		EKP3, EKP4
13.	Potential flows and gas dynamics.	1	1		EKP1

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1	X			X					
EKP2	X			X					
EKP3	X			X					
EKP4					X				

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
I	Student achieved the expected learning outcomes and meets the requirements of the STCW Convention in order to complete the course. Student attended lectures, exercises (limit - 3 absences). He received a credit from the lecture (test) and exercise (2 tests and 2 tasks to be performed in the form of a report). The final grade: the average score for a test from lectures and score for a tests from exercises. Student rating (final score) after successful completion of all forms of classes.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	45			
Reading literature	15			
Preparing for laboratories, project classes				
Preparing for the exam, the pass test	10			
Drafting documentation of a project/report	6			
Participating in pass tests and exams	5			
Participating in consultation hours	2			
Total number of hours	83			
Number of ECTS points	**3**			
Summary number of ECTS points for the course	**3**			
Student's workload connected with practical classes				
Student's workload during the classes involving direct participation of academic teachers	45+5+2=52 h - 2 ECTS			

Literature:

Primary literature
9. Jeżowiecka-Kabsch K., Szewczyk H., Mechanika płynów, skrypt Politechniki Wrocławskiej, Wrocław 2001. 10. Puzyrewski R., Sawicki J., Podstawy mechaniki płynów i hydrauliki. PWN, Warszawa 2000. 11. Gryboś R., Podstawy mechaniki płynów, cz. I. i II, PWN, Warszawa 1998. 12. Bukowski J., Mechanika Płynów, PWN Warszawa 1959. 13. Gryboś R., Zbiór zadań z technicznej Mechaniki Płynów, Warszawa PWN, 2012
Secondary literature
2. Prosnak W., Mechanika płynów, t. I i II, PWN, Warszawa 1970, 1971.

3. Orzechowski Z., Prywer J., Zarzycki R., Mechanika płynów w inżynierii środowiska, WNT, Warszawa 1997.
4. Rumianowski A., Zbiór zadań z Mechaniki Płynów nieściśliwych z rozwiązaniami, PWN, Warszawa 1974.
5. Kubrak E., Kubrak J., Podstawy obliczeń z Mechaniki Płynów w inżynierii i ochronie środowiska, Wydawnictwo SGGW 2010.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Dr hab. inż. Andrzej Miszczak	*KPT*
2. The other people conducting the course:	
Dr inż. Krzysztof Łukaszewski	*KPT*
Mgr inż. Adam Czaban	*KPT*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	13	Course :	**Engineering Graphics**
Field/Level of education:			**Mechanical Engineering and Machine Design/First-degree**
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
II	4	1		2			15		30	
III	3			2					30	
Total number during the studies:							**75**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills of secondary school students

Course objectives

2.	Acquisition of fundamental knowledge in the scope of ways and methods for preparing engineering drawings, schematic diagrams, and manual engineering sketching necessary for carrying out of ship equipment maintenance activities; developing of skills for reading, verification and using ship operation and maintenance documentation
3.	Achievement of skills for reading, verification and using ship operation and maintenance documentation
4.	Course is compliant with the enhanced framework programme of training at operational and management levels in the engine department – specialization in mechanical engineering (Regulation of the Minister of Infrastructure and Development dated 28 February 2014 item 536)

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can:	Reference to the field educational effects
EKP1	draw orthographic and central projection for given geometric solids and reproduce real shapes and sizes of geometric solids presented in projections	K_W01, K_U22
EKP2	solve design tasks using drawing method according to given algorithm	K_W01, K_U22
EKP3	Selects normalized elements of engineering drawing and draw basic components of engineering drawing	K_W01, K_U18, K_U21, K_U22
EKP4	carry out dimensioning of machine parts taking into account geometric dimensioning and tolerancing	K_W01, K_W03, K_W09, K_U13, K_U21, K_U22
EKP5	draw working drawing of machine part based on assembly drawing taking into account dimension and geometric tolerances and surface characteristics resulted from its function in assembly	K_W01, K_W03, K_W09, K_U02, K_U13, K_U18, K_U21, K_U22
EKP6	identify main dimensions and body lines of ship hull, system coordinates and base planes for form representation of ship hull; identify structural elements of ship hull (side frame, beam knee, side	K_W01, K_W03, K_W09, K_U02, K_U11, K_U13,

	grider etc.); draw schematic diagram of ship power plant installation for its given structural elements	K_U18, K_U21, K_U22, K_K06
EKP7	explains principle of vector graphic representation in data bases applied in CAD; use drafting tools software applications for drafting (CAD) for preparing engineering drawing and modify engineering drawing by use of edit commands	K_W01, K_U02, K_U21, K_U22
EKP8	communicate by use of various graphical methods	K_U02

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester II

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Preliminary information; descriptive geometry objectives; terms of a projection and a projection method	1			EKP1
2.	Representation of basic geometric elements in orthographic projections	1			EKP1
3.	Adherence of geometric elements in orthographic	2		2	EKP1
4.	Application of transformation methods in basic geometric element projections	2		2	EKP1
5.	Drawing of intersecting geometric figures	4		2	EKP2
6.	Normalized elements of graphic engineering: a) drawing sizes, b) aspect ratio, c) types, widths and using of drawing lines, d) basic geometric constructions such as: dividing a line segment, development of a circle by means of Kochanski's method, regular polygons, drawing of plane curves e) system of views, f) views, intersections and superimposed sections, g) title blocks **(8.18.p.1)**	1		13	EKP3
7.	Threaded fasteners and joints: a) types of threaded fasteners, b) geometric representations, c) and symbolic representations **(8.18.p.2)**	1		2	EKP3, EKP8
8.	Welding joints: a) weld shapes, b) geometric representations, c) symbolic representations **(8.18.p.3)**	1		2	EKP3, EKP8
9.	Toothed wheels and gears - symbolic representations (8.18.p.4)	1		4	EKP3, EKP8
10.	Fundamental principles of dimensioning in engineering drawings: a) specific cases of dimensioning; b) tolerance and fits of machine parts **(8.18.p.5)**	1		3	EKP4

Semester III

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Geometric tolerancing **(8.18.p.6)**			2	EKP4, EKP8
2.	Surface characteristics of machine parts **(8.18.p.7)**			2	EKP4, EKP8

3.	Principles of drawing up working drawings of assembly elements **(8.18.p.8)**			4	EKP5
4.	Drawing up engineering drawings and dimensioning of basic machine parts: a) working drawing of assembly elements, b) assembly drawing **(8.18.p.9)**			10	EKP3, EKP5, EKP8
5.	Principles of drawing body lines of ship hull **(8.18.p.10)**			2	EKP6, EKP8
6.	Principles of preparing schematic diagrams for installations of ship power plant **(8.18.p.11)**			4	EKP6, EKP8
7.	Principles of preparing schematic diagrams for hydraulic and pneumatic installations **(8.18.p.12)**			2	EKP6, EKP8
8.	Principles of preparing schematic diagrams for electric installations **(8.18.p.13)**			2	EKP6, EKP8
9.	Interpretation of engineering drawings **(8.18.p.14)**			2	EKP6, EKP8

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1				**X**				**X** (during lab.)	
EKP2				**X**				**X** (during lab.)	
EKP3				**X**				**X** (during lab.)	
EKP4				**X**				**X** (during lab.)	
EKP5				**X**				**X** (during lab.)	
EKP6				**X**				**X** (during lab.)	
EKP7				**X**				**X** (during lab.)	
EKP8				**X**				**X** (during lab.)	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
II	Student received the expected educational effects and accomplishes requirements STCW Convention regarding to complete of subject credits. Student participated in lectures (permissible only 3 justifications for student absence). Laboratory – completion of all given tasks during laboratory exercises. Final assessment: average grade from completing all laboratory exercises.
III	Student received the expected educational effects and accomplishes requirements STCW Convention regarding to complete of subject credits. Laboratory – completion of all given tasks during laboratory exercises. Final assessment: average grade from completing all laboratory exercises.

Note: A Student is credited with the grade higher than a minimum pass, if exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	75			
Reading literature		25		
Preparing for laboratories, project classes		50		
Preparing for the exam, the pass test	10	10		
Drafting documentation of a project/report				
Participating in pass tests and exams	2			
Participating in consultation hours	5			
Total number of hours	92	85		
Number of ECTS points	**7**			
Summary number of ECTS points for the course	**7**			
Student's workload connected with practical classes	60+50+25 = 135h			
Student's workload during the classes involving direct participation of academic teachers	75+2+5 = 82h			

Literature:

Primary literature
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.
Secondary literature
1. Kochanowski M., Zapis konstrukcji z geometrią wykreślną, wyd. 1. Wydawnictwo Politechniki Gdańskiej. 2. Pikon Andrzej: AutoCAD 201x. 3. AutoCAD Tutor: http://www.cadtutor.net/tutorials/autocad/

Persons conducting the course:

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
DSc. PhD. Eng. Lesław Kyzioł, Assoc. prof. GMU	*KPT*
2. The other people conducting the course:	
PhD. Eng. Małgorzata Kotlicka	*KPT*
PhD. Eng. Grzegorz Skorek	*KPT*
PhD. Eng. Piotr Kamiński	*KPT*
PhD. Eng. Krzysztof Rudzki	*KPT*
MSc. Eng. Jadwiga Borkowska	*KPT*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam

ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects

Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	14	Course :	**Fundamentals of Machine Element Design + CAD**
Field/Level of education:			**Mechanical Engineering and Machine Design/**First-degree
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	**ECTS**	**Number of hours in the week**					**Number of hours in the semester**			
		L	**C**	**Lab**	**P**	**S**	**L**	**C**	**Lab**	**P**
III	3	2					30			
IV	2	2					30			
V	2			4					60	
Total number during the studies:							**120**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills of secondary school students
2.	Knowledge and skills in a scope of fundamental and course subjects (mathematics, physics, mechanics engineering; strength of materials, engineering graphics, material knowledge, fundamentals of manufacturing engineering).

Course objectives

3.	Acquisition of fundamental knowledge in a scope of characteristics and taxonomy, design principles, selection of material necessary to design, application, and appropriate operational use and maintenance of machine components and units.
4.	Acquiring of skills for design and operational use and maintenance of various types of machine components and units such as: machine joints, bearings, shafts, couplings and clutches, gears.

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	**After completing the course a Student can:**	**Reference to the field educational effects**
EKP1	explain essence of the individual stages of machine life-cycle; present a design process and characterize basic design principles; present essence of dimension and geometric tolerances, fits, and surface characteristics of machine elements; select and calculate tolerances and fits of machine elements	K_W01, K_W03, K_W04, K_W07, K_W08, K_W09, K_U12, K_U17, K_U18
EKP2	justify benefits resulted from lubrication; explain nature of setting up hydrodynamic loading and elastohydrodynamic lubrication; calculate a journal bearing; characterize the individual types of bearings; select clearances of rolling bearings; explain arrangements of rolling bearings; identify types and dimensions of rolling bearings	K_W01, K_W03, K_W04, K_W08, K_W09, K_U13, K_U17, K_U18, K_U20, K_K03
EKP3	characterize the individual types of machine joints (welded joints, threaded fasteners and bolted joints, interference-fit joints, key joints) and check their strengths for the given loading; enumerate factors influencing machine element fatigue	K_W01, K_W03, K_W04, K_W08, K_W09, K_U13, K_U18

EKP4	describe types of springs, couplings and clutches, brakes, and valves; present shaft design principles and explain essence of static and dynamic balancing of shafts	K_W01, K_W03, K_W08, K_W09, K_U17, K_U18
EKP5	present types of gear wheel teeth, meshing geometrical features, and conditions for gearing constancy and continuity; characterizes basic design features of the selected type of mechanical gears, ways of their lubrications and component sealing	K_W01, K_W03, K_W04, K_W08, K_W09, K_U13, K_U17, K_U18, K_K03
EKP6	determine shear stress distribution in fillet weld, force proportion acting in preload bolt joints, and bolt joints withstanding bending forces; determine coil spring characteristics, kinematic parameters of friction clutch and pressure distribution in journal bearing	K_W01, K_W03, K_W04, K_W08, K_U12, K_U18, K_U20
EKP7	draw up two-dimensional sketch using basic graphic tools; draw up solid using basic tools; prepare assembly or disassembly animations for prepared unit; carry out calculation of example machine part using finite element method FEM	K_W01, K_W09, K_U18, K_U02, K_U21
EKP8	search additional information to introduction to classes from supplementary sources; appreciate benefits resulted from synergic cooperation of lab group; communicate by use of various graphical methods	K_U01, K_U02, K_U05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester III

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Origins of subject. Objectives and tasks of the subject. Machine life-cycle and its stage.	1			EKP1
2.	Engineering design process and its phases. Optimization of machine structure. Computer-aided design CAD.	4			EKP1, EKP8
3.	Fits and tolerances of machine elements. Geometric tolerances and surface characteristics of machine elements.	4			EKP1
4.	Types of friction. Bowden and Tabor's theory of dry friction. Multi - layer bearing. Boundary friction.	2			EKP2
5.	Lubricants and their characteristics. Viscosity and lubricating ability. Ferro-fluids and their application.	1			EKP2, EKP8
6.	Hydrodynamic lubrication theory. Nature of setting up hydrodynamic loading based on plain bearing example. Ways and conditions of achieving hydrodynamic lubrication.	4			EKP2
7.	Stribeck curve. Elastohydrodynamic lubrication.	1			EKP2
8.	Types of bearings. Sliding bearings. Criteria for hydrodynamic similarity of bearings.	1			EKP2
9.	Magnetic bearings. Bearings with ferro-fluid lubrication.	1			EKP2
10.	Rolling bearings. Types of rolling bearings. Rolling bearing identification. Fits, clearances, arrangements and selection of rolling bearings.	3			EKP2
11.	Types of machine joints. Welded joints. Spot and projection welding. Fusion weld zone and stress concentration - design against crack growth.	2			EKP3
12.	Types of threaded fasteners and bolted joints. Efficiency and self-locking of thread. Strength of thread. Design of bolted joint	3			EKP3

	elements structure. Ways of relieve from bending and torsion stresses. Main cases of bottled joint loadings and principles their calculation.				
13.	Key, spline, knuckle and cotter joints.	1			EKP3
14.	Interference-fit joints. Stress distribution in interference-fit joint. Strain of joint elements versus contact press. Load capacity of Interference-fit joint.	2			EKP3

Semester IV

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Types of loads and stresses. Fatigue of machine elements. Wöhler diagram. Factors influencing fatigue and ways of their taking into account in calculations. Smith diagram of fatigue.	2			EKP3
2.	Flexible machine elements. Springs and rubber suspension elements.	1			EKP4
3.	Couplings and clutches. Types of couplings, their characteristics and design principles.	2			EKP4
4.	Valves. Types of valves, their characteristics and design principles. Expansion joints.	1			EKP4
5.	Valves. Types of valves, their characteristics and design principles. Expansion joints.	2			EKP4
6.	Types of gears. Types of toothed gears. Gear ratios.	1			EKP5
7.	Toothed wheel. Types of toothed wheels. Gear nomenclature, module and centre distance.	2			EKP5
8.	Fundamental law of tooth gearing. Line of action and pressure angle. Contact ratio.	2			EKP5
9.	Fundamental law of tooth gearing. Line of action and pressure angle. Contact ratio.	2			EKP5
10.	Spur gear drive. Undercutting and limiting number of teeth.	1			EKP5
11.	Gear tooth profile corrections. Identification of teeth types.	3			EKP5
12.	Helical gear drive. Main characteristics of helical gears.	2			EKP5
13.	Main characteristics of internal gear drive. Internal gear train. Planetary gearsets.	2			EKP5
14.	Main characteristics of bevel gear drive. Bevel gear ratio.	2			EKP5
15.	Main characteristics of worm gear drive.	1			EKP5
16.	Unique gear drive. Harmonic gear drive.	1			EKP5, EKP8
17.	Friction gear transmission. Flexible traction drive.	1			EKP5
18.	Types of lubrication. Nature of splash and forced-feed circulatory lubrications. Lubrication of bearings.	1			EKP5
19.	Engineering seals. Static and dynamic seals of machine elements.	1			EKP5

Semester V

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Introduction to laboratory.			2	EKP6
2.	Measurement principles. Model and measuring system errors.			4	EKP6, EKP8
3.	Analysis of shear stress distribution in fillet weld.			4	EKP6
4.	Analysis of preload bolt joints.			4	EKP6

5.	Strength analysis of bolt joints withstanding bending forces.			4	EKP6
6.	Analysis of coil springs.			4	EKP6
7.	Start-up analysis of friction clutch.			4	EKP6
8.	Analysis of pressure distribution in journal bearing.			4	EKP6
9.	Introduction to three-dimensional modeling. Computer-aided three-dimensional modeling.			2	EKP7, EKP8
10.	Three-dimensional modeling. Two-dimensional sketching and transition ways to three-dimensional drawing. Tools for modeling (extrusions, cuts, and revolutions).			2	EKP7
11.	Basic tools in parametric solid modeling (lines, constraints, bases).			2	EKP7
12.	Development of assembly element in three-dimensional modeling. Its conversion into two-dimensional working drawings.			2	EKP7
13.	Development of assembly drawings. Use of normalized parts.			2	EKP7
14.	Computer-aided design of machine shaft.			4	EKP7
15.	Introduction to Finite Element Method (FEM).			2	EKP7
16.	Design structure analysis of selected assembly elements by means of MES.			4	EKP7
17.	Kinematic chain and its analysis. Animation of kinematic chain (cooperation of elements, assembling and dissembling).			4	EKP7
18.	Analysis of CAD capabilities with regard to machine element drawing and FEM calculations.			2	EKP7, EKP8

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1	**X**	**X**							
EKP2	**X**	**X**							
EKP3	**X**	**X**							
EKP4		**X**							
EKP5		**X**							
EKP6				**X**	**X**				
EKP7								**X**	
EKP8									**X**

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
III	Student received the expected educational effects. Student participated in lectures gets bonus points. Lectures: passing the test. Final assessment: average grade from both the test and the bonus points.
IV	Student received the expected educational effects. Lectures: passing the verbal exam; in the case of more than 3 student absences - passing the additional test. Final assessment: a grade from the verbal exam.
V	Student received the expected educational effects. Fundamentals of Machine Element Design laboratory – completion of all given tasks during laboratory exercises. CAD laboratory – completion of all given tasks during laboratory exercises. Final assessment: average grade from completing both the Fundamentals of Machine Element Design laboratory and the CAD laboratory.

Note: A Student is credited with the grade higher than a minimum pass, if exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	60	60		
Reading literature	15			
Preparing for laboratories, project classes		15		
Preparing for the exam, the pass test	15			
Drafting documentation of a project/report		15		
Participating in pass tests and exams	2			
Participating in consultation hours	3			
Total number of hours	95	90		
Number of ECTS points	**5**	**2**		
Summary number of ECTS points for the course	**7**			
Student's workload connected with practical classes	60+15+2+3=80h			
Student's workload during the classes involving direct participation of academic teachers	120+2+5=125h			

Literature:

Primary literature

14. Podstawy Konstrukcji Maszyn pod red. zbiorową Z. Osińskiego, PWN, Warszawa 1999.
15. Wykład z Podstaw Konstrukcji Maszyn z ćwiczeniami. Skrypty Politechniki Gdańskiej:
    - B. Siwek - Połączenia spawane, zgrzewane, lutowane i klejone.
    - R. Maciakowski - Połączenia śrubowe.
    - Sikora J., Maciakowski R. - Przekładnie zębate.
16. Dietrych J, Korewa W., Zygmunt K. Podstawy Konstrukcji Maszyn, cz. I, II i III, WNT, Warszawa.
17. Osiński Z., Bajon W., Szucki T. Podstawy Konstrukcji Maszyn, PWN, Warszawa.
18. Bowden, D. Tabor. Wprowadzenie do trybologii, WNT, Warszawa.
19. Niezgodziński T. Niezgodziński S; Obliczenia zmęczeniowe elementów maszyn, PWN, Warszawa.
20. Markusik S.; Sprzęgła mechaniczne. WNT, Warszawa.
21. Ochęduszko K. ; Koła zębate, tom - I, WNT, Warszawa.
22. Muller L. - Przekładnie zębate – projektowanie. WNT, Warszawa.

23. Tarełko W. Laboratorium podstaw konstrukcji maszyn. Wydawnictwo Wyższej Szkoły Morskiej w Gdyni. Gdynia 2001.
24. Skorek G. Zbiór ćwiczeń Autodesk Inventor. Wydawnictwo Akademii Morskiej w Gdyni. Gdynia 2012.

Secondary literature

4. Rusiński E., Czmochowski J., Smolnicki T., Zaawansowana metoda elementów skończonych w konstrukcjach nośnych, Oficyna Wyd. Pol. Wroc., Wrocław, 2000.
5. Nagórski Z.: Modelowanie przewodzenia ciepła za pomocą arkusza kalkulacyjnego. Wydawnictwo Politechniki Warszawskiej. Warszawa, 2001.

Persons conducting the course:

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Prof. PhD. Eng. Wiesław Tarełko	*KPT*
2. The other people conducting the course:	
DSc. PhD. Eng. Marek Szwabowicz, Assoc. prof. GMU	*KPT*
DSc. PhD. Eng. Lech Murawski, Assoc. prof. GMU	*KPT*
PhD. Eng. Jerzy Kowalski	*KPT*
PhD. Eng. Grzegorz Skorek	*KPT*
PhD. Eng. Leonard Hempel	*KPT*
PhD. Eng. Krzysztof Rudzki	*KPT*
PhD. Eng. Małgorzata Kotlicka	*KPT*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	15	Course :	**Design of Machine Elements**
Field/Level of education:			**Mechanical Engineering and Machine Design/**First-degree
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
IV	2				1					15
V	2				1					15
Total number during the studies:							**30**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills from the secondary school
2.	Knowledge of the Physics Course (No.9)
3.	Knowledge of the Engineering Mechanics Course (NO. 10)
4.	Knowledge of Strength of Materials Course (No. 11)
5.	Knowledge of Engineering Graphics Course (No. 13)
6.	Knowledge of Fundamentals of Machine Elements Design & CAD Course (No. 14)

Course objectives

7.	The aim of the course is to perpetuate the knowledge and skills in the Machine Elements Design and reading the technical documentation of marine equipment

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	use knowledge of the strength of materials in practice	K_W01, K_W03
EKP2	use of technical standards related to the construction and operation of machines	K_W09
EKP3	replace the methods and techniques used to solve simple engineering tasks	K_W08, K_U17
EKP4	design a simple technical device	K_U18

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester IV

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	The choice of the technical solution of the screw mechanism			4	EKP3
2.	Strength calculations of screw mechanism			4	EKP1
3.	Selection and strength calculation of driving mechanism			2	EKP1
4.	Mechanism design and construction			3	EKP4
5.	Technical documentation of design			2	EKP2

Semester V

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Strength calculations of helical gear			5	EKP1
2.	Strength calculations of gear shafts			4	EKP1
3.	Selection of roler or slide bearings			2	EKP2
4.	Selection of gear lubrication and seals			1	EKP2
5.	Technical documentation of gear			3	EKP2

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1						**X**			
EKP2						**X**			
EKP3						**X**			
EKP4						**X**			

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
IV	Students actively participated in at least 50% of classes and present the proper technical documentation of design
V	Students actively participated in at least 50% of classes and present the proper technical documentation of design

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours			30	
Reading literature			45	
Preparing for laboratories, project classes			30	
Preparing for the exam, the pass test				
Drafting documentation of a project/report			10	
Participating in pass tests and exams				
Participating in consultation hours			1	
Total number of hours			116	
Number of ECTS points			4	
Summary number of ECTS points for the course	**4**			
Student's workload connected with practical classes	116h - 4 ECTS			
Student's workload during the classes involving direct participation of academic teachers	30 h - 4 ECTS			

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
dr inż. Jerzy Kowalski	*KPT*
2. The other people conducting the course:	
dr inż. Grzegorz Skorek	KPT
dr inż. Leonard Hempel	KPT
mgr inż. Krzysztof Rudzki	KPT
mgr. inż. Tomasz Kowalewski	KPT

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	16	Course :	**Machines Operation and Maintenance**
Field/Level of education:			**Mechanical Engineering and Machine Design/**First-degree
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	**ECTS**	**Number of hours in the week**					**Number of hours in the semester**			
		L	**C**	**Lab**	**P**	**S**	**L**	**C**	**Lab**	**P**
IV	1	1					15			
VIII	1	1					15			
Total number during the studies:							**30**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills from the secondary school
2.	Knowledge of the Physics Course
3.	Knowledge of Materials Science Course
4.	Knowledge of the Marine Power Plants Course
5.	Knowledge of Fundamentals of Manufacturing Engineering Course

Course objectives

1.	Main objective of the course is to acquire basic knowledge and skills in the rational maintenance and operation of marine power plants components and equipment of offshore constructions

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	**After completing the course a Student can :**	**Reference to the field educational effects**
EKP1	Identifies the key issues associated with the machines maintenance and operation.	K_W03, K_W07, K_U18
EKP2	Illustrates the basic concepts of systems theory.	K_W01
EKP3	Classifies processes in the machines maintenance and operation.	K_W04
EKP4	Distinguishes between machines maintenance and operation systems	K_W09
EKP5	Specifies the basic issues of reliability theory.	K_U13

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester IV

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Basic issues associated with the machines maintenance and operation: phases of machines existence, classification and properties of the machines, the system human-machine-environment, causes and effects of the damage, the quality of machines maintenance and operation.	2			EKP1

2.	Basic theory of systems: components, structure and purpose of the system, the construction of the system and its conditions, the decomposition of the system, the active element and its coupling with the system	1			EKP2
3.	Processes in the machines maintenance and operation: controlled and uncontrolled processes, classification of processes, utility processes, suport and control processes, logistics and disposal processes.	5			EKP3
4.	Machines maintenance and operation systems: structure and system design, features and objectives of the system, the role of information in the system, the process of decision-making, operational strategies, repertoire, potential, cycle and operating conditio of the machines maintenance and operation systems, the evaluation and the effectiveness of the system, criteria and types of evaluations.	5			EKP4
5.	Basic theory of reliability: the reliability of the system and systems element, the unrecoverable element, the theoretical and empirical functions of failure and reliability, durability and intensity of damage of sysems components, damage frequency, reliability testing of components and systems, system reliability structures.	2			EKP5

Semester VIII

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Types of the friction: dry, border, mixed, liquid. Definition of a friction The theory of a dry friction – mechanical – molecular mechanical – molecular	1			EKP1
2.	The actual contact area. The top layer, the formation and properties. Physico-chemical phenomena on the metal surface; physical sorption; chemisorption; Rebinder effect.	2			EKP2
3.	Boundary friction and mixed friction	0.5			EKP1
4.	Conditions for performance liquid friction – assumptions hydrodynamic lubrication theory – Reynolds equation and the method of its solution. – Sommerfeld number – Hersey's parameter				EKP1
5.	Assessment of the impact on the design parameters of the hydrodynamic bearing load capacity.	2			EKP1
6.	Criteria of the hydrodynamic bearing reliability - minimum of the oil film thickness - temperature - surface load - cavitation	2			EKP1
7.	***Hydrostatic bearings***	0.5			EKP1
8.	Elasto-hydrodynamic lubrication theory, examples of associations. The properties of lubricants.	1			EKP1
9.	Classification of the tribological wear processes. Identification of the type of process on the basis of visual inspection.	3			EKP1

	Methods to minimize the intensity of the processes of destruction.				
10.	Tribological nodes working conditions in the transitions states.	0.5			EKP1

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1				**X**					
EKP2				**X**					
EKP3				**X**					
EKP4				**X**					
EKP5				**X**					

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
IV	Student pass the test
VIII	Student pass the test

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	30			
Reading literature	15			
Preparing for laboratories, project classes				
Preparing for the exam, the pass test	10			
Drafting documentation of a project/report				
Participating in pass tests and exams	2			
Participating in consultation hours	2			
Total number of hours	59			
Number of ECTS points	**2**			
Summary number of ECTS points for the course	**2**			
Student's workload connected with practical classes	-			
Student's workload during the classes involving direct participation of academic teachers	30 h - 2 ECTS			

Literature:

Primary literature
1.
Secondary literature
1.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
dr inż. Jerzy Kowalski – Sem IV	*KPT*
dr inż. Stefan Kluj – Sem VIII	*KSO*
2. The other people conducting the course:	
dr inż. Wojciech Gałecki	KSO

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	17	Course :	**Marine Materials Science**
Field/Level of education:			**Mechanical Engineering and Machine Design/**First-degree
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
I	3	2					30			
II	4	1		2			15		30	
III	2			1					15	
Total number during the studies:							90			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills in the secondary education
2.	The program must be consistent with the framework extended training program for seafarers in the specialty department of mechanical engineering (Reg. MIiR of 28.02.2014r. Poz.536 -zał.nr.8- p. 8.17)

Course objectives

3.	The aim of the subject is to provide basic knowledge and skills of material science, necessary for the safe operation of the ship technical equipment

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	list construction materials for marine structures; describe the structure, properties and application of materials and test methods	K_W02; K_W08
EKP2	describe the destruction mechanisms of structural materials	K_W07; K_K02
EKP3	explain the effect of heat treatment and plastic forming on the properties of metal and alloys used in shipbuilding	K_W02; K_W03; K_W05
EKP4	choose the parameters of heat treatment; perform metallographic analysis of metallic construction materials; perform hardness test; interpret the results and draw conclusions	K_U08, K_U09, K_U12, K_U13, K_U18
EKP5	specify and apply technical norms and standards associated with the technical materials used in shipbuilding, and their research	K_W09, K_U21
EKP6	use literature sources for interpretation of test results	K_U01 K_U05
EKP7	work in a group assuming different roles in it, understands the principles of cooperation	K_K05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester I

No	Content	Number of aching	

		L	C	Lab/P	Reference to EKP of the
.	Fundamentals of solid construction: **(8.17. p.1)** a) metallic crystal and amorphous structure, crystal systems, defects, b) influence the physical construction on materials properties.	0,5			EKP1
2.	Mechanisms of materials destruction: **(8.17. p.2)** a) corrosion, b) wear, c) brittle fracture, d) fatigue, e) erosion.	1			EKP2
3.	Fundamentals of metals alloys structure. **(8.17. p.3**	0,5			EKP1
4.	Types of equilibrium systems, phase components of alloys **(8.17. p.4)**	0,5			EKP1
5.	Technical ferrous alloys. **(8.17. p.5)**	1			EKP1
6.	Steels and cast steel, cast iron, special alloys: **(8.17. p.5a)** a) foreign elements in iron alloys and their influence on the properties, **(8.17. p.5b)** b) marking iron alloys, **(8.17. p.5c)** c) selected properties and application examples. **(8.17. p.5d)**	2			EKP1
7.	Technical nonferrous alloys. **(8.17. p.6)**	0,5			EKP1
8.	Copper, aluminium, titanium, nickel, magnesium, tin, lead: a) marking nonferrous alloys, b) selected properties and application examples. **(8.17. p.6a-c)**	1			EKP1
9.	Non-metallic materials. **(8.17. p.7)**	0,5			EKP1
10.	Natural materials: **(8.17. p.7a)** a) ceramics, b) polymers.	0,5			EKP1
11.	Composites. **(8.17. p.7b)** a) composites based on polymers and metals, b) examples of technical applications.	1			EKP1
12.	Auxiliary materials: adhesives, sealants, insulation, paint, varnish, abrasive pastes, chemicals. **(8.17. p.7c)**	0,5			EKP1
13.	Welding materials. **(8.17. p.8)**	0,5			EKP1
14.	Application of metals and their alloys in shipbuilding. **(8.17. p.9)**	2			EKP1
15.	Application of natural materials, ceramics and polymers in shipbuilding. **(8.17. p.10)**	2			EKP1
16.	Application of composites based on polymers and metals in shipbuilding. **(8.17. p.11)**	2			EKP1
17.	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			EKP1
18.	Application of welding materials in shipbuilding. . **(8.17. p.13)**	2			EKP1
19.	Metallurgy and casting, and their influence on the properties of metals: a) basis for metallurgy and foundry, b) correctness assessment of cast iron, steel and nonferrous alloys structures. **(8.17. p.14)**	3			EKP1
20.	Fundamentals of metal forming and its influence on the properties of metals, plastic deformation, cold work and recrystallization. **(8.17. p.15)**	3			EKP3

21.	Fundamentals of heat treatment processes and their influence on material properties, heat treatment of non-ferrous alloys. **(8.17. p.16)**	2			EKP3
22.	The rules of classification societies of marine materials. **(8.17. p.17)**	2			EKP5

Semester II

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Hull construction materials. Low temperature ship steels. Corrosion protection. **(8.3. p.7)**	2			EKP1
2.	Steels: stainless, creep-resistant, heat-resisting, valve, for quenching and tempering, carburizing and nitriding. Tool steels. Cast steels.	2		2	EKP1; EKP4
3.	Copper alloys for casting and forming. Brasses and bronzes. Copper alloys for ship propellers.	2			EKP1, EKP5; EKP4
4.	Aluminium alloys casting and forming. Application of aluminium alloys in marine construction. **(8.17. p.18)**	1		2	EKP1; EKP4
5.	Bearing materials: alloys of tin and lead, copper and aluminium alloys, other metals alloys. Composites.	2		2	EKP1, EKP6; EKP4
6.	Modern construction materials. Steels: to work in low temperatures, maraging, shape memory materials, glass and glass ceramics.	2			EKP1
7.	Polymer, ceramics and composite materials. **(8.17. p.10, 11***)*	2			EKP1
8.	Construction materials: a combination of elements, corrosion protection.	2		2	EKP1; EKP4
9.	Introduction to laboratory classes. Safety rules. Terms of the laboratory. Discussion of exercise forms.			2	EKP1
10.	Ultrasonic flaw detection. **(8.10. p.35)**			2	EKP6
11.	Radiographic flaw detection. Interpretation of radiographs.			2	EKP6, EKP5 EKP7
12.	Studies of structural steel.			2	EKP4
13.	Microscopic examination of steel after heat treatment. **(5.17. p.18)**			2	EKP1, EKP3
14.	Research of steel after plastic forming.			2	EKP3
15.	Research of properties and microstructure of cast iron.			2	EKP1,EKP6 EKP7
16.	Measurements of microhardness and hardness.			2	EKP1, EKP5 EKP7
17.	Non-destructive testing. Radiographic and Penetrant. **(8.10. p.33, 34)**			2	EKP4,EKP5 EKP7
18.	Influence of heat treatment on the properties of the alloys: **(8.17. p.18)** a) ferrous alloys b) non-ferrous alloys			2	EKP4, EKP5 EKP7

Semester III

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Introduction to laboratory classes. Discussion of exercises.			2	EKP1, EKP6 EKP7
2.	Microscopic examination of steel after thermo-chemical treatment.			2	EKP1, EKP4, EKP5
3.	Tests of metal and protective coatings.			2	EKP1, EKP4, EKP5
4.	Ship steels. Steels for marine shaft lines. **(8.3. p.7)**			3	EKP1, EKP4, EKP5

5.	Testing of copper alloys. **(8.17. p.18)**			2	EKP1, EKP4,
6.	Microscopic examination of welded joints.			2	EKP1, EKP4, EKP5
7.	Testing of properties and microstructure of tool steels.			2	EKP1 EKP4 EKP5

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1				**X**					
EKP2				**X**					
EKP3				**X**					
EKP4				**X**	**X**			**X** (during laboratory classes)	
EKP5				**X**	**X**				
EKP6					**X**			**X** (during laboratory classes)	
EKP7					**X**			**X** (during laboratory classes)	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
I	Student achieved the expected learning outcomes and meets the requirements of the STCW Convention relating to complete the course. Attended lectures (limit - 3 absences). Lecture: method of assessment - test of the lecture.
II	Student achieved the expected learning outcomes. Attended lectures. 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, the work in the laboratory, with the laboratory reports. Evaluation index after successful completion of the two forms of activity with the assessment of the average of the 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: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	45	45		
Reading literature	15			
Preparing for laboratories, project classes		55		
Preparing for the exam, the pass test	20			
Drafting documentation of a project/report		5		

Participating in pass tests and exams	3			
Participating in consultation hours		5		
Total number of hours	83	110		
Number of ECTS points	**3**	**4**		
Summary number of ECTS points for the course	**7**			
Student's workload connected with practical classes	45+55+5+5=110 h - 4 ECTS			
Student's workload during the classes involving direct participation of academic teachers	45+45+3+5=98 h - 4 ECTS			

Literature:

Primary literature
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.
Secondary literature
1. Michael F. Ashby, David R. H. Jones: 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.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
dr hab. inż. Mirosław Czechowski, prof. nadzw. AMG	*KMOiTR*
2. The other people conducting the course:	
dr inż. Krzysztof Dudzik	*KMOiTR*
dr inż. Maria Cicholska	*KMOiTR*
dr hab. inż. Robert Starosta	*KMOiTR*
dr inż. Justyna Molenda	*KMOiTR*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 22.12.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	18	Course :	**Fundamentals of Manufacturing Engineering**
Field/Level of education:			**Mechanical Engineering and Machine Design/**First-degree
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
I	3	2					30			
II	3	1		1			15		15	
III	2			4					60	
Total number during the studies:							**120**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	The knowledge and skills in the secondary school

Course objectives

1.	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 is consistent with the framework extended training program at the operational level and management in the department of mechanical engineering with a specialization

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	name and describe the basic methods of casting, plastic forming and welding	K_W03, K_W08
EKP2	explain the phenomena occurring in the process of cutting	K_W01, K_W03
EKP3	name and distinguish machining methods	K_U13
EKP4	make a project technological process typical machine parts	K_W03, K_W08
EKP5	perform basic locksmith, assembling, welding, select the necessary measuring instruments	K_W05, K_W09, K_U12, K_U14, K_U18
EKP6	use literature in order to expand and clarify their knowledge	K_W03, K_W08, K_U17, K_K10
EKP7	work in a team, understand the principles of cooperation	K_U01, K_U05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester I

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Introductory messages.	2			EKP4

	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.	Casting. Classification methods and processes for producing castings. Gravity casting: disposable forms and reusable forms. Casting pressure. Principles of design of castings. Casting defects.	6			EKP1
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			EKP1
4.	Bonding processes. Bonding mechanism. Classification of welding processes. Gas welding. Electric welding methods. Arc welding, plasma and laser. Welding stress and strain. Weld ability some materials. Classification and general characteristics of the pressure welding. Resistance welding. Friction welding. Soldering. Gluing.	6			EKP1
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.	8			EKP2, EKP6
6.	Principles of design of manufacturing processes. Design of machine parts manufacturing processes. General recommendations. Technical documentation.	2			EKP4, EKP6

Semester II

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
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.	3		6	EKP3
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.	3		2	EKP3
3.	Finishing treatment.	3			EKP1, EKP3

	General characteristics: honing, superfinishing, lapping and polishing. The quality of the machined surface. Principles of selecting machining conditions.				
4.	Treatment of erosion. The genesis of erosive machining. Characteristics of treatment: EDM, electrochemical anodic - mechanical, streaming.	1			EKP3, EKP6
5.	Screw cutting. Cutting turning tool, screw tap, screwing die, diehead, milling cutters. Grinding threads.	1		2	EKP3
6.	Cutting gear teeth. Profile milling and hobbing. Shaving and grinding of gear teeth.	2		2	EKP3
7.	Basics of designing manufacturing processes. Design processes. Fundamentals of computer aided process planning (CAM – Computer Aided Manufacturing).	2		3	EKP4, EKP6

Semester III

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Basic machining operations locksmith: routing, sawing, cutting, scraping. **(8.10. p.22)**			4	EKP5, EKP7
2.	Power handling rules: drills, saws, screw, grinders.			2	EKP5
3.	Fundamentals of machining. Types of treatment.			2	EKP3, EKP5
4.	Machining parameters. Selection of parameters.			2	EKP3, EKP4
5.	Turning lathe **(8.10. p.23)**: a) the types and service, b) the types of tools, c) basic operations.			12	EKP3, EKP4
6.	Drilling machine **(8.10. p.24)**: a) the types and service, b) the types of tools, c) basic operations.			2	EKP3, EKP4
7.	Grinding machine **(8.10. p.25)**: a) the types and service, b) the types of tools, c) basic operations.			2	EKP3, EKP4
8.	Milling machine a) the types and service, b) the types of tools,			4	EKP3, EKP4

	c) basic operations.				
9.	Installation methods and methods of assembly assembling basic operations.			4	EKP5, EKP7
10.	Gas welding and cutting **(8.10. p.26)**: a) health and safety and fire during welding and gas cutting, b) the properties of gases, c) the storage and transport of gases, d) construction and types of flame, e) the types and construction of burners for welding and cutting, f) additional materials for welding, g) the practical operation of the welding equipment, h) the types of connectors, joints and welding positions, i) the preparation of material for welding and cutting, j) cutting the sheets, profiles and steel pipes, k) welding in the flat position and vertical, l) welding of butt joints in the flat position, and vertical, wall, m) types of connectors, joints and welding positions, n) to prepare material for welding and cutting, o) cutting steel sheets, profiles and pipes, p) welding of butt joints in the flat position, wall-mounted and vertical.			12	EKP1, EKP5, EKP7
11.	Arc welding and cutting **(8.10. p.27)**: a) health and safety and fire during welding and cutting arc, b) the structure and operation of equipment for welding and cutting electrical c) additional materials for electric arc welding, d) electrode, e) technical gases, f) ceramic pads, g) the practical operation for welding and cutting h) the types of connectors, joints and welding positions, i) the preparation of material for welding and cutting, j) welding wire and electrode welding naked, k) welding flanged tee joints, l) welding of butt joints prepared for the "I", "V" and "Y", m) arc cutting sheets, profiles and steel pipes.			8	EKP1, EKP5, EKP7
12.	Electrical Workshop: a) making the ends of wires and cables, b) the removal, repair and installation of electrical lighting fixtures, c) the removal, repair and installation of container terminals contact one phase and three phase, d) removal, repair and installation of switches and sockets manifolds of different types,			6	EKP5, EKP7

	e) ways of laying cables.				

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1				X					
EKP2				X					
EKP3				X	X			X	
EKP4					X			X	
EKP5					X			X	
EKP6					X			X	
EKP7					X			X	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
I	Student achieved the expected learning outcomes and meets the requirements of the STCW Convention relating to complete the course. Attended lectures. Lecture: pass test of the lecture.
II	Student achieved the expected learning outcomes. Attended lectures. Lecture: pass test of the lecture. Laboratories: 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. After successful completion of the evaluation of two forms of activity with the assessment of the average of the grades received lecture and laboratory.
III	Student achieved the expected educational effects . 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, with the report.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	45	75		
Reading literature	15			
Preparing for laboratories, project classes		30		
Preparing for the exam, the pass test	20			
Drafting documentation of a project/report		10		
Participating in pass tests and exams	3			
Participating in consultation hours		5		
Total number of hours	83	120		

Number of ECTS points	**4**	**4**		
Summary number of ECTS points for the course	**8**			
Student's workload connected with practical classes	75+30+10+5=120 h - 4 ECTS			
Student's workload during the classes involving direct participation of academic teachers	45+75+3+5=128 h - 5 ECTS			

Literature:

Primary literature
1. Bartosiewicz, Józef.: Manufacturing technology. Wyd. Akademii Morskiej w Gdyni, Gdynia, 2002. 2. Rosłanowski, Jan.: Workshop practice: issues welding and cutting materials. Wyd. Akademii Morskiej w Gdyni, Gdynia, 2002.
Secondary literature
1. Engineer's Guide. Casting. Warszawa: WNT 1986. 2. Erbel S., Kuczyński K., Marciniak Z.: Plastic working. Warszawa: PWN 1986. 3. Górski E.: Guide turner. WNT, Warszawa 2008. 4. Gourd L.M.: Fundamentals Welding Technology. WNT, Warszawa 1997.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
dr inż. Tomasz Dyl	*KMOiTR*
2. The other people conducting the course:	
dr inż. Krzysztof Dudzik	*KMOiTR*
dr inż. Wojciech Labuda	*KMOiTR*
dr inż. Justyna Molenda	*KMOiTR*
mgr inż. Andrzej Daszyk	*KMOiTR*
mgr inż. Włodzimierz Kończewicz	*KMOiTR*
mgr inż. Grzegorz Gesella	*KMOiTR*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 12.12.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	19	Course :	**Engineering Thermodynamics**
Field/Level of education:			**Mechanical Engineering and Machine Design/**First-degree
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
III	4	2	2				30	30		
IV	3	1		2			15		30	
Total number during the studies:							**105**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	The knowledge and skills acquired in secondary school and gained from the mathematic and physic lectures during the first-level studies

Course objectives

1.	The goal of the course is to provide basic knowledge and skills in the field of engineering thermodynamics, which are necessary for the safe operation of industrial plants, machinery and technical equipment, which also operate in ships power plant systems.
2.	The Program is consistent with the extended training framework program at the operational and management level in the department of mechanical engineering with a specialization est. No. 8 (The Regulation of the Minister of Infrastructure and Development of 28 February 2014. Pos. 536)

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	name and use the Laws of Thermodynamics (The Zeroth, First and Second Law); describe the important physical properties and quantities;	K_W01; K_W02; K_W06
EKP2	name the specific kinds of thermodynamic processes; describe the thermodynamic power cycles and heat pump cycles (heat engine, refrigerator, heating pump) – cycles of gas and vapour systems (e.g. Carnot, Otto, Diesel, Sabathé, Atkinson, Clausius-Rankine, Joule, Striling, Ericsson, Linde, Brayton, compressor and jet engine theoretical cycles);	K_W01; K_W02; K_W04; K_W06; K_U11; K_U13
EKP3	discuss the basics of heat flow and heat exchangers; characterize the parallel-flow and counter-flow heat exchangers; perform energy balance calculation for heat exchanger;	K_W01; K_W02; K_W04; K_W06; K_W09; K_U11
EKP4	discuss the basics of combustion; discuss phenomena and processes occurring in the vapour and humid gases;	K_W01; K_W02; K_W04; K_W06; K_W09; K_U11

EKP5	characterize conventional and unconventional energy sources and methods of their use;	K_W01; K_W02; K_U01;
EKP6	select the appropriate testing equipment and perform basic measurements of thermal and flow parameters (measurement of temperature, pressure, humidity, stream velocity, thermal conductivity, calorific value, the composition of the exhaust gases, etc.);	K_W01; K_W02; K_U01, K_K07;
EKP7	use literature sources for understanding and interpretation of results;	K_U01
EKP8	work in a group taking various tasks and understand the principles of cooperation within the group.	K_K07

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester III

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	The basic concepts of thermodynamics: pressure, temperature, mass, energy, heat, work, and their units. The thermodynamic system and its parameters, the thermodynamic equilibrium. **(8.2.1)**	3			EKP1
2.	The ideal gas law. The perfect, ideal and real gases. The Boyle's law, the Gay-Lusac's law, the Charles' law. The equation of state of the gas (the Clapeyron equation). The equations for real gases. **(8.2.3)**	3	2		EKP1, EKP2
3.	The specific heat. The enthalpy. A mixture of gases. The entropy. **(8.2.4)**	1			EKP1
4.	The First Law of thermodynamics. The absolute, external and technical work. The definition and equations of the First Law of thermodynamics. **(8.2.5)**	3	2		EKP1
5.	The thermodynamic processes of gases. An isochoric, isothermal, isobaric, adiabatic, polytropic, isentropic and isenthalpic process. **(8.2.6)**	1	1		EKP1 EKP2
6.	The Second Law of thermodynamics. The definition of the second law of thermodynamics. Thermodynamic cycles. The Carnot cycle. **(8.2.7)**	3	2		EKP1, EKP2
7.	The theoretical cycles of internal combustion engines. The Otto cycle, Diesel cycle and Sabathé cycle. The charts single and multi-stage of compressors. **(8.2.8)** The theoretical cycles of jet engines and combustion turbine generators.	4			EKP2
8.	The thermodynamics of vapour. The steam generation, the wet and superheated steam, steam parameters. **(8.2.9)**	2			EKP1, EKP2
9.	The p-v and i-p charts for water/steam. The T-s and i-s phase diagrams for water/steam. The choked flow of steam. **(8.2.10)** The Clausius-Rankine cycle.	2	2		EKP1, EKP2
10.	Methods of improving the energy efficiency of a steam power plant theoretical cycle.	1			EKP2
11.	The cooling cycles. The heat balance of the cooling cycle. **(8.2.11)**	2			EKP2
12.	The transfer of heat. The modes of heat transfer: conduction, convection, heat penetration, heat transmittance, radiation, heat transfer during phase transition, effect of surface contamination on heat transfer, methods of increasing the heat transfer. **(8.2.14)**	3			EKP3
13.	Heat exchangers - operating principle. The energy balance of heat exchanger. **(8.2.15)**	1	4		EKP3

14.	The humid gases. The parameters of humid air. Enthalpy of humid air. The i-x chart of humid air. The isobaric process of humid air. **(8.2.12)**	1	2		EKP1,EKP4

Semester IV

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Fundamentals of metrology of thermodynamic processes. **(8.2.2)**	4			EKP1, EKP6
2.	The heat exchangers. The types of heat exchangers. **(8.2.15)**	2			EKP3
3.	The humid gases (continuation and complement). **(8.2.12)**	2			EKP1, EKP4
4.	The theoretical basis of the combustion processes. Types of combustion. The composition of the exhaust gases. **(8.2.16)**	2			EKP4
5.	The unconventional sources of energy: solar energy, geothermal energy, water courses, biomass, wind energy, other sources of non-conventional energy (hydrogen fuel, waste heat, fuel cells, unconventional engines, MGD and MHD generators, heat pumps).	5			EKP5
6.	Introduction to laboratory and the basic issues of metrology of thermal and flow processes: measured values, methods and techniques of measurement, methods of analyzing the results of experiments.			2	EKP6,EKP8
7.	The calibration of a manometer by the comparison method.			2	EKP6, EKP7, EKP8
8.	The calibration of thermometers (thermocouple, resistance thermometer, liquid thermometer, manometric thermometer) by the comparison method.			2	EKP6, EKP7, EKP8
9.	Measurement of surface temperature and determination of emissivity with the pyrometers.			2	EKP6, EKP7, EKP8
10.	The tests of Peltier module operating characteristics.			2	EKP6, EKP7, EKP8
11.	The measurement of air humidity.			2	EKP6, EKP7, EKP8
12.	Measurement of the mass flow rate and volume flow rate. Calibration of the Venturi flow meter using the Prandtl tube.			2	EKP6, EKP7, EKP8
13.	Calibration of the cup anemometer using a discharge nozzle.			2	EKP6, EKP7, EKP8
14.	Determination of the pressure losses in the pipeline.			2	EKP6, EKP7, EKP8
15.	The exhaust gases analysis.			2	EKP6, EKP7, EKP8
16.	The study of heat losses of the shell and tube heat exchanger.			2	EKP6, EKP7, EKP8
17.	Evaluation of isentropic exponent and polytropic index for the expansion of the air.			2	EKP6, EKP7, EKP8
18.	Determination of the heat of combustion and calorific value of the fuel.			2	EKP6, EKP7, EKP8
19.	Determination of the thermal conductivity by Poensgen apparatus.			2	EKP6, EKP7, EKP8
20.	Verification of acquired knowledge and skills on measurements of heat and flow processes.			2	EKP6, EKP7, EKP8

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1	**X**			**X**					
EKP2	**X**			**X**					
EKP3	**X**			**X**					
EKP4	**X**			**X**					
EKP5	**X**			**X**					
EKP6					**X**			**X** (during lab.)	
EKP7					**X**				
EKP8								**X** (during lab.)	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
III, IV	Student achieved the expected learning outcomes and meets the requirements of the STCW Convention in order to complete the course. Student attended lectures, exercises (limit - 3 absences) and laboratories. He received a credit from the lecture (test) and exercise (2 tests) and laboratory (reports). The final grade: the average score for a test from lectures and score for a tests from exercises (Thermodynamics I); the average score for a test of lectures and score for a tests from exercises and score for laboratory reports (Thermodynamics II). Student rating (final score) after successful completion of all forms of classes.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	75	30		
Reading literature	20	5		
Preparing for laboratories, project classes		10		
Preparing for the exam, the pass test	20	5		
Drafting documentation of a project/report		8		
Participating in pass tests and exams	10			
Participating in consultation hours	5	2		
Total number of hours	125	60		
Number of ECTS points	**5**	**2**		
Summary number of ECTS points for the course	**7**			
Student's workload connected with practical classes	30+5+10+5+8+2=60h - 2 ECTS			
Student's workload during the classes involving direct participation of academic teachers	75+30+10+5+2= 122h – 5 ECTS			

Literature:

Primary literature
1. Szargut J., Termodynamika, PWN, Warszawa 2013. 2. Staniszewski B., Termodynamika, PWN, Warszawa 1982. 3. Wiśniewski S., Termodynamika techniczna, WNT, Warszawa 1993. 4. Wiśniewski S., Wiśniewski T. S., Wymiana ciepła, WNT, Warszawa 1994.
Secondary literature
1. Szargut J., Teoria Procesów Cieplnych. PWN, Warszawa 1973. 2. Staniszewski B., Wymiana ciepła, PWN, Warszawa 1979.

Persons conducting the course :

Title/degree, name and surname	Didactic unit
1. Person responsible for the course :	
Dr hab. inż. Andrzej Miszczak	KPT
2. The other people conducting the course:	
Dr inż. Krzysztof Łukaszewski	KPT
Mgr inż. Adam Czaban	KPT

Explanation of the abbreviations used:

L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	20	Course :	**Electrotechnics & Electronics**
Field/Level of education:			**Mechanical Engineering and Machine Design/**First-degree
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
I	3	2	1				30	15		
II	3								15	
Total number during the studies:							60			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills in the secondary school

Course objectives

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 is compatible with the framework extended training program at the operational level and management in the department of mechanical engineering with a mechanical specialization est. No. 8 (Regulation of the Minister of Infrastructure and Development of 28 February 2014. Pos. 536)

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Discuss the basic concepts of electricity and electronics	K_W02; K_U05
EKP2	Discuss the phenomena occurring in systems of coupled coils, give a practical example of a such system	K_U12; K_U013; K_K05;
EKP3	Select instruments and measure the basic electrical quantities based on the specified scheme. Carry out the theoretical analysis of the system	K_U01; K_U12; K_U22; K_K05
EKP4	Carry out the test in the three-phase symmetrical and asymmetrical system	K_W04; K_U09;

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester I

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Basic concepts, division circuits: (8.11. P.1) a) DC current, b) alternating, (AC) c) SI units.	1			EKP1
2.	Electrical circuit elements: **(**8.11. P.2)	1			EKP1

	sources and receivers, principles of arrow convention, meters. Symbols used in the electrical diagrams,				
3.	Circuits of electric current (8.11. P.3) a) definition of electric current, current conduction types, the distribution of materials due to the conduction current, conduction in semiconductors, d) electric field, electric field intensity, displacement current, electric potential, capacitance, unit of capacitance, capacitors, circuit with a capacitor and resistance, time constant of circuit with capacity, energy-charged capacitor. b) Ohm's law, an explanation of the concepts of current intensity, voltage, electromotive force, resistance, basic units, cable resistance, resistivity, conductivity materials, thermal effect of current, power electricity, c) Kirchhoff's law, equation of complex DC circuits, rules of writing of equations, a description of the methods of calculation of complex-circuit, principle of superposition, Thevenin theorem.	5			EKP1
4.	Electromagnetism: (8.11. P.4) a) the magnetic field, the image field, the field of electrical current, Biot and Savart law, Ampere's law, magnetic field strength, field coil and wire, clockwise corkscrew rule, the mechanical action of the magnetic field on the current, a simple electric motor, the rule of the left hand , flux density, unit of flux density, other models of force action from fields, rules directional current activities in the magnetic field b) electromagnetic induction, the induction of EMF, the magnetic flux, circuit inductance, unit of magnetic flux and inductance, directional rules induction for EMF, the circuit with inductance, time constant of circuit with inductance, field energy of winding, the principle of operation of the electrical generator, EMF of wire in a magnetic field , c) the magnetization of bodies, permeability, types of magnetic materials, ferromagnetism, characteristics of ferromagnetic, soft and hard magnetic materials, magnetic circuit, Ohm's law for magnetic circuit, reluctance, magnetic forces in the magnetic circuits.	3			EKP1
5.	Alternating current, sinusoidal current(8.11. P.5) a) single-phase sinusoidal alternating current, sinusoidal current parameters (mean, effective, maximum value), analytical, graphical and symbolic representations of sinusoidal current, phase shift, instantaneous power, average power. b) simple circuits of sinusoidal current (RL, RC, RLC), reactance, impedance, admittance, phase shift, Ohm's law for simple circuits, serial and parallel resonance, c) equations for circuits of sinusoidal current and their vector representation (phasor figure), symbolic method, complex circuits of sinusoidal current, active power, reactive, apparent power interpretations,	9			EKP1
6.	three-phase circuits: vector representation of 3-phase current and voltage, quantitative relationships in 3-phase system, associating	3			EKP4

	sources and receivers in Δ / Y systems, symmetry or asymmetry of 3-phase systems, the capacity of a 3-phase systems, power system, 3 and 4 - wire, phase sequence indicator.				
8.	Distorted waveforms Fourier series, harmonic analysis, THD Transients in electrical circuits: Linear circuits first and second order, the transient component and fixed, overvoltage, overcurrent.	3			EKP2
9.	Electronics: (8.11. P.11) a) selection of semiconductor devices, low power contact barrier p-n diode, bipolar transistor, FET, the basic elements of optoelectronic, LED, optoelectronic components for liquid crystals, b) the basic power electronics semiconductors, high-power diode, thyristor classic (SCR), high-power bipolar transistor, the transistor with a gate voltage IGBT, GTO thyristor, thyristor MCT	5			EKP1

Semester II

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Measurements of the electrical parameters (8.11. P.9, 27) a) analog and digital measuring instruments: - operating principle, - classification, - application, - accuracy, - indication, b) the methods and measurement systems, c) the construction and operation of the analog meters indicators magnetoelectric, electromagnetic, dynamic, induction heating, resonant meters, d) A / D conversion, digital multimeters: - Measurements of currents and AC and DC voltages, ranges, single-phase power measurements and three-phase AC power measurement, power quality, - Measurement of the resistance of different sizes and different methods, the bridged methods, technical methods, - Measurement of inductance and capacitance, - Measurement of non-electrical quantities - Trials and calibration of sensors, e) measurement and registration of time-varying waveform, oscilloscope and computer methods, f) measuring interfaces, computer measurement systems. g) rules for constructing electrical circuits, h) the interpretation of the electrical circuit diagrams.			10	EKP3
2.	Components and electronic systems and power electronics, maintenance and exchange of: semiconductor components: a) diodes, b) transistors, c) thyristors,			5	EKP3

	d) power transistors, e) resistors, f) capacitors, g) selection of electronics systems.				

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1				**X**					
EKP2				**X**					
EKP3					**X**				
EKP4					**X**				

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
I	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.
II	A student achieved the expected learning outcomes. He attended the laboratory. Laboratories: 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. Evaluation index after successful completion of the 2 tests.
III	

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	45	15		
Reading literature	15			
Preparing for laboratories, project classes		15		
Preparing for the exam, the pass test	20			
Drafting documentation of a project/report		15		
Participating in pass tests and exams	4			
Participating in consultation hours				
Total number of hours	84	45		
Number of ECTS points	**3**	**3**		
Summary number of ECTS points for the course	**6**			
Student's workload connected with practical classes	45 – 3 ECTS			
Student's workload during the classes involving direct participation of academic teachers	64 – 3 ECTS			

Literature:

Primary literature
1. Electrotechnics and Electronics for mechanics WNT 2000 (collective work)
Secondary literature
1. Electrotechnics and Electronics Przeździecki PWN Warszawa 1998

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Dr inż. Piotr Jankowski (Lecture)	*KEO*
Dr inż. Tomasz Nowak (laboratory)	*KEO*
2. The other people conducting the course:	
Mgr inż. Andrzej Piłat	*KEO*
Mgr inż. Marcin Pepliński	*KEO*
Mgr inż. Marcin Lisowski	*KEO*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	21	Course :	**Fundamentals of Control Engineering & Robotics**
Field/Level of education:			**Mechanical Engineering and Machine Design/**First-degree
Form of studies:			**Full-time programme**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
IV E	3	2					30			
V	2			1					15	
Total number during the studies:							**45**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills in mathematics, physics, mechanics, as necessary to achieve the subject,
2.	Knowledge and skills in the field of thermodynamics and fluid mechanics, electrical engineering and electronics, as being useful to achieve the subject.

Course objectives

1.	Provide fundamental knowledge of the equipment and operation of existing control systems,
2.	Provide fundamental knowledge and skills in the field of control, which is necessary for safe operation of the ship marine systems
3.	The program is compatible with the framework extended training program at the operational level and management in the department of mechanical engineering with a specialization est. No. 8 (Regulation of the Minister of Infrastructure and Development of 28 February 2014. Pos. 536)

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Presents the basic terms used in control, ie .: a signal, a element, a object, static characteristics, dynamic characteristics, frequency characteristics, transfer function and spectral function.	K_W02; K_W04
EKP2	Characterized the basic elements of the control system, ie .: the control object, controler, signal processing, actuator and distinguishes the signals of control system such as setpoint, disturbance and response, the main channel and the feedback circuit in the control system.	K_W02; K_W04
EKP3	Presents the continuous regulators PID, gives their transfer function and parameters, draws step characteristics, Nyquist and Bode characteristics.	K_W02; K_W04
EKP4	Appropriate adjustments for controller PID to the control system, for example Ziegler and Nichols method or by known object.	K_W04; K_U05; K_U08; K_U09; K_U13; K_U15; K_U17; K_U21;

EKP5	Identifies the type of control used in this example.	K_W04; K_U09; K_U13; K_U15;
EKP6	Calculate the characteristics of a good response of the control system and indicators of the control quality, improve indicated control quality index by using the controller settings.	K_W09; K_U08; K_U09; K_U13; K_U15; K_U17; K_U21;
EKP7	Analyzes indicated control system for proper answer and the solution used.	K_U01; K_U05; K_U13; K_U15; K_U18; K_K03;
EKP8	Expands the their knowledge, working in a group assumes different roles in it, understands the principles of cooperation	K_U01;K_U13; K_U15; K_K01; K_K05; K_K06; K_K07;

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester IV

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	The structure of the control system, fundamental elements of control. (8.12. P. 1)	2			EKP1; EKP2
2.	The measuring transducers used in marine control systems. (8.12. P. 2)	2			EKP1; EKP2
3.	Transmission of signals. (8.12. P. 3)	2			EKP1; EKP2
4.	Fundamental elements of control and their characteristics: (8.12. P. 4) a) the proportional element and examples of these, b) the inertial element and examples of these, c) the oscillating element and examples of these, d) the derivative element and examples of these, e) the static and dynamic characteristics.	10			EKP1; EKP2; EKP3
5.	PID controllers - their functions, tuning parameters of controller. (8.12. P. 5)	2			EKP4; EKP5; EKP6
6.	The positioners. (8.12. P. 6)	2			EKP1; EKP2
7.	Computer control systems and their operational control (testing). (8.12. P. 12)	4			EKP1; EKP2; EKP7
8.	Computer alarm and signaling systems and control their activities (testing). (8.12. P. 13)	4			EKP7
9.	PLC controllers used in marine systems. (8.12. P. 14)	2			EKP7
	Total	30			

Semester V

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Survey the pneumatic control cascade.			1	EKP1, EKP2
2.	Survey the pneumatic power amplifiers.			1	EKP1, EKP2
3.	Survey the dynamics of the fundamental elements of control.			2	EKP1, EKP2
4.	Survey the spectrum characteristics of control			1	EKP1, EKP2
5.	The measuring transducers used in marine control systems. (8.12. P. 16) Survey the measuring transducer.			1	EKP1, EKP2
6.	Survey the pneumatic actuator. The positioners. (8.12. P. 18)			2	EKP1, EKP2
7.	Survey the characteristics of pneumatic controller PID			2	EKP3
8.	The controllers PID – tuning parameters of controller. (8.12. P. 17)			2	EKP4, EKP6, EKP7,EKP8
9.	Identification of control objects.			1	EKP4, EKP6, EKP7,EKP8
10.	Survey of the relay control system			2	EKP5, EKP6
	Total			15	

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1			**X**	**X**	**X**			**X** (during the lab.)	
EKP2			**X**	**X**	**X**			**X** (during the lab.)	
EKP3			**X**	**X**	**X**			**X** (during the lab.)	
EKP4			**X**	**X**	**X**			**X** (during the lab.)	
EKP5			**X**	**X**	**X**			**X** (during the lab.)	
EKP6			**X**	**X**	**X**			**X** (during the lab.)	
EKP7			**X**	**X**					
EKP8			**X**	**X**	**X**			**X** (during the lab.)	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
IV	The student achieved the expected effects of the course and meets the requirements of the STCW Convention relating to complete the course. Attended lectures (permissible - 1 absence). Lecture: two tests of the lecture and a written exam. The final grade average of the test 40% and 60% written exam.
V	The student achieved the expected effects of the course and meets the requirements of the STCW Convention relating to complete the course. He attended all laboratories. Laboratories: Execution and completion of all laboratory, according to the schedule. The final grade average of the laboratory work and reports.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	30	15		
Reading literature	20	10		
Preparing for laboratories, project classes		10		
Preparing for the exam, the pass test	15			
Drafting documentation of a project/report		15		
Participating in pass tests and exams	5			
Participating in consultation hours	5	5		
Total number of hours	65	55		
Number of ECTS points	**3**	**2**		
Summary number of ECTS points for the course	**5**			
Student's workload connected with practical classes	20+10+10+15+15=70 h - 3 ECTS			
Student's workload during the classes involving direct participation of academic teachers	30+15+5+5+5=60 h - 2 ECTS			

Literature:

Primary literature
1. Dorf R.C., Bishop R.H. Modern Control Systems. Addison – Wesley & Sons Inc., 1998.
2. Nise N.S. Control System Engineering. 3th edition. John Wiley & Sons, 2004.
3. Kuo B. C. Automatic Control of Dynamic Systems, 7th ed, Addison-Wesley & Sons Inc., 1995.
4. Hostetter G.H., C.J. Savant, R.T. Stefani, Design of Feedback Control Systems, Saunders College Publishing, 1989.
5. Franklin G.,F., Powell J., D., Workman M., Digital Control of Dynamic Systems, 3rd edition, Addison Wesley Longman, Inc.,1998.
6. Ogata K. Designing Linear Control Systems with MATLAB. Prentice Hall, 2002.
7. Ogata K. Modern Control Engineering. 4th edition. Prentice Hall, 2002.
Secondary literature
1. The Mathworks. Control System Toolbox for use with Matlab. Natick, 2001.

Persons condcuting the course :

Title/degree, name and surname	Didactic unit
1. Person responsible for the course :	
dr inż. Andrzej Mielewczyk	KPT
2. The other people conducting the course:	
dr inż. Hoang Nguyen	KPT
mgr inż. Wojciech Frąckowiak	KPT

Explanation of the abbreviations used:

L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 20.12.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	22	Course :	**Metrology and Measurement Systems**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
III	3	1		2			15		30	
Total number during the studies:							45			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge of names of technical items and manual skills in safe operation of workstations

Course objectives

1.	Delivery of basic knowledge about the use of measurement techniques for the assessment (evaluation) of the conditions of exploitation and technical state of ship equipment.
2.	The programme is in accordance with the extended framework training program in the operational and management level in engineering department in the mechanical specialisation, annex No 8 (Ministry of Infrastructure and Development's Regulation of 28 February 2014, pos. 536).

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Quote the basic SI units and its etalons; discuss the converting of measure units from etalons to measurement tools; write the results of measurements and its multiple	K_W01; K_W09
EKP2	Measure with the measurement tool; select the measurement method for metrological tasks; use of metrological names	K_W04; K_W05; K_U08; K_U09
EKP3	Describe the structure of measurement tools and processing of input data to output data; state the correctness of measuring tools state	K_W02; K_U15
EKP4	Appoint parameters of geometrical area's structure (deviations of shape, location, surface's coarseness) and measurement uncertainty (systematic and random), write the measurement result	K_U12; K_U16; K_W08
EKP5	Use the sources of literature and use technical norms and standards regarding the use of measurement tools	K_W09; K_U01; K_U05; K_U07
EKP6	Work in group with understinding of the principles of cooperation and health and safety at work in lab rooms	K_K04; K_K05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester III

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	

1.	Measurement information and its presentation. System of SI units and its etalons. To deliver pattern value to measurement tools.	2			EKP1; EKP5
2.	Measurement accuracy and its presentation. Measuring uncertainty appointment. Conditions of reference and their influence on measurement.	2			EKP1; EKP2; EKP4
3.	Metrological characteristics of measuring tools. Classification of measuring tools and their construction: a) Patterns b) Tests c) Measuring devices	2		2	EKP1; EKP3
4.	Geometrical structure of surface and its components: a) Shape deviations b) Waviness deviations c) Surface's coarseness	2		2	EKP2; EKP3; EKP4: EKP6
5.	Direct measurements of dimensions: a) Outter b) Inner c) Mixed			4	EKP2; EKP5; EKP6
6.	Measurement methods: a) Differencing b) Optical c) Indirect			6	EKP2; EKP4; EKP5; EKP6
7.	Measurements of compound shapes: a) Thread b) Gear c) Cone	2		6	EKP2; EKP6
8.	Pneumatic measurements	1		2	EKP2; EKP6
9.	Ultrasonic measurements. Analogue and digital measurements	2		2	EKP2; EKP6
10.	Liquid flow rate's measurement	2		2	EKP2; EKP6
11.	Measurements of the reference conditions: a) Temperature b) Humidity c) Pressure			2	EKP2; EKP6
12.	Measuring of parameters' signals measurement			2	EKP2; EKP6

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1				**X**					
EKP2								**X**	
EKP3					**X**			**X**	
EKP4				**X**	**X**			**X**	
EKP5								**X**	

EKP6								**X**	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
III	Student has: achieved established effect of education; attended lectures; performed and ranked all exercises basing on the measuring cards according to studies schedule. Final mark is the average evaluation of the marks of teoretical knowledge, tests,lab work and measuring cards.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	15	30		
Reading literature	5			
Preparing for laboratories, project classes		10		
Preparing for the exam, the pass test	5	5		
Drafting documentation of a project/report				
Participating in pass tests and exams	2	3		
Participating in consultation hours		2		
Total number of hours	22	50		
Number of ECTS points	**1**	**2**		
Summary number of ECTS points for the course	**3**			
Student's workload connected with practical classes	30+10+5+3+2=50 – 2 ECTS			
Student's workload during the classes involving direct participation of academic teachers	15+5+5+2=22 – 1 ETCS			

Literature:

Primary literature
1. Tumański S., Technika pomiarowa, WNT, Warszawa 2007 r. 2. Daszyk A., Metrologia długości i kąta – ćwiczenia WSM Gdynia 2003 r. 3. Jakubiec W., Malinowski J., Metrologia wielkości geometrycznych WNT Warszawa 2004 r.
Secondary literature
1. Miłek M., Metrologia elektryczna wielkości nieelektrycznych, Oficyna wydawnicza Uniwersytetu Zielonogórskiego, Zielona Góra 2006 r. 2. Podręcznik akademicki ; Pomiary cieplne cz. I, II ,WNT Warszawa 2001 r. 3. Piotrowski J., Kostyrko K.; Wzorcowanie aparatury pomiarowej WNT, Warszawa 2000 r. 4. Hagel R., Zakrzewski J.,: Miernictwo dynamiczne WNT, Warszawa1984 r.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Prof. dr hab. inż. Janusz Mindykowski	*KEO*
2. The other people conducting the course:	
mgr inż. Andrzej Daszyk	*KMOiTR*

dr inż. Wojciech Labuda	*KMOiTR*
dr inż. Krzysztof Dudzik	*KMOiTR*
dr inż. Robert Starosta	*KMOiTR*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	23	Course :	**Protection of the Marine Environment**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
IE	2	2					25			
Total number during the studies:							25			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Secondary school knowledge and skills

Course objectives

1.	The aim of the course is to provide basic knowledge in the field of environmental protection, MARPOL and Helsinki. Risks of global and local environment.
2.	The Program is consistent with the framework extended training program at the operational level and management in the department of mechanical engineering with a specialization est. No. 8 (Regulation of the Minister of Infrastructure and Development of 28 February 2014. Pos. 536)

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Know the basic definitions and concepts of ecology.	K_W10
EKP2	Determine the principles of safe operation of equipment and engine room for the removal of contaminants from the ship.	K_W09
EKP3	Process information on the safe use of engine room equipment for the removal of contaminants from the ship.	K_U07
EKP4	Know the conditions for the use of technical measures to prevent environmental contamination.	K_U16
EKP5	Use standard Polish environmental laws.	K_W11
EKP6	Take decision to ethical and financial implications.	K_K03

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester I

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Definitions and basic concepts of ecology. (8.13, p. 1)	1			
2.	The role of water transport in the economy in global and regional terms, transport as a source of environmental emissions. Baltic Sea as a Particularly Sensitive Sea Area (PSSA). (8.13, p. 2)	2			

3.	Effect of operational pollution on the environment. (8.13, p. 4)	1			
4.	International and local environmental regulations in the operation of the vessel. (8.13, p. 5)	2			
5.	The vessel as a source of pollution, the types and amounts of operational pollution from ships: a) pollution of the sea by oil, bilge water, ballast water b) contamination of harmful substances transported in bulk and packaged - fuels, lubricants, cleaners, maintenance agents, etc. c) marine pollution sewage d) marine pollution waste e) pollution by exhaust fumes (8.13, p. 3)	8			
6.	Conditions for the use of technical measures to prevent environmental pollution. (8.13, p. 7)				
7.	Methods and measures to prevent pollution by the vessel: a) exhaust emissions testing, b) the treatment of sewage, c) The bilge water oil separators, d) testing of waste fluids, e) garbage incinerator, f) ballast water testing, g) other (8.13, p. 6)	6			
8.	Types of documentation and oversight responsibility for documentation. (8.13, p. 8)	1			
9.	Types and rules of inspections in the field of environmental regulations. Inspection equipment. Issue of certificates. (8.13, p. 9)	1			
10.	Legal aspects of liability for pollution during the operation of the vessel. (8.13, p. 10)	2			
11.	The role of the crew in proactive activities to prevent pollution. (8.13, p. 11)	1			
	Total	25			

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1		**X**		**X**					
EKP2		**X**		**X**					
EKP3		**X**		**X**					
EKP4		**X**		**X**					
EKP5		**X**		**X**					
EKP6		**X**		**X**					

EKP7		**X**		**X**					

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
I	A student obtained the expected learning outcomes and meets the requirements for receiving credit. Attended lectures (permissible - 1 absence). Lecture: passing the test from the lecture. Oral examination
II	
III	

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	25			
Reading literature	15			
Preparing for laboratories, project classes				
Preparing for the exam, the pass test	10			
Drafting documentation of a project/report				
Participating in pass tests and exams	3			
Participating in consultation hours	5			
Total number of hours	58			
Number of ECTS points	**2**			
Summary number of ECTS points for the course	**2**			
Student's workload connected with practical classes	25+15+10+3+5 = 58 [h] – 2 ECTS			
Student's workload during the classes involving direct participation of academic teachers				

Literature:

Primary literature
a) Wiewióra A., „Ochrona środowiska morskiego w eksploatacji statków", Fundacja Rozwoju WSM Szczecin 1999. 3. Kaniewski E., Łączyński H., „Ochrona środowiska morskiego", WSM Gdynia 2000. 4. The MARPOL 73/78 Convention. 5. The DUMPING Convention. 6. The HELSINKI Convention. 7. The HELCOM Convention.
Secondary literature
3. Maintenance of engine room devices associated with the impact on marine environment. 4. Ochrona środowiska przyrodniczego, Bozena Dobrzańska, Grzegorz Dobrzański, Dariusz Kielczewski Wydawnictwo Naukowe PWN, 2010 (copyright 2008).

5. Krótkie wykłady Ekologia, Ball S. Andy, Mackenzie Aulay, Virdee R. Sonia, 2009, Wydawnictwo Naukowe PWN.
6. Mechanika płynów w inżynierii i ochronie środowiska, Orzechowski Zdzisław, Prywer Jerzy, Zarzycki Roman, 2009, WNT.
7. Chemia środowiska, Duffy Stephen J., VanLoon Gary, 2008, Wydawnictwo Naukowe PWN.
8. Wprowadzenie do inżynierii i ochrony środowiska. fizykochemiczne podstawy inżynierii środowiska, Zarzycki Roman, 2007, WNT.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	*Department of Marine Maintenance*
M.Sc. Eng. Włodzimierz Kończewicz	
2. The other people conducting the course:	*Department of Marine Maintenance*
M.Sc. Eng. Andrzej Daszyk	

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	24	Course :	**Repair Engineering**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	S
VE	2	2					30			
VII	2	1				1	15			10
VIII	3	1		2			15		30	
Total number during the studies:							**100**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills in the school

Course objectives

1.	The aim of the course is to provide basic knowledge of machinery technology, equipment maintenance , and equipment of ship hull with its ability to safely execute
2.	The program is compatible with the framework extended training program at the operational level and management level in the department of mechanical engineering with a specialization in Appendix 8 (Regulation of the Minister of Infrastructure and Development, February 28, 2014 . Item 536)

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Is familiar with the construction and operation of basic repairing tools and the terms of they use	K_W02; K_W08
EKP2	Knows dismantling structure as phase of technology process is able to repair and remove ship machines	K_W07; K_K02
EKP3	Regenerate to surfaces of the equipment and the ship by means of the adhesive composites of plastics	K_W02; K_W03: K_W05
EKP4	Apply protective coating of plastic on metal surfaces and knows the types of paints and varnishes	K_U08; K_U09 K_U12; K_U13 K_U18
EKP5	Perform periodic inspections marine engines and other marine equipment to confirm or renewal of the class	K_W09; K_U21
EKP6	Remove the valve malfunctions and leaks of naval installations	K_U01; K_U05
EKP7	Work in a group assuming different roles in it and understand the principles of cooperation	K_K05
EKP8	Lead management of spare parts and materials, and know the rules of the corrosion protection of metals along with protection application	K_W02; K_W06
EKP9	Knows the principles of welding , especially in argon; metal cutting and selection of welding parameters accordingly	K_W04; K_U11 K_U15

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester V

No	Content	Number of hours			Reference to EKP of the course
		L	C	Lab/ P	
1.	General safety during repair work in machinery and equipment maintenance in the engine room	1			EKP1
2.	Different types of tools used in disassembly of different devices (8. 10. No. 10.)	2			EKP1
3.	The basic disassembly and assembly operations using hand tools with electric, hydraulic and pneumatic drive (8.10 .No. 29)	2			EKP1 EKP2
4.	Rules concerning disassembly and sub-assembly of devices, and elements in marine power plant (8.10. No. 12): a) ways of impurities removal, b) exchang of elements and sub-assemblies, c) assembly principles and tests of tightness.	8			EKP 2
5.	Safety principles in disassembly and assembly works (8.10. No. 13)	1			EKP 2
6.	Regeneration of machines and equipment : a) by welding , b) by using epoxy resin , c) by means of plastic, d) by use of composites (8.10 . No 14)	8			EKP3 EKP4
7.	Mounting rotors and rotor assembly control . Installation of roller bearings (8.10. No. 40)	3			EKP2
8.	Assembly of shafts (shaft, supported on multiple bearings) assembly : control of alignment holes for bearings, plain bearings assembly , measuring backlash(8.10.No.41)	4			EKP2
9.	Installation of dynamic seals (8.10.No.43)	1			EKP2

Semester VII

No	Program content	Number of hours				Reference to EKP of the course
		L	C	Lab	S	
1.	Phases of technological process and repair phases (8.10. No. 11)	2				EKP 1
2.	Repair technology of piston of internal combustion engines: a) preparation and organization of repair, b) measurements before disassembly start, c) disassembly of basic units of the engine, d) verification and repair of engine elements, e) engine testing after repair (8.10.No.15).	6			3	EKP 4 EKP 5 EKP 6 EKP 7
3.	Repair technology of turbocompressor (8.10. No.16).	3			2	EKP 4
4.	Repair technology of machines and auxiliary devices: a) pumps, b) compressors,					EKP 4 EKP 6

	c) fans, d) filters, e) heat exchangers, f) centrifugal separators, g) hydraulic appliances, h) protection system of sea environment (8.10. No.17).	4			3	EKP 7
5.	Presentation materials collected during marine practices in accordance with the Book of the practice . Discussion and conclusions				2	EKP1 EKP5 EKP6

Semester VIII

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Repairs and acceptance of: a) hulls, b) tanks, c) internal combustion engines, d) pressure vessels, e) gas and steam turbines, f) turbocompressors, g) auxiliary machines, h) gears, i) shafting and propellers, j) pipelines and fittings, k) deck, gear, l) protective devices of nautical environment, m) automatics and steering devices (8.10. No. 18)	2			EKP5; EKP6 EKP7
2.	Technology repair of ship piping and fittings : a) cutting of pipes, b) pipe threading , c) the immediate removal of the pipes leak , d) plugging the pipe sections with flange connections , e) removal of pipes, f) the performance of the new pipe sections with flanges (straight and curved) , fitting flanges g) the repair of valves (8.10 No. 9 and No.28) .	2		2	EKP3 EKP4
3.	Management of repairs on ships and aging hull and ship's equipment : a) organization of ship repair (types of repairs : class, annual, emergency, other) , b) planning repairs and maintenance , management of spare parts (8.10 . No.19) .	2			EKP1 EKP6 EKP7 EKP9
4.	Implementation of connections of cylindrical parts (by forcing, heating, cooling) . Implementation of conical parts connections (by forcing hydraulic expansion hub , heating, cooling). Assembly control . Repair by inserting elements : bushing , pinning , sewing (8.10 . No.37) .	2		4	EKP4 EKP7
5.	Implementation of bolted connections : screw position control , control of preload (8.10 . No. 38)	1		1	EKP3 EKP4
6.	Implementation of the wedge connections and keyways	1		1	EKP3; EKP4

	(8.10 . No. 39).				
7.	Mounting of shafts supported on multiple bearings: checking arrangement of shafts and crank shafts (spring and rainfall measurement of the shaft)- (8.10 . No. 42).	1		2	EKP2 EKP4
8.	Installation of piston- crank system (8.10 No. 44).	1		2	EKP2; EKP4
9.	Assembly of camshaft and timing equipment (8.10 . No. 45).	1		2	EKP2; EKP4
10.	Coaxial alignment of the shaft engine generator. Installing the machine on the foundation (8.10 . No. 46).	1		2	EKP2 EKP4
11.	Checking the alignment shafting (8.10 . No. 47).	1		2	EKP2; EKP4
12.	Repairing usining cold plastics and adhesives (8.10 . No. 48).			2	EKP2; EKP4
13.	Measurements of deviations of the shape of the roller (including the journals of the crankshaft) (8.10 . No. 30).			2	EKP2; EKP4
14.	Measurements of shape deviations holes (cylinder liners , bearings bearing holes) (8.10 . No. 31).			2	EKP2; EKP4
15.	Measurements of displacement (piston , connecting rod , crankshaft , etc .) (8.10 No. 32).			2	EKP2; EKP4
16.	Discontinuity detection methods by macrostructure material penetration (8.10 No. 33).			2	EKP2; EKP4
17.	Leak testing and leak test (8.10 No. 36).			2	EKP2; EKP4

Reference list identifying the framework of the expanded program of training for seafarers in the specialty department of mechanical engineering at the operational level and management contained in the Regulation of the Minister of Infrastructure and Development of 28th February 2014 . (Pos. 536 est. No. 8) training program for undergraduate studies the degree of practical specialization profile of the Faculty of Mechanical Engineering ESOiOO Gdynia Maritime University .

No	Item according to the program Reg. Min . of Infrastructure and Development, 28 February 2014 .	**No topic**	**No. / Item according to the program of study first-degree part-time and practical level profile - ESOiOO**	**Sem.**	**No topic**
1.	Technology of repairs (8.10)	**2, 20, 21**	22. Metrology and Measurement Systems	III	1-12
2.	Technology of repairs (8.10)	**22**	18. Basics of manufacturing engineering III	III	1
3.	Technology of repairs (8.10)	**23,24,25 4,5,6**	18. Basics of manufacturing engineering III	III	5, 6,7
4.	Technology of repairs (8.10)	**26,27,8,7**	18. Basics of manufacturing engineering III	III	10,11,12
5.	Technology of repairs (8.10)	**33,34,35** (3 godz)	17. Ship Materials II	II	10,17

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1		X		X					
EKP2		X		X					
EKP3		X		X					
EKP4		X			X			X	during laboratory classes
EKP5		X			X				
EKP6					X			X	during laboratory classes
EKP7					X			X	during laboratory classes
EKP8		X		X					
EKP9		X		X				X	during laboratory classes

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
I	Student assumed the expected learning outcomes and meets the requirements of the STCW Convention relating to complete the course . Attended lectures (limit - 3 absences) . Lecture : test - test of the lecture.
II	Student assumed the expected learning outcomes . Attended lectures . Lecture: written and oral examination . Laboratories: 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. Evaluation index after successful completion of the two forms of activity with the assessment of the average of the 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 report.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	60	30		10
Reading literature	15			
Preparing for laboratories, project classes		15		30
Preparing for the exam, the pass test				
Drafting documentation of a project/report		10		
Participating in pass tests and exams	3			
Participating in consultation hours		5		

Total number of hours	98	60		
Number of ECTS points	**4**	**3**		
Summary number of ECTS points for the course	**7**			
Student's workload connected with practical classes	30+10+15+30+10+5=100 h – 4 ECTS			
Student's workload during the classes involving direct participation of academic teachers	60+30+3+5=98 h – 3 ECTS			

Literature:

Primary literature
1. Wrotkowski J. Paszkowski B., Wojdak J., " Repair of machinery. Disassembly , repair parts , installation , WNT, Warszawa 1987 . 2. Piaseczny L., "Technology repair of marine diesel engines ' , Publisher . Marine , Gdańsk 1992 . 3. A. Kowalski , Zaczek Z., "Technology overhaul engine room '' Publisher Sea , Gdańsk 1973 . 4. Klimpel A., " Welding and thermal spraying . Technology '' , WNT Warszawa 2000 . 5. Dylicki M., " The technology of hydraulic equipment repair ship '' Publisher Sea , Gdańsk 1981 . Raunmiagi Z., "Repair of selected marine machine elements using the machining of ' Publishing House Maritime University of Szczecin , Szczecin , 2010.
Secondary literature
1. J. Jezierski , "Technology piston diesel engines ' WNT Warszawa 1999 . 2. Łukomski Z., " The technology of combustion engines and marine railways ' WKiŁ 3. Warszawa 1986 . 4. Piaseczny L., "Technology of polymers in repairs of ships ' Publishing House Gdańsk , Gdańsk , 2002. 5. Klimpel A., " Welding and cutting of metals. Technologies ' WNT Warszawa 1999 . 6. Wajand I, " Damage to the internal combustion engine traction ' WNT Warszawa 1969 . 7. Bocheński C. , T. Janiszewski , " Diagnosis of diesel engines ' WKiŁ , Warsaw 1996 .

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Jan Rosłanowski Ph.D.Ch.(Eng.)	*KMOiTR*
2. The other people conducting the course:	
Włodzimierz Kończewicz Master of Science	*KMOiTR*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated:30.12.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	25	Course :	**Naval Architecture & Ship Construction**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
V	3	2	1				30	15		
VII	3	2					30			
Total number during the studies:							**75**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Command of the material covered by the earlier courses in applied mechanics, strength of materials and fluid mechanics.

Course objectives

1.	The goal of the course is to teach the basics of naval architecture and ship construction necessary for safe operation and maintenance of ship's devices and equipment at the managing level, in compliance with the regulation of the Ministry of Infrastructure of the Republic of Poland of July 13th, 2005 on training and examination requirements with regard to professional qualifications of mariners.
2.	The program contained hereby is compatible with the extended framework training program at the operational and managing level in the engineering department as specified in Appendix 8 (regulation of the Ministry of Infrastructure and Development of the Republic of Poland of February 28th, 2014, item 536)

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Determine the quantities characterizing geometry of ship's hull	K_U22
EKP2	Describe concepts and explain principles of ship's floatation and stability	K_U22
EKP3	Describe structural details typical of particular ship types	K_U22
EKP4	Explain principles governing the strength of ship's hull	K_U15, K_U22
EKP5	Explain the purpose and role of the principal structural members of ship's hull	K_U15, K_U22
EKP6	Use the Trim&Stability Book at the elementary level	K_U22
EKP7	Describe procedures undertaken in case if partial loss of floatation	K_W10, K_K09

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester V

No	Content	Number of aching	

		L	C	Lab/P	Reference to EKP of the
1.	Geometry of ship's hull: **(8.3.p.2)** a) main dimensions, b) body lines, c) ratios of main dimensions, hull coefficients d) freeboard and load lines.	4			EKP1
2.	Centers of gravity and buoyancy: **(8.3.p.10)** a) group weights and weight shift, b) center's of buoyancy elevation over baseline, c) location of the center of buoyancy with respect to the center of gravity, d) ship's equilibrium.	4	4		EKP2
3.	Transverse stability: **(8.3.p.12)** a) transverse metacentric point, b) metacentric radius, c) metacentric height.	4	3		EKP2
4.	Longitudinal stability: **(8.3.p.13)** a) longitudinal metacentric point, b) longitudinal metacentric radius, c) longitudinal metacentric height, d) trim, e) change of draft resulting from change of trim.	4			EKP2
5.	Dynamical stability: **(8.3.p.15)** a) the angle of dynamical heel, b) stability standards, c) free surface effect on stability.	4			EKP2
6.	Flooding. **(8.3.p.11)**	4			EKP2
7.	Ship types and their subdivision: **(8.3.p.1)** a) bulk carriers, b) general cargo, c) container ships, d) tankers, e) LNG and LPG carriers, f) ro-ro, g) ferries, h) passenger ships, i) special ships.	6			EKP3 EKP5
8.	Using Trim&Stability Book. **(8.3.p.23)**		5		EKP6
9.	Tank sounding. **(8.3.p.17)**		2		EKP6
10.	Hull, propeller and Kingston valves surveys **(8.3.p.20)**		1		

Semester VII

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Strength of ship's hull: **(8.3.p.18)** a) local and longitudinal strength, b) weight, buoyancy and load curves, c) bending of a hull, shear forces, bending moments, twisting of a hull.	4			EKP4
2.	Ship's hull structure: **(8.3.p.6)** a) blueprints,	7			EKP3 EKP4

	b) scantlings, c) joints, d) double 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.				EKP5
3.	Grounding and docking stability: **(8.3.p.14)**.	6			EKP2
4.	Ballasting – purpose and effects. **(8.3.p.16)**	4			EKP2
5.	Typical hull damage and its assessment **(8.3.p.21)**	3			EKP7
6.	Resistance **(8.3.p.3)** a) components of the underwater resistance (frictional, wave, eddy-making), aerodynamic resistance, b) resistance curve; evolution of resistance while in service, assessment.	4			EKP1
7.	Powering a ship. **(8.3.p.4)**	1			EKP1
8.	Muster drills. **(8.3.p.22)**	1			EKP7

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1	**X**								
EKP2	**X**								
EKP3	**X**								
EKP4	**X**								
EKP5	**X**								
EKP6								**X** (class test)	
EKP7	**X**								

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
V	When a student achieved the educational effects assumed and fulfills the requirements of the STCW Convention. Presence at classes is compulsory, though three missed classes are admissible. Lectures and classwork: credited based on the results of a final test.
VII	As above.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	75			
Reading literature	20			
Preparing for laboratories, project classes				
Preparing for the exam, the pass test	20			
Drafting documentation of a project/report				
Participating in pass tests and exams	3			
Participating in consultation hours	3			
Total number of hours	121			
Number of ECTS points	**6**			
Summary number of ECTS points for the course	**6**			
Student's workload connected with practical classes				
Student's workload during the classes involving direct participation of academic teachers	75+3+3=81 h. - 3 ECTS			

Literature:

Primary literature
[1] C. Bryan Barrass and D.R. Derrett. Ship stability for masters and mates. Butterworth-Heinemann, sixth edition, 2006. *[2] D. J. Eyres. Ship construction. Butterworth-Heinemann, Oxford, 2001.* *[3] William I. Milwee. Modern marine salvage. Cornell Maritime Press, 1996.* *[4] Eric Tupper. Introduction to naval architecture. Butterworth-Heinemann, Oxford, 2000.*
Secondary literature
[1] B. Baxter. Teach yourself naval architecture. The English Universities Press Ltd., London, 1959. *[2] W. Muckle. Naval architecture for marine engineers. Butterworth & Co, London, 1975.* *[3] K. J. Rawson and E. C. Tupper. Basic Ship Theory. Butterworth-Heinemann, 2001.*

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Dr hab. inż. Marek Szwabowicz, prof. nadzw. AM	*Katedra Postaw Techniki*
2. The other people conducting the course:	

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	26	Course :	**Marine Power Plants**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
IV	2	2					30			
V	2	1	1				15	15		
VI				z					x	
VII E	3	1				1	15			10
Total number during the studies:							**85**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and abilities based on the secondary school

Course objectives

1.	The aim of the subject is the basic knowledge and skills relating to ships power plant, indispensable to operate the necessary equipment in a safe manner
2.	The program follows the advanced training program for operational and management level in engineering department in mechanical specialization

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Explain the function, construction and working principle of the engine room and ships general purpose systems, power plant and main propulsion systems of the merchant ships	K_W03; K_W04; KU_13; KU_15; KU_22
EKP2	To know the types of the fluids in the ships system, power and main propulsion plants, the present and set point values of the parameters	K_W03; K_W04; K_W09
EKP3	Understand the manuals and instructions including English language regarding the operation of the ships systems, power and main propulsion plants	K_U01; K_U05; KU_22
EKP4	Describe the methods to increase the ships plant efficiency and reduction of the operational expenses, knows the basics regarding the efficient power plant operation	K_W03; K_W04; K_U15
EKP5	List and characterize the rules of the safe operation and control the correct operation of the ships system, power and main propulsion plant	K_W04; KU_11; KU_13; K_U15
EKP6	Characterize the work of the propulsion engineering plants in the steady state at sea as well as transient state: maneuverings, running up, slowing down	K_W04; K_U13; KU_22

EKP7	Describe the correct behave and procedures during the watch keeping regarding the aspects of finding out abnormalities and its occurrence, e.g. in case of fire, major fuel oil leaks etc.	K_W04; K_U11; K_U13; K_U15

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester IV

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	General description of the ships propulsion: a) ships propulsion definition, classification and types, the design of the engine room, ships propulsion and power plant, b) ship propulsion thermal balance, power systems, power plant efficiency and the methods for its improvement, total efficiency of the main propulsion and its components. (8.5.1)	6	1		EKP1
2.	Construction and operation of the basic ship's and engine room systems: a) cooling water systems for engines: - jacket water cooling, jacket water cooling systems for low and medium speed engines, engine heating, deaeration of the system, influence of the fresh water generator on the operation of the system, - the parameters of the system and the methods of control, - the jacket water cooling system with a pressurized header tank, - water treatment, cleaning the system, b) pistons fresh water cooling systems: - advantages and disadvantages of pistons fresh water cooling fluid, - basic diagram of the system, its basic elements and operation, c) sea water cooling system: - general description, - the series, parallel and mixing connections of the cooled units, - the operational system parameters, its control, prevention against corrosion, erosion and the sedimentation, d) central water cooling systems: - advantages and disadvantages of the central water cooling systems, - basic systems of the central systems, - optimization methods, operational variables and control of the system, e) fuel oil systems, standard and engine makers requirements regarding marine fuels and fuel properties influence on the construction and operation of the				EKP1; EKP2; EKP3;EKP4

	system, f) fuel oil transfer system: - basic objectives, bunkering, storage and debunkering, - transfer and bunkering rules, - overflow safeties, - storage, discharging and utilization fuel sludge, g) fuel oil treatment system: - factors influencing correct fuel oil treatment in the separators and filters, its influence on the construction and operation of the treatment system, - operation of the basic system elements: settling tanks, centrifuges and filters, - implementation of atypical fuel cleaning and treatment methods: decanters, homogenizes, not full throughput filters, fuel oil additives, - contemporary treatment system, h) engines fuel oil supply systems: - atmospheric system – conventional and pressurized for the distilled and residue fuels, - application of the pressure regulation system, construction and operation chosen system elements, - the objective of the mixing tank and aeration, - heating up and control of the fuel oil viscosity before the engine, - fuel oil filtration in the supply system, - one type fuel systems, i) transfer and bunkering lubrication oil systems, j) engine lubrication oil treatment systems: - operation of centrifuges and filters, - selection of the separator optimal through put and multiplication factor of the forced lubrication oil during continuous and periodical separation, - not full through put filtration, - contemporary treatment forced lubrication oil system, k) piston engine forced lubrication oil systems, - system components and its construction, operation; tanks and pumps, coolers, filters and valves, - the principles to deal with the lubrication oil contamination, k) cylinder oil systems, l) forced lubrication oil system: transmission gear, turbochargers, propeller and intermediate shafts, m) Auxiliary steam-drain systems: - basic diagram of the steam system and its construction, - conventional steam-water system (saturated steam), saturated steam receivers, ship's steam				

	balance, factors influence the exhaust gas boiler capacity, the capacity control, - configuration of oil fired boiler with exhaust gas boiler, - basic diagram of the drain/steam return system, - system components: drain valves, drain coolers, condenser, - basic diagram of the feed water system, - components: atmospheric drain tank, distilled fresh water tanks, feed water pumps, water control and treatment, feed water control, - operational principles steam-drain system, system activation, control of the system in operational mode, shut down the system, maintenance and cleaning, n) thermal loss energy recovery systems: - factors influencing the application of the energy loss recovery systems, - source of the energy loss and possibilities of its application, - influence of the application of the system on the possibility to cover the engine room energy demand, - basic diagrams of the single and double pressure steam-water systems, - integrated systems, systems' working parameters, heating up of feed water and superheating of the steam, o) engines and boilers exhaust gas systems: - 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, p) 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. (8.5.2)				

Semester V (Marine Power Plants II)

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Ships general purpose systems: a. 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, b. 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, c. fire fighting systems: - water type (hydrant, sprinkler and water mist), - foam (heavy, medium and light), - gas (CO_2, nitrogen, inert gas), - dry powder, - steam, d. 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,	9	4		EKP1; EKP2; EKP3;EKP4

	e. effluent water systems: - classification of the effluent water, - the collecting conditions and its dumping, - effluent water diagrams. (8.5.2)				
2.	Watch keeping safety measures and procedures once either fire hazard has been detected or other abnormalities particularly in the fuel oil system: a. engine room round: - checking the units and systems working parameters, liquid levels (watching the sensors and organolepticly), - checking the leaktightness of the units and pipes, b. procedures once either fire hazard or other abnormalities are found: - reason for occurrence and hazard define, including fire, failure and systems, techniques to define the level of the hazard (regarding the speed of response and taking action), - emergency procedures, - unpredictable action, paying attention to personal safety and watchkeeping person responsibility for the ship and its crew (alarm activation before action is taken).	2			EKP5; EKP7
3.	Power plant: a. power systems efficiency, b. power required to ships propulsion, c. electric and thermal power demand – balance calculations, total energy efficiency of the power plant and the methods for improvement.	2			EKP1; EKP4
4.	Waste heat recovery, review of the used contemporary systems and the principle of its operation.	2			EKP1; EKP4
5.	Storage prediction of indispensable fuel and lubricating oil, water and other fluids used in the engine room as well as on board the ship. (8.5.6)		1		EKP2; EKP3; EKP4; EKP5; EKP6
6.	Planning of the maintenance and verifications of all engines and ships units. (8.5.7)		1		
7.	***Elaborate the current ship operation documentation: reports, fuel oil reports and settlements, service and overhaul specification. (8.5.8)***		2		EKP2; EKP3; EKP4; EKP5; EKP6

Semester VI (Sea phase)

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Time spend on board the ship according to the syllabus written in the Training Record Book. The tasks done during the sea phase on board the ship are confirmed and signed by the Chief engineer.			Pass	EKP1; EKP2; EKP3; EKP4; EKP5; EKP6; EKP7
2.	Familiarization with the engine room operation in different ship's conditions/modes.			Pass	EKP1; EKP2; EKP3; EKP4;

					EKP5; EKP6; EKP7
3.	Trace and make diagrams of different systems: compressed air, fuel oil supply, main engine lubricating oil, sea water, main engine piston and jacket water cooling, auxiliary engines cooling and lubricating oil, fuel oil transfer, bilge water, ballast water, domestic water, steam and drain, fire fighting and sketch of the ship's main propulsion system.				
4.	Make propeller law curves in relation to the engine speed and ship's speed in different trading conditions.				

Semester VII (Marine Power Plants III)

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Marine steam turbine power plant systems: - steam-drain system, - vacuum system, - lubricating oil system, - fuel oil system, - cooling water system.	3			EKP1; EKP2; EKP3
2.	Operational factors influencing the fuel oil consumption in the engine room: a) marine power plant, b) ship. (8.5.5)	1			EKP2; EKP3; EKP4; EKP5; EKP6
3.	Rules of the economic operation of the marine power plant.	1			EKP4; EKP5
4.	Emergency operation of the marine power plant.			1	EKP5; EKP7
5.	Sea and weather conditions influence on the ability and activity of the person. (8.5.10)	1			EKP7
6.	Supervision and operation of the propulsion combustion piston engines in working conditions: a) propulsion diesel engines' characteristics: rotational constant fuel setting, propeller universal, load, b) methodology of the operational supervision, c) static and dynamic engine work – basic features, d) variables and engine operational indicator: - parameters values of the engine work evaluation methods, - engines' performance – measurement methods and its application into the engines' operation, - determining the engine operational indicators; mean effective and indicated pressure, indicated and brake power, specific fuel oil consumption, specific cylinder oil consumption, exhaust gas emission, e) main engines load diagram, f) the minimum and maximum operational limitations of the engines loads, g) operational factors influencing the limitations, permissible overload of main engines. (8.5.4)	2			EKP1; EKP6

7.	Safe operation of diesel generators: a) types (main propulsion, auxiliary, emergency) and general construction of diesel generators, b) drive types of generators and alternators, c) general principles of diesel generators cooperation, d) start, connection and disconnection to/from bus bar, stop, e) diesel generators monitoring and control systems, f) diesel generators safe operation (daily operation and maintenance), prevention maintenance reducing defects and action once the either failure or abnormality happened in the working diesel generator.	2			EKP5; EKP7
8.	Construction of the marine facilities and oceangoing ships for the sake of control systems of the correct work and early detection systems abnormalities and failures: a) procedures for the safe operation of the main propulsion equipment: - assessment of the technical conditions before start, - assessment criteria of safe operation level, - taking decision to disable the equipment from operation, b) auxiliary equipment safe operation procedures: - - assessment of the technical conditions before start, - assessment criteria of safe operation level, - taking decision to disable the equipment, c) the influence of disabled equipment on the ship's operation and hazard of the ship's safety, general construction and basic functions of the control systems of the correct work and early detection systems abnormalities and failures.	2		1	EKP5; EKP7
9.	Contemporary marine power plants – evolution tendency.	1			EKP1
10.	State of the art designs of the propulsion-power plants with shaft generators and their operation.	1			EKP1; EKP4
11.	New designs of the marine power plants systems.	1			EKP1
12.	Presentation of the seminary work based on the sea phase in the semester VI.			8	EKP5; EKP7

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1		**X**		**X**					
EKP2		**X**		**X**					
EKP3		**X**		**X**					
EKP4		**X**		**X**					
EKP5					**X**			**X**	

EKP6					**X**			**X**	
EKP7					**X**			**X**	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
IV	Student has got the predicted educational effects and meets the STCW conditions to pass the subject. Participated in the lectures (maximum - 3 absences). Lecture: to get a positive grade, student must pass the test.
V	Student has got the predicted educational effects and meets the STCW conditions to pass the subject. Participated in the lectures (maximum - 3 absences). Lecture: to get a positive grade, student must pass the test.
VI	Student has got the predicted educational effects. Made and passed all the seminars, according to the syllabus. The final grade – based on the seminar activity and prepared presentation.
VII	Student has got the predicted educational effects and meets the STCW conditions to pass the subject. Participated in the lectures (maximum - 3 absences). Lecture: written and oral exam.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	**Estimated number of hours devoted to the activity**			
	L, C	Lab	P	S
Contact hours	75			10
Reading literature	20			10
Preparing for laboratories, project classes				
Preparing for the exam, the pass test	25			
Drafting documentation of a project/report				30
Participating in pass tests and exams	7			3
Participating in consultation hours	7			3
Total number of hours	134			56
Number of ECTS points	**5**			**2**
Summary number of ECTS points for the course	**7**			
Student's workload connected with practical classes	10+10+30+3=53h – 2ECTS			
Student's workload during the classes involving direct participation of academic teachers	75+10+7+3+7+3=105h – 4ECTS			

Literature:

Primary literature

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

Secondary literature

1. Michalski R.: SIŁOWNIE OKRETOWE, 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.

Persons conducting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Ph.D. Eng. Mariusz Giernalczyk, Prof. AM, Chief Engineer	*SPP*
2. The other people conducting the course:	
Prof. Ph.D. D.Sc. Eng. Adam Charchalis	*MM*
Ph.D. D.Sc. Eng. Stanisław Polanowski, Prof AM	*SPP*
Ph.D. Eng. Jacek Krzyżanowski	*SPP*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.05.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	17	Course :	**Technical Diagnostics**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
V	1	0.5		0.5			8		7	
Total number during the studies:							**15**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

4.	Knowledge and skills in the secondary education

Course objectives

5.	The aim of the course is to provide basic knowledge and skills in the field of technical diagnostics, necessary for evaluation of the technical condition of engine room equipment

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	characterize the essence of technical diagnostics in engine room operation	K_W02; K_W08
EKP2	discuss the physical and chemical processes as sources of diagnostic information	K_W07; K_K02
EKP3	define the technical condition of the engine base of the noise and vibration measurements, endoscopy, etc.	K_W02; K_W03; K_W05
EKP4	assess the condition of the engine on the basis of modern diagnostic systems	K_U08, K_U09, K_U12, K_U13, K_U18

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester I

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Basic concepts of technical diagnostics (the structure of the object, structure parameters, operating parameters, diagnostic parameters, performance status, disability, fitness and unfitness). **(8.5. p. 11)**	2			EKP1
2.	Diagnostic models (analytical, functional, topological. Diagnostic methods (parametric, vibroacoustic, pollution directive). **(8.5. P. 12)**	2			EKP2
3.	Diagnostyka kotłów i turbin parowych. Diagnostyka pomp i urządzeń hydraulicznych. **(8.5. P. 14,15)**	2			EKP2

4.	Used for diagnostic systems - overview. **(8.5. P. 16)**	2			EKP3
5.	Technical diagnostics of machines and equipment of ship: a) vibroacoustic diagnosis of rotating machinery and piston, c) the use of endoscopy in shipbuilding. d) ultrasonic methods for quality control of materials and material thickness measurements e) studies of mechanical impurities in oil f) studies using acoustic emission			7	EKP3, EKP4

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1	**X**								
EKP2	**X**								
EKP3	**X**				**X**			**X** (during laboratory classes)	
EKP4					**X**			**X** (during laboratory classes)	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
II	Student achieved the expected learning outcomes. Attended lectures. 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, the work in the laboratory, with the laboratory reports. Evaluation index after successful completion of the two forms of activity with the assessment of the average of the grades received lecture and laboratory.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	8	7		
Reading literature	5			
Preparing for laboratories, project classes		6		
Preparing for the exam, the pass test	5			
Drafting documentation of a project/report				
Participating in pass tests and exams				
Participating in consultation hours		1		
Total number of hours				
Number of ECTS points				

Summary number of ECTS points for the course	**1**
Student's workload connected with practical classes	14
Student's workload during the classes involving direct participation of academic teachers	16

Literature:

Primary literature
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.
Secondary literature
1. Cempel Cz.: Podstawy wibroakustycznej diagnostyki maszyn. WNT, Warszawa 1982.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Prof. dr hab. inż. Adam Charchalis	*KSO*
2. The other people conducting the course:	
Dr hab. inż. S. Polanowski, prof. nadzw. AMG	*KSO*
Dr inż. S. Kluj	*KSO*
Dr inż. R. Pawletko	*KSO*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 22.12.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	28	Course :	**Ship Safety Management**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
VII	1					1				10
VIIIE	3	1.5	1				20	10		
Total number during the studies:							**40**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills in the range of secondary school

Course objectives

1.	The course objective is the basic knowledge and skills in the range of ship safety management, essential to safe maintenance of ship technical equipment
2.	The course programme is in conformity with the extended training course on operational and management level in engineering department in mechanical specialty, annex No. 8 (A Directive of Ministry of Infrastructure and Development, 28th February, 2014, pos.536)

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	utilize knowledge concerning to ship safety management, organization and management of ship power plant reserves	K_W12
EKP2	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. Possessing skills: determine requirements for machinery crew in STCW Convention; managing the team; describe the rules of ship technical supervision; enumerate the most important vessel certificates; perform procedures of preparation, stopping and supervision of attended and unattended power plant in deferent operation ship states;	K_W09 K_U07 K_W15

	using onshore and vessel book of safety management (SMS system); interpret resolutions of MARPOL Convention; interpret resolutions of SOLAS Convention.	
EKP3	work in a group accepting different roles in; understand co-operation rules; complete check lists and work permits required ISM and ISPS codes; fulfillment the Risk Assessment form; making activities to minimize the risk in emergency situations	K_K05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester VII

No	Content	Number of aching			Reference to EKP of the course
		L	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	EKP1
2.	Alarm signals. Crew duties during alarms. Arrangement of handy rescue and fire-fighting equipment, equipment of personal protection and first medical aid.			1	EKP1
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	EKP1
4.	Watch procedures, taking and passing the duties. Procedures of maintenance and monitoring of power plant ability for periodically unattended operation.			1	EKP1
5.	Systems and marine environment protection equipment arrangement and destination. Oil Record Book. Ship Oil Pollution Emergency Plan.			1	EKP1
6.	Fuel bunkering procedure (check lists: before, during and after fuel bunkering).			2	EKP1
7.	Procedures of maintenance and monitoring of operation efficiency of fire-fighting equipment.			1	EKP1

Semester VIII

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Crew competence partition required STCW Convention. Instruction and training onboard. (8.15. p.1).	2			EKP1
2.	Crew organizing structure, structure of machinery department, machinery watch duties, unattended power plant operation (8.15. p.2).	2	2		EKP1
3.	Team management principles (8.15. p.3).		4		EKP1
4.	Acts, conventions and other certificates concerning to ship safe management (8.15. p.4).	2			EKP3
5.	ISM code onboard (8.15. p.5).	2			EKP1
6.	ISPS code onboard (8.15. p.6).	2			EKP1

7.	Structure of ship technical supervision onboard (8.15. p.7).	2			EKP1
8.	Organization principles and navigation safety supervision and safety of live at sea in emergency situations (8.15. p.8).	2			EKP1
9.	Risk analysis in ship technical operation (8.15. p.9).	2	2		EKP2
10.	Ship emergency plans (8.15. p.10).	2			EKP2
11.	Ship and crew ability to safe sea shipping: a) ship certificates; b) requirements of PSC (Port State Control), FSC (Flag State Control), OCIMF , USCG (US Coast Guard); c) preparation of ship for inspection (8.15. p.11).	2	2		EKP3

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1			**X**						
EKP2			**X**						
EKP3							**X**	**X**	

Criteria for crediting the course:

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

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	30			10
Reading literature	20			
Preparing for laboratories, project classes				
Preparing for the exam, the pass test	10			
Drafting documentation of a project/report				20
Participating in pass tests and exams	3			
Participating in consultation hours				
Total number of hours	63			30
Number of ECTS points	**3**			**1**
Summary number of ECTS points for the course	**4**			
Student's workload connected with practical classes	20			
Student's workload during the classes involving direct participation of academic teachers	40			

Literature:

Primary literature
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.
Secondary literature
1. Check lists. 2. Ship technical documentation.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Jerzy Herdzik	*Marine Power Plant Department*
2. The other people conducting the course:	
Andrzej Młynarczak	*Marine Power Plant Department*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P – project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 20.12.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	29	Course :	**Marine Piston Engines**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
IV	2	2					30			
V	2	1		1			15		15	
VII E	3	1,3		1		1	20		15	10
Total number during the studies:							**105**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Basic knowledge of subjects such as materials science, technical thermodynamics, mechanics, strength of materials and base machine design, automation.

Course objectives

1.	The aim of the course is to provide knowledge and skills in the design and operation of marine piston engines necessary for the safe operation.
2.	The program is consistent with the framework extended training program at the operational and management level in the Department of Mechanical Engineering with Annex 8 (Regulation of the Minister of Infrastructure and Development of 28 February 2014. Pos. 536)

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	describe the structure and function of the marine piston engines; characterize processes: gas exchange, compression, injection and combustion considering their impact on the engine operating parameters, including the composition of the exhaust gas (environmental impact), the mechanics of the piston-crank, a control circuit, thermal load, to evaluate the technical condition of the engine.	K_W02; K_W03; K_U01; K_U13; K_K02
EKP2	analyze the theoretical and actual cycles of piston engines; calculate basic energy and economic indicators of engine operation	K_W01; K_W08; K_U17
EKP3	discuss the design, construction and materials of the most important structural elements of marine piston engine operating systems	K_W03; K_W05; K_W09 ; K_U01; K_U22
EKP4	prepare for operation, run, supervise the work and stop the engine; perform basic activities within the scope of the static adjustment of marine piston engines	K_W04; K_U01, K_U16; K_U17; K_U19; K_U20; K_U22
EKP5	measure the basic parameters of the ship engine, analyze changes in their values and draw the diagnostic conclusions.	K_W04; K_W08; K_U08; K_U09; K_U13; K_U17

EKP6	record indicator diagrams with a mechanical indicator, operate electronic indicators, analyze changes in the diagrams and draw diagnostic conclusions	K_W04; K_W08; K_U08; K_U09; K_U13; K_U17
EKP7	use literature sources, databases, other sources of information; interpret information, formulate opinions and conclusions	K_U01 K_U05
EKP8	work in a group assuming different roles in it, understand the principles of a cooperation; be able to direct a small team taking responsibility for the results of its work	K_K05; K_K07

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester IV

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Introduction: (tab. 8.4., Item 1) a) Types of the internal combustion engines, b) The principle of operation of the internal combustion piston engine: two-stroke and four-stroke,				EKP1
2.	The theory of the work process: (tab. 8.4., Item 2) a) standard cycles (theoretical): - Types of the standard cycles - Indicators of the comparator circuit b) actual cycles: - Indicator diagram analysis - Gas exchange (process, performance, engine timing, impact of a speed and load), - Compression (process, parameters) - Creating a combustible mixture (fuel atomization, vaporization and mixing with air), - Combustion (ignition delay, phases of a combustion, heat release rate, maximum combustion pressure), - Expansion (process, parameters) - Exhaust (process, phases, parameters).				EKP1,EKP2, EKP5, EKP8
3.	Gas exchange process (tab. 8.4., Item 3) a) the gas exchange in 4-stroke engines, b) the gas exchange in 2-stroke engines, c) gas exchange diagnostics.				EKP2
4.	a) Supercharging thermodynamics, b) The purpose and methods of supercharging, c) The use of exhaust gas energy: impulse and constant pressure system, d) The parameters of the scavenge air, cooling, condensation of a water, e) The impact of operational factors on supercharged system operating parameters, f) Supercharging process diagnostics.				EKP1
5.	Creation, ignition and combustion of the air-fuel mixture (Tab. 8.4., Item 5) a) The thermodynamic basis for the combustion process, b) The process of fuel injection, optimization of a fuel atomization				EKP1, EKP2,EKP5, EKP8

	process, c) The creation of the air-fuel mixture, macro- and microstructure of the stream, the parameters of fuel atomization, d) The combustion process, e) The impact of a fuel injection on a combustion efficiency of the engine, f) The impact of a fuel injection and combustion on the exhaust gas composition, toxic exhaust components, g) The impact of fuel parameters on the process of the air-fuel mixing and combustion, h) The effect of operating parameters on the process of the air-fuel mixing and combustion, i) The diagnostics of the injection and combustion process.				
6.	Efficiency indicators of the piston engine operation: (tab. 8.4., Item 6) a) Definitions: torque, engine speed, mean indicated and effective pressure, indicated and effective power, the indicated, mechanical and general efficiency, specific fuel consumption, b) The method of measuring efficiency indicators of an engine on board, c) The heat balance and Sankey diagram of the marine piston engine.				EKP5; EKP6
7.	The characteristics of the marine piston engines (Tab. 8.4., Item 7) a) characteristics as a function of a speed, b) characteristics as a function of a load c) governor characteristics, d) special characteristics, e) determining the characteristics of the engines.				EKP1

Semester V (Marine piston engines II)

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Design, construction and materials of the engine block basic elements: **(tab. 8.4., item 8)** a. bed plate, b. frame box, c. cylinder frame, d. cylinder liner, e. cylinder head, f. stay bolts, g. holding down bolts.	2			EKP3
2.	Design, construction and materials of the engine block basic elements: **(tab. 8.4., item 9)** a. pistons, b. gudgeon pin, c. piston rings, d. piston rod, e. crosshead, connecting rod, f. crankshaft, g. crankshaft bearings.	3			EKP3
3.	Construction and working principle of the tappet valves camshaft mechanisms: **(tab. 8.4., item.10)**	2			EKP3

	a) elements of the timing gear system: cam, tappet roller, tappet, rocker arm, tappet valve with spring, b) tappet valve spring characteristic, c) exhaust valve hydraulic oil driving system, d) tappet clearance and its regulation.				
4.	Control system of the combustion piston engine revolutions: **(tab. 8.4., item.11)** a) purpose of the system application, b) types, working principle and construction of the RPM governors, c) working principle of the RPM control system in the real conditions.	2			EKP3
5.	Fuel oil supply system **(tab.8.4., item 12)** a. the marine fuel oil properties requirements at the engine (viscosity and quality), b. construction of the power drive system and principle of the fuel dosage control, c. construction and principle of the fuel injection pumps, d. fuel injection valves construction, e. accumulation system construction and the principle of the fuel dosage control principle, f. fuel oil high pressure connections, g. fuel oil dosage principle for the dual fuel engines.	4			EKP3, EKP4
6.	Engine cooling water systems: **(tab. 8.4., item 13)** a. cooling objective and cooling liquid aims, b. cooling liquids parameters.	1			EKP1, EKP4
7.	***Marine diesel engines diagnostics.*** *(tab. 8.5., pkt.13)* Mechanical and thermal load evaluation piston-cylinder unit, combustion chamber tightness evaluation, piston and cylinder liner interaction evaluation, cylinder liner wear evaluation, piston rings condition evaluation. Charge air system diagnostics, air filter contamination evaluation, air charger condition evaluation, air cooler condition evaluation, turbocharger condition evaluation. Fuel oil injection process diagnostic, combustion process evaluation. Bearings diagnostic, bearing temperature measurement and journal trajectory.	1			EKP1
8.	Laboratory introduction, industrial safety regulations.			1/-	EKP8
9.	Tracing and making diagrams of the systems servicing the engine.			6/-	
10.	Internal combustion piston engine basic operational routines: **(tab. 8.4., item. 23)** a. systems servicing the engine and engine preparations for start, b. start the engine, c. adjustment of the engine working indicators, d. engine work supervision, values readings and its interpretation, e. stop the engine. f. Internal combustion piston engine RPM governors: **(tab. 8.4., item.24)**			4/-	EKP4

	a) main engine and diesel generators governors settings, b) governors settings choice: makers and operators, governors repairs.				
11.	Fuel oil injectors technical conditions evaluation: **(tab. 8.4., item. 26)** a. visual evaluation, b. the evaluation based on the fuel valve tests.			4/-	EKP4

Semester VII (Marine piston engines III)

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Engine lubricating oil systems: **(tab. 8.4., item 14)** a) lubricating oil goals in the engine, b) engine lubricating oil system.	2			EKP1, EKP4
2.	Charging air system: **(tab. 8.4., item 15)** i. examples of systems construction and its components, ii. turbochargers types and construction, iii. turbocharger and the charged air system interaction, iv. turbocharger surging phenomenon, methods to prevent and eliminate surging reasons, v. engine work with cut off turbocharger.	4			EKP1, EKP4
3.	Prevention and emergency systems: **(tab. 8.4., item 16)** i. oil mist, ii. under piston space steam system.	1			EKP1, EKP4
4.	Crank assembly: **(tab. 8.4., item 17)** i. equation of motion of the crank assembly components, ii. inertia forces and its balancing principle, iii. examples of balancing forces and the inertia torques in the multicylinder engines, iv. unsteady work of the engine, v. reasons of the engine unbalancing, vi. construction and working principle of the fly wheel, vii. crankshaft torsional vibrations – safety margin of the resonance specific example of the torsional vibrations, viii. torsional vibrations dampers – construction, working principle and the operational recommendations.	5			EKP1, EKP5
5.	Starting system and control of the engine work: **(tab. 8.4., item 18)** i. the creating principle of the driving torque during the pneumatic start, work of the components in the starting air system, working principle of the air distributor and the starting air valve, ii. the changing principle of the crankshaft during the starting process in both directions of the engine revolutions (reversible), iii. safeties in the engine control system,	2			EKP4

	iv. control system work during the engine maneuverings.					
6.	Engine thermal load. **(tab. 8.4., item 19)**	2				EKP1
7.	Operational aspects of the diesel engine: **(tab. 8.4., item 20)** i. prepare engine for maneuverings, ii. engine surveillance during its work, iii. surveillance during maneuverings, iv. stop the engine.	2				EKP4
8.	Specific operational aspects of the marine internal combustion piston engine: **(tab. 8.4., item 21)** i. piston-crank assembly, ii. fuel oil injection system, iii. lubricating oil system, iv. cylinder oil system, v. starting air and reversible starting air system, vi. charging air system.	2				EKP3, EKP7, EKP8
9.	Emergency working conditions of the marine engines **(tab. 8.4., item 22)**	2				EKP4, EKP5, EKP7
10.	Characteristics in load function, investigation of the influence of the chosen abnormalities on the engine performance. Measurement or calculation of the basic engine work indicators: **(tab. 8.4., item 27)** i. compression and combustion process in crank angle degree relation, ii. compression pressure, iii. maximum compression pressure, iv. mean and effective indicated pressure, v. indicated and brake horse power, vi. output torque on the propeller shaft, vii. fuel oil consumption, viii. SFOC, ix. Total efficiency.				6/-	EKP7, EKP8
11.	Fuel oil injection pumps settings adjustment **(tab. 8.4., item 25)**				4/-	EKP4
12.	Engine performance with mechanical indicator, work indicators calculation.				4/-	EKP6
13.	Final exam				1/-	EKP4, EKP5
14.	Sea phase final work				/10	EKP1, EKP3, EKP6

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1			**X**	**X**			**X (sem)**		
EKP2			**X**	**X**				**X (lab)**	
EKP3			**X**	**X**					
EKP4					**X**			**X (lab)**	

EKP5					**X**			**X (lab)**	
EKP6					**X**			**X (lab)**	
EKP7							**X (sem)**		
EKP8								**X (lab)**	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
IV	Student has got the predicted educational effects and meets the STCW conditions to pass the subject. Participated in the lectures (maximum - 3 absences). Lecture: to get a positive grade, student must pass the test.
V	Student has got the predicted educational effects. Participated in the lectures. Lecture: to get a positive grade, student must pass the test. Laboratories: Made and passed according to the syllabus, all the laboratories with accepted reports. The final grade: mean grade based on the theoretical knowledge, laboratory activity, accepted reports. Grade in the student's book: once both forms of classes are positively passed with a mean grade based on the lectures and laboratories.
VII	Student has got the predicted educational effects. Participated in the lectures. Lecture: exam. Laboratories: Made and passed according to the syllabus, all the laboratories with accepted reports. Seminary: prepared thematic presentation, positive grade of the presentation. The final grade: mean grade based on the theoretical knowledge, laboratory activity, accepted reports and seminars. Grade in the student's book: once three forms of classes are positively passed with a mean grade based on the lectures, laboratories and seminars.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	**Estimated number of hours devoted to the activity**			
	L, C	Lab	P	S
Contact hours	65	30		10
Reading literature	30			
Preparing for laboratories, project classes		15		10
Preparing for the exam, the pass test	25			
Drafting documentation of a project/report		20		
Participating in pass tests and exams	5			
Participating in consultation hours	5	5		
Total number of hours	130	70		20
Number of ECTS points	**4,5**	**2**		**1,5**
Summary number of ECTS points for the course	**7,0**			
Student's workload connected with practical classes	30+15+20+5 +10=80 – 3 ETCS			

Student's workload during the classes involving direct participation of academic teachers	65+30+10+5+5+10=125 - 4 ETCS

Literature:

Primary literature
1. Piotrowski I., Witkowski K.: Okrętowe silniki spalinowe. TRADEMAR, Gdynia 2003 2. Włodarski J.K., Witkowski K.: Okrętowe silniki spalinowe. Podstawy teoretyczne. Akademia Morska w Gdyni, 2006
Secondary literature
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

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Dr hab. inż. Kazimierz Witkowski	*DSPP*
2. The other people conducting the course:	
Dr inż. Stefan Kluj	DSPP
Dr inż. Wojciech Gałecki	DSPP
Dr hab. inż. Stanisław Polanowski	DSPP
Dr inż. Jerzy Krefft	DSPP
Dr inż. Mirosław Dereszewski	DSPP
Dr inż. Rafał Krakowski	DSPP
Mgr inż. Grzegorz Sikora	DSPP

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 15.06.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	30	Course :	**Marine Boilers**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
IV E	3	2	1				34	15		
VII	1					1				10
Total number during the studies:							**59**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and abilities based on the secondary school

Course objectives

1.	The aim of the subject is to present the knowledge and abilities relating to construction and operation of the marine boilers
2.	The program follows the advanced training program for operational and management level in engineering department in mechanical specialization

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Recognize the marine steam boilers types, describe the boiler construction elements.	K_W03; K_W04
EKP2	Procedure to start up and shut down the boiler, list the operational activities during the watchkeeping	K_W04;K_U11;K_K03
EKP3	Make calculations of the basic boilers processes	K_W03
EKP4	Assess the boiler technical condition, its burner, equipment that controls the boiler work and prepare the schedule for repair work	K_W04;K_W05;K_W07; K_U13;K_U16
EKP5	Work in a team playing different parts, understand the liaison principles and take care regarding the safety	K_W09, K_U21; K_K07;K_K08

K_W03, K_U13; K_K07 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester IV

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Working principle theory of marine boilers: **(8.7.1.)** a) thermodynamic properties of water and steam,	2	2		EKP1 EKP3

	b) thermodynamic processes cycle taking place in the boiler and its depiction in the diagram i-s, T-s, i-p, c) physical chemistry properties of the diathermic oil.				
2.	Working processes taking place in a boiler: **(8.7.2.)** a) combustion: - impact of fuel oil and air parameters and technical conditions of the burner on the combustion process quality, b) heat exchange: - radiation, - convection, - types of fouling and its impact on the heat exchange process, c) aerodynamics: - boiler construction impact on the resistance of the exhaust gas flow, - contaminants impact on the resistance of the exhaust gas flow, - extract fans, d) water circulation in the boiler: - gravity circulation and its disturbance, - forced circulation.	2	10		EKP1 EKP3
3.	Auxiliary marine boilers classification and construction: **(8.7.3.)** a) auxiliary oil fired, b) smoke tube, c) water tube, d) double running, e) composite, f) thermal oil boilers, g) boiler construction review.	3			EKP1 EKP2 EKP5
4.	Basic quantities, parameters and indicators of the contemporary marine auxiliary boilers: **(8.7.4.)** a) specific water capacity, b) furnace thermal load, c) thermal load heat exchange surface, d) pressure range in the boiler, e) temperature range in the boiler, f) boiler accumulation abilities.	2			EKP1 EKP2
5.	Exhaust gas boiler construction and working principle: **(8.7.5.)** a) construction examples of water tube and smoke tube boilers, b) systems servicing the boiler.	2			EKP1 EKP2 EKP5
6.	Boiler thermal balance – efficiency: **(8.7.6.)** a) thermal balance on the steam-water side, b) thermal balance on the fuel oil side, c) methods to estimate the efficiency (direct and indirect), d) operational parameters impact on the boiler efficiency.	1	3		EKP1 EKP2 EKP5
7.	Marine boiler construction elements: **(8.7.7.)** a) water and steam drums, b) main heating surfaces in boilers, c) framing, gastight jacket, insulation, d) drying the steam, e) air and water heaters,	3			EKP1 EKP2 EKP5

	f) steam superheaters.				
8.	Boiler armature and accessories: **(8.7.8)** a) stop, safety, check valves, b) water level gauges, c) soot blowers, d) level controllers, floating type, capacitance sensor, e) pressure switches, temperature switches, thermocouples, manometers, f) boiler exhaust gas side water wash system, g) scum and blow down systems, h) technical regulations.	3			EKP1
9.	Boiler systems: **(8.7.9.)** a) feed water systems (continuously and periodically supplied), b) steam systems, c) scum and blow down systems.	2			EKP1 EKP2 EKP4
10.	Fuel oil supply systems: **(8.7.10)** a) Residual fuel, b) Distilled fuel, c) Sludge.	1			EKP1 EKP2
11.	Boiler burners: **(8.7.11.)** a) pressure jet type burner, b) rotating cup type burner, c) dual fuel type burner, d) steam blast jet type burner, e) air blast jet type burner.	1			EKP1 EKP2 EKP4
12.	Auxiliary and exhaust gas boilers automation **(8.7.12.)**	1			
13.	Marine boilers operation and maintenance: **(8.7.13.)** a) start and line up the boilers, b) boiler operation during their work (water treatment, water level control, daily servicing, blow down of the water level gauges and water level controllers), c) fuel oil, feed water and steam system operation (operation of filter and heaters operation, steam and water traps, atmospheric drain tank, inspection tank, cooling and excessive steam condensers), d) stop and cool down the boiler, e) stop and shut down the burner, f) lowering the pressure, scum and blow down the boiler, g) capacity control of the exhaust gas boiler, h) interaction of the exhaust gas and oil fired boiler.	3			EKP1 EKP2 EKP5
14.	Boiler safety systems, marine boilers safe operation and emergency procedures. **(8.7.14.)**	1			EKP2
15.	Boiler water: **(8.7.15.)** a) distilled water in the steam-drain system, b) water properties requirements in boiler system: - lowpressure, - highpressure, - flow type, c) water analysis – understanding the results and taking operational decisions, d) chemical methods to clean the boiler, e) practical requirements – using makers recommendations	1			EKP2

	regarding the chemicals to treat the boiler water on board the ships.				
16.	Diathermal oils requirements used in the marine power plants **(8.7.16.)**	1			EKP2

Semester VII

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Marine boilers operation: **(8.7.13.)** a. start and line up the boilers, b. boiler operation during their work (water treatment, water level control, daily servicing, blow down of the water level gauges and water level controllers), c) fuel oil, feed water and steam system operation (operation of filter and heaters operation, steam and water traps, atmospheric drain tank, inspection tank, cooling and excessive steam condensers), d) stop and cool down the boiler, e) stop and shut down the burner, f) lowering the pressure, g) scum and blow down the boiler, h) water replenishment, i) capacity control of the exhaust gas boiler, j) interaction of the exhaust gas and oil fired boiler.			2	EKP2 EKP5
2.	Marine boilers safe operation and emergency procedures. **(8.7.14.)**			2	EKP5
3.	Marine boiler operation during normal and emergency conditions, boilers cool down/shut down and maintenance: a. boiler supervision during operation, b. emergency procedures, c. Oil fired and exhaust gas boilers cool down and shut down procedures, d. Maintenance of the out of work boilers in short and long periods. **(8.7.9)**			2	EKP2, EKP5
4.	Marine boiler operation during normal and emergency conditions, boilers cool down/shut down and maintenance: a. boiler supervision during operation, b. emergency procedures, c. Oil fired and exhaust gas boilers cool down and shut down procedures, d. Maintenance of the out of work boilers in short and long periods. **(8.7.9)**			2	EKP2, EKP5
5.	Boiler systems: **(8.7.9., 8.7.10.)** a. feed water systems, b. steam systems, c. scum and blow down systems, d. fuel oil systems.			2	EKP1, EKP5

Methods of verifying educational effects /in correlation with particular effects/:

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING
Field/Level of education: Mechanical Engineering and Machine Design
Profile of education: Practical
Specialization: Marine Propulsion Plant and Offshore Construction Operation

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1		**X**	**X**						
EKP2			**X**				**X**		
EKP3				**X**					
EKP4							**X**		
EKP5							**X**		

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
IV	Student has got the predicted educational effects and meets the STCW requirements to pass the subject. Participated in the lectures (maximum - 3 absences) and classes (maximum - 3 absences). Classes: final work. Lectures: written and oral exam. **To get a positive grade as an average of both forms that are the lectures and classes, student must pass both the final works.**
VII	Student has completed the sea phase confirmed by chief engineer signatures in the Training Record Book. Made and defend the presentation based on the knowledge and abilities gained during the sea phase on board the ship. Seminary: Oral final work

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	49			10
Reading literature	10			10
Preparing for laboratories, project classes	5			10
Preparing for the exam, the pass test	20			
Drafting documentation of a project/report				10
Participating in pass tests and exams	3			
Participating in consultation hours	3			2
Total number of hours	90			42
Number of ECTS points	**3**			**1**
Summary number of ECTS points for the course	**4**			
Student's workload connected with practical classes	15+10 +5+10+10+10+2=62– 2 ECTS			
Student's workload during the classes involving direct participation of academic teachers	49+15+3+3+2=72 – 2 ECTS			

Literature:

Primary literature
1. Górski Z., Perepeczko A., „Okrętowe kotły parowe", Fundacja Rozwoju Wyższej Szkoły Morskiej w Gdyni, Gdynia 2002.
2. Kowalski A., Krzyżanowski J., „Teoria okrętowych kotłów parowych", Wydawnictwo Wyższej Szkoły Morskiej w Gdyni, Gdynia 1993.

Secondary literature
1. Kowalski A., Krzyżanowski J., „Okrętowe siłownie parowe ”,Wydawnictwo Wyższej szkoły Morskiej w Gdyni, Gdynia 1995.

Persons conducting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Ph.D. Eng. Jacek Krzyżanowski	*SPP*
2. The other people conducting the course:	
Msc. Eng. Grzegorz Sikora	*SPP*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 27.05.2014

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	31	Course :	**Marine Turbines**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
V	4	2	1	1			30	15	15	
Total number during the studies:							**60**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	The knowledge and skills in the range of the college from objects: the thermodynamics, the mechanics, the endurance of materials.

Course objectives

1.	On purpose the object is the delivery of the basic knowledge and the skill in the range of the safe exploitation a ship turbine power plant.

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	correctly to hold, to serve and to exploit devices and shipping-installations , safely to serve exploitive practical materials in the shipbuilding, to use the knowledge in the range of standards and technical norms connected with the construction and the exploitation of machines	K_W04 K_W06 K_W09
EKP2	to gain over the information from the literature, databases and other sources, to integrate it, to execute their interpretation, to reason and to formulate and to base opinions	K_U01
EKP3	it possesses skills self-educations, among other things for the purpose of lifting of professional competences , to use to formulating and the resolution of practical engineer exercises methods analytic, stimulatory and experimental, typical for the ship power plant.	K_U05 K_U09
EKP4	to work in the group to accept in her different role, the understands of the rule of the cooperation	K_K05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester V

No	Content	Number of			Reference to EKP of the course
		L	C	Lab/P	
1.	Systems of the energy conversion in the turbine stage. Principles of the impulse stage, reaction stage and Curtis stage.	2			EKP1
2.	Velocity triangles, forces acting on rotor blade, the torque and the stage output.	2			EKP2
3.	Stage internal losses –cascade and other internal losses, overall stage efficiency.	3			EKP1
4.	The internal turbine efficiency, the comparative cycles for the steam turbine power plants.	2	2		EKP1
5.	Regenerative and reheating cycles for the marine steam turbine power plants, utilization turbines cycles.	2	3		EKP1
6.	Principles of power control of the marine steam turbines, types of control.	2			EKP1
7.	Characteristics of marine steam turbines. Problems of the reversing in ship turbines.	2	4		EKP1 EKP2
8.	The basic gas turbine cycle, scheme of the contemporary marine gas turbine engine..	2	2		EKP1 EKP2
9.	Cycle efficiency and specific output of marine gas turbine, output enhancement.	4	4		EKP1 EKP2
10.	Principles of radial and axial compressor.	2			EKP1
11.	The characteristics of air-compressor stage , the cooperation of the turbo-compressor with the combustion engine.	2		4	EKP1
12.	Basic elements of the marine steam and gas turbines.	2			EKP1
13.	Typical damages of the marine steam and gas turbines.	2			EKP3
14.	Regulations of classification society concerning of the marine turbines.	1			EKP1 EKP2
15.	The operation of the marine steam turbines.			7	EKP3 EKP4
16.	Balancing of the rotor of the turbo-compressor.			4	EKP1

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1				**X**				**X**	
EKP2				**X**					
EKP3				**X**					
EKP4					**X**			**X**	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
V	The student obtained founded effects of the education and realizes requirements STCW convention in relation credits of the object. He frequented on all lectures, exercise and laboratory- according to schedule studies. The final estimation - the average from estimations for theoretical knowledge , exercises and laboratory.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	45	15		
Reading literature	10			
Preparing for laboratories, project classes		20		
Preparing for the exam, the pass test	5			
Drafting documentation of a project/report		15		
Participating in pass tests and exams	3			
Participating in consultation hours	2	5		
Total number of hours	65	55		
Number of ECTS points	**2**	**2**		
Summary number of ECTS points for the course	**4**			
Student's workload connected with practical classes	15+20+15+5=55 – 2 ECTS			
Student's workload during the classes involving direct participation of academic teachers	45+15+3+2+5=70 – 2 ECTS			

Literature:

Primary literature

1. Cwilewicz R., Perepeczko A.: *Okrętowe turbiny parowe*, Wydawnictwo Akademii Morskiej w Gdyni, Gdynia 2014.;
2. Kosowski K.: *Introduction to the Theory of Marine Turbines,* Foundation for the Promotion of Maritime Industry, Gdańsk 2005;
3. Kosowski K.: *Ship Turbine Power Plants,* Foundation for the Promotion of Maritime Industry, Gdańsk 2005;
4. Perycz S.: *Turbiny parowe i gazowe*, Ossolineum 1992.;

5. Cwilewicz R.: *Okrętowe turbiny gazowe*, Fundacja Rozwoju Akademii Morskiej w Gdyni, Gdynia 2004;
6. Szewalski R.: *Turbiny parowe*, Poradnik techniczny, Mechanik t. IV, PWT W-wa 1960;
7. Lipka M.: *Wytrzymałość maszyn wirnikowych*, WNT W-wa, 1967;
8. Tuliszka E.: *Turbiny cieplne, zagadnienia termodynamiczne i przepływowe*, WNT , W-wa 1973;

Secondary literature

1. Nikiel T. *Turbiny parowe*, WNT, W-wa 1980

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Prof. dr hab. inż. Romuald Cwilewicz	*Marine Power Plant Department*
2. The other people conducting the course:	
Dr inż. Jerzy Herdzik	*Marine Power Plant Department*
Dr inż. Mirosław Dereszewski	*Marine Power Plant Department*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIWERSITY FACULTY OF MARINE EGINEERING			
No	32	Course :	**Marine Auxiliary Machines and Equipment**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
IV	2	2					30			
V	3	2		1			30		15	
VIIE	4	2			1	1	30		15	10 S
Total number during the studies:							**130**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skill in the scope of secondary school

Course objectives

1	Course objective is relaying of basic knowledge in construction and operation of ship auxiliary machines and equipment necessary for safety maintenance of ship technique
2	The course is compatible to enlarged training programme in operational and management level for ship engine department staff acc. to 8 annex (Decree of Ministry of Infrastructure and Development dated February 28th 2014 item 536)

Educational Effects for the whole Course (EKP) – after completing the educational cycle:

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Has systematic knowledge in construction and operation of ship machinery.	K_W03
EKP2	Has detailed technical knowledge necessary for proper operation and maintenance of ship machinery and systems.	K_W04
EKP3	Has detailed knowledge concerning lifetime of engine room and whole ship machinery.	K_W07
EKP4	Knows basic methods, directions for use, tools and materials used for resolving simple engineering problems concerning engine room and ship operation.	K_W09
EKP5	Has detailed knowledge concerning ship and engine room safety management and activities organizing.	K_W12
EKP6	Can plan and execute experiments including measurements and computer simulations, evaluate results, make interpretations and draw conclusions.	K_U08
EKP7	Can use knowledge for interpretation of events happened in ship machines and systems.	K_U13
EKP8	Can perform critical analysis of ship machinery and equipment work and estimate existing technical constructions necessary for proper and safety operation.	K_U15

EKP9	Can identify and specify simple engineering problems of practical nature e.g. remedy of break-downs, overhauls, planning and executing machinery and energetic plants (ship in particular) overhals.	K_U16
EKP10	Can estimate usefulness and apply methods and tools to solve simple engineering problems of practical nature connected with operation of engine room machinery and systems.	K_U18
EKP11	Is able and experienced in running operation and maintenance of ship engine room machines and equipment (adequately to watch keeping engineer certificate).	K_U20
EKP12	Can understand and make use of informations from: technical documentation, ship stability documentation, service manual of ship machinery and systems.	K_U22
EKP13	Is aware of professional and etic responsibility in decisions concerning operation of engine room machinery and equipment.	K_K01
EKP14	In specific marine conditions can act in effective manner.	K_K10

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester IV (Marine auxiliary machines and equipment I)

No	Content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Pump systems: **(8.6. p. 1)** a) types of pumping systems, b) characteristic data of pumping system, c) characteristics of pumping systems.	2			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
2.	Pumps: **(8.6. p. 2)** a) classification, characterisation and application of different types of pumps, b) types of pump drive, characteristics of driving motors, c) impeller pumps: – construction and principle of operation, – parameters of pumps operation, – characteristic data of pumps, speed discriminant (shape) of impeller, – characteristics of pumps: capacity, power and efficiency, total, – cooperation of pump and pumping system, energetic balance, selection of pump type and power of pump drive, – effect of pumping system parameters on pump capacity, – methods of pump capacity adjustment, – cooperation of pumps in series and parallel, – transverse and longitudinal forces acting on impeller, means for balance – the most important operation activities (starting, running attendance, stoppage), – most often operational malfunctions of impeller pumps, symptoms and counteractions, d) positive displacement pumps: – construction and principle of operation, – characteristic data of pumps,	9			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9

	– parameters of pumps operation, – characteristics of pumps: capacity, power and efficiency, – cooperation of pump and pumping system, energetic balance, selection of pump type and power of pump drive, – effect of pump system parameters on pump capacity, – methods of pump capacity adjustment, – cooperation of pumps in series and parallel, – the most important operation activities (starting, running attendance, stoppage), – most often operational malfunctions of positive displacement pumps, symptoms and counteractions, e) phenomenon of cavitation in pumping systems, consequences and counteractions, f) regulations of classification societies concerning marine pumps.				
3.	Effect of operational conditions on pump characteristics. **(8.6. p.3)**	2			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
4.	Jet pumps: **(8.6. p. 4)** a) construction and principle of operation, b) classification of jet pumps and application, c) characteristic data of jet pumps, d) parameters of jet pumps operation, e) cooperation of pump and pumping system, f) characteristics of jet pumps.	2			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
5.	Compressors: **(8.6. p.5)** a) classification, types and application of compressors, b) positive displacement compressors: – construction and principles of operation, p(v) and t(s) diagrams, real volumetric factor, multistage compression, final temperature of compression, cooling and lubrication of compressors, – timing of positive displacement compressors, – characteristic data of positive displacement compressors, – parameters of positive displacement operation, – cooperation with compressed air system, – measurement and capacity adjustment of compressors on board the ship, – the most important operation activities (starting, running attendance, stoppage), – the most important activities during overhauls of positive displacement compressors (clearance volume measurement, adjustment, interstage pressure adjustment), – the most frequent malfunctions of positive displacement compressors during operation, symptoms and counteraction, – safety devices of compressors and compressed air systems, – regulation of classification societies concerning starting air compressors, c) impeller compressors: – construction and principles of operation, p(v) and t(s) diagrams, real volumetric factor, multistage compression,	6			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9

	final temperature of compression, cooling and lubrication of compressors, – characteristic data of impeller compressors, – characteristics of impeller compressors, – parameters of impeller compressors operation, – cooperation with compressed air system, – adjustment of capacity, – pumping of impeller compressors and counteraction, d) blowers and fans: – characteristics, – cooperation with ventilation system.				
6.	Fuel oils and lubricating oils cleaning machinery: **(8.6. p.6)** a) kinds of oils contaminations, effects on operation of ship machinery and systems, b) gravitational settling and centrifugation: – theory of settling and centrifugation, – construction of centrifugal separators, – selection of centrifugal separators capacity for different engine room systems, – selection of methods and parameters of marine fuels centrifugation, – selection of methods and parameters of lubricating oils centrifugation, – the most important operation activities (starting, running attendance, stoppage), – the most frequent malfunctions of centrifugal separators during operation, symptoms and counteraction, c) filtration: – theory of filtration, – filter inserts, characteristic data of filter inserts, – construction and maintenance of fuel oil and lubricating oil filters.	7			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
7.	Systems and equipment for control of fuel viscosity before engine: **(8.6. p.7, 25)** a) construction and tasks of systems, b) construction and working principle of mixers and homogenizers, c) methods of viscosity measurements in ship fuel oil systems, d) components and setting of viscosity control equipment, e) application of viscosity control equipment in fuel oil mixing systems, f) changing procedure of engine supply with different grade of fuel oil: HFO/MDO and MDO/HFO, g) the most frequent malfunctions during operation, symptoms and counteraction.	2			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9

Semester V (Marine auxiliary machines and equipment II)

No	Content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Heat exchangers: **(8.6. p.8)**	8			EKP1, EKP2; EKP4; EKP7;

	a) theoretical basics of heat transfer, conduction, convection, penetration and radiation, characteristic parameters, b) classification, construction and application of heat exchangers, c) parallel flow, counter flow and mixed flow heat exchangers, d) construction elements of heat exchangers, e) operational parameters of heat exchangers, f) maintenance of heat exchangers, automatic adjustment of flowing media temperatures, g) kinds of corrosion and counteraction, h) cleaning, preservation and leak tightness tests of heat exchangers, i) regulations of classification societies concerning heat exchangers.				EKP8; EKP9
2.	Fresh water generators: **(8.6. p.9)** a) construction, operational principle and maintenance of vacuum fresh water generators, b) the most important operation activities (starting, running attendance, stoppage), c) the most frequent malfunctions during operation, symptoms and counteraction, d) construction, operational principles and maintenance of reverse osmosis desalination plants, e) the most important operation activities (starting, running attendance, stoppage), f) the most frequent malfunctions during operation, symptoms and counteraction, g) regulations of classification societies concerning desalination plants.	5			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
3.	Marine hydraulic plants: **(8.6. p.10)** a) theoretical principles of hydraulic systems operation, b) elements of hydraulic systems: – hydraulic pumps, – hydraulic motors, – hydraulic cylinders, – hydraulic valves, – hydraulic distributors, – hydraulic piping, – hydraulic tanks, c) graphical symbols used in documentation of hydraulic systems, d) the most frequent malfunctions during operation, symptoms and counteraction, f) the most important principles of hydraulic system maintenance during system operation, e) procedures of dismantling, assembling and change of hydraulic oil, f) diagnostics of pumps and hydraulic plants.	7			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
4.	Ship steering gears: **(8.6. p.11)** a) construction and maintenance of electrohydraulic steering gears (piston, plunger, vane and toroid), b) adjustment of electrohydraulic steering gears,	6			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9

	c) the most important operation activities (starting, running attendance, stoppage), d) the most frequent malfunctions during operation, symptoms and counteraction, e) procedure of steering gear emergency operation, f) regulations of classification societies concerning steering gears.				
5.	*Principles of operation and construction of bow thrusters and active steering gear.* ***(8.6. p.12)***	4			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
6.	Laboratory test of impeller pumps. **(8.6. p.21)** Cooperation of impeller pump and pumping system: a) preparation of pumping system for pump start, b) start of pump, reading of working parameters, adjustment of capacity, c) evaluation of pump working parameters on the base of data given in instruction manual, pump working point, d) perform of maintenance tasks: control of electric motor earth, bearings greasing, grease refilling, pump and motor bearings temperature control, *e) pump and pumping system stoppage.*			L5	EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
7.	Laboratory test of positive displacement compressors. **(8.6. p.22)** Measurement of starting air piston compressor capacity: a) familiarity with fittings and equipment of starting air compressor, b) familiarity with fittings and equipment of starting air system, c) preparation of compressor and compressed air system for start, d) starting of compressor, e) reading and interpretation of compressor working parameters, evaluation of parameters correctness on the base of producer requirements, f) maintenance activities during compressor working, g) measurement of compressor capacity and comparison to classification societies requirements. h) observation of indicator diagram change as a dependence on simulated malfunctions.			L3	EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
8.	Laboratory test of fan: a) determination of fan characteristics, b) determination of ventilation system characteristics, c) cooperation of fan and ventilation system.			L2	EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
9.	Laboratory test of heat exchanger: a) determination of heat transfer coefficient for oil-water heat exchanger, b) observation of heat transfer coefficient change as a dependence on media flow rate.			L3	EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
10.	Fuel oil centrifugation: **(8.6. p.23, 24)** a) selection of centrifugation method (purification, clarification, in series and parallel connection of centrifugal separators), b) selection of centrifugation parameters for different fuel oils, c) preparation of system for fuel oil centrifugation, d) preparation of centrifugal separator for start, d) start of centrifugal separator and centrifugation parameters setting,			L2	EKP1, EKP2; EKP4; EKP7; EKP8; EKP9

	e) maintenance activities during fuel oil centrifugal separator operation, g) stoppage of centrifugal separator and fuel oil cleaning system.				

Semester VI

No	Content	Number of			Reference to EKP of the course
		L	C	Lab	
1.	Sea practice: Occupation on board the ship executed according to the programme included in Training Record Book. Execution of programme is to be confirmed by signature of Chief Engineer.	Minimum 6 months			EKP2; EKP3; EKP4; EKP5; EKP6; EKP7; EKP8; EKP9; EKP10; EKP11; EKP12; EKP13; EKP14

Semester VII (Marine auxiliary machines and equipment III)

No	Content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Controllable pitch propellers: **(8.6. p.13)** a) construction and operational principle of controllable pitch propeller, b) the most important operation activities (starting, running attendance, stoppage) controllable pitch propeller gear, c) the most frequent malfunctions during operation, symptoms and counteraction.	8			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
2.	Windlasses and capstans: **(8.6. p.14)** a) components of windlass and capstan, b) construction and maintenance of electric windlasses and capstans, c) construction and maintenance of hydraulic windlasses and capstans, d) the most important operation activities (starting, running attendance, stoppage), e) the most frequent malfunctions during operation, symptoms and counteraction, f) regulations of classification societies concerning windlasses and capstans.	4			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
3.	Cargo hold hatch covers: **(8.6. p.15)** a) hydraulic systems – construction and maintenance, b) the most frequent malfunctions during operation, symptoms and *counteraction,* *c) emergency operation of hatch covers.*	2			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
4.	Watertight doors hydraulic systems: **(8.6. p.16)** a) construction and maintenance of watertight compartments doors, b) construction and maintenance of bow and stern ramps, c) the most frequent malfunctions during operation, symptoms and counteraction.	2			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9

5.	Cargo handling equipment: **(8.6. p.17)** a) construction of cargo booms, b) construction and maintenance of topping and guy winches, c) construction and maintenance of electric cranes, d) construction and maintenance of hydraulic cranes, e) conditions of cargo handling equipment cooperation.	6			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
6.	Anti-rolling stabilizers: **(8.6. p.18)** a) types and application of anti-rolling stabilizers, b) construction and maintenance of stabilizer gears and systems.	2			EKP1, EKP2; EKP4; EKP7; EKP8; EKP9
7.	Life-boat winches: **(8.6. p.19)** a) construction and maintenance of life-boat winches, b) construction and maintenance of life-boat drop ramps.	2			
8.	Ship propulsion shafting: **(8.6. p.20)** a) shafting: propeller shafts, intermediate shafts, thrust shafts, principles of shafting and engine assembly, b) construction, lubricating systems and maintenance of shafts bearings (stern tube, intermediate shaft, thrust shaft), c) construction and maintenance of couplings, d) construction and operation of marine reduction gears.	4			
9.	Simulation of pumps and hydrophore units operation.			2L	EKP13; EKP14
10.	Simulation of compressor operation.			1L	EKP13; EKP14
11.	Simulation of fresh water generator operation.			2L	EKP13; EKP14
12.	Simulation of osmosis desalination plant operation.			2L	EKP13; EKP14
13.	Simulation of steering gear operation.			2L	EKP13; EKP14
14.	Simulation of controllable pitch propeller operation.			2L	EKP13; EKP14
15.	Simulation of oily water separator operation.			2L	EKP13; EKP14
16.	Simulation of sewage treatment plant operation.			2L	EKP13; EKP14
17.	*Operational analysis of auxiliary machines and equipment work on the base of knowledge acquired on simulator and sea training.*			10S	EKP12; EKP13; EKP14

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1			**X**	**X**					
EKP2				**X**					
EKP3				**X**					
EKP4				**X**					
EKP5					**X**				
EKP6					**X**				
EKP7					**X**		**X**		
EKP8					**X**		**X**		
EKP9				**X**	**X**		**X**		
EKP10					**X**		**X**		
EKP11					**X**				
EKP12					**X**				
EKP13							**X**	**X**	

EKP14								**X**	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
IV	A student achieved assumed educational effects and met requirements of STCW Convention concerning crediting the course. Attended lectures (allowed 3 absences). Crediting of lecture – pass test of knowledge from lecture.
V	Student achieved assumed educational effects and met requirements of STCW Convention concerning crediting the course. Attended lectures (allowed 3 absences). Crediting of lecture - pass test of knowledge from the lecture. Crediting of laboratory: carrying out and pass test of all laboratory exercises according to the schedule. Final grade is average from theoretical knowledge pass test, laboratory activity and report from exercise. Students book grade is estimated after positive pass of lecture and laboratory as an average of obtained grades.
VI	Student achieved assumed educational effects. Student carried out activities listed in Training Record Book.
VII	Student achieved assumed educational effects and met requirements of STCW Convention concerning crediting the course. Attended lectures (allowed 3 absences). Crediting of lecture - pass test of knowledge from the lecture. Crediting of project: carry out and pass test of all simulator exercises according to the schedule. Crediting of seminary: pass test of Training Record Book and presentation of selected ship auxiliary machines operation. Final exam including all program from semester IV, V and VI. Students book grade is estimated after positive pass of lecture, project, seminary and final exam as an average of obtained grades.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	**Estimated number of hours devoted to the activity**			
	L, C	Lab	P	S
Contact hours	90	30		10
Reading literature	30			
Preparing for laboratories, project classes		20		5
Preparing for the exam, the pass test	30			
Drafting documentation of a project/report		10		10
Participating in pass tests and exams	4	2		
Participating in consultation hours	2	2		
Total number of hours	156	64		25
Number of ECTS points	**6**	**2**		**1**
Summary number of ECTS points for the course	**9**			

Literature:

Primary literature
1. Górski Z.: Okrętowe Mechanizmy i Urządzenia Okrętowe, TI,TII, Wydawnictwo TRADEMAR, Gdynia, 2013. 2. Orszulok W., Wiewiórski S.: Wyposażenie Pokładowe Statku Handlowego, Wydawnictwo Morskie, Gdańsk 1982. 3. Wojtaszczyk B.: Urządzenia Przeładunkowe drobnicowców ro-ro i lo-lo, Wydawnictwo Morskie, Gdańsk 1988. 4. Kozak E., Klein E.: Eksploatacja Urządzeń Portowych, Wydawnictwo WSM Szczecin, 1994.
Secondary literature
1. Górski Z. Construction and Operation of Marine Pumps, Wydawnictwo TRADEMAR, Gdynia, 2010. 2. Górski Z. Construction and Working of Marine Compressors, Blowers and Fans, Fundacja Rozwoju Akademii Morskiej w Gdyni, Gdynia, 2006. 3. Górski Z. Construction and Operation of Marine Cleaning Machinery, Wydawnictwo TRADEMAR, Gdynia, 2009. 4. Górski Z. Construction and Working of Marine Heat Exchangers, Fundacja Rozwoju Akademii Morskiej w Gdyni, Gdynia, 2007. 5. Górski Z. Construction and Operation of Hydraulic Machinery, Wydawnictwo TRADEMAR, Gdynia, 2008. 6. Górski Z. Construction and Operation of Marine Steering Gears, Controllable Pitch Propellers and Stern Tubes, Wydawnictwo TRADEMAR, Gdynia, 2009.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course:	
Doc Eng. Zygmunt Górski assoc. prof. of GMU	Department of Marine Propulsion Plants
2. The other people conducting the course:	
Doc Eng.Andrzej Młynarczak	*Department of Marine Propulsion Plants*
Doc Eng.Rafał Krakowski	*Department of Marine Propulsion Plants*

Explanation of the abbreviations used:
L – lectures,
C– classes,
Lab – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.
MiBM – Field of education; Mechanical Engineering and Machine Design

Updated: 22.12.2014

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	33	Course :	**Refrigeration, Ventilation & Air Conditioning**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
05	2	2					30			
07	2			1		1			15	10
Total number during the studies:							**55**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills of subjects: Technical thermodynamics, Fluid Mechanics, Automation and Robotics

Course objectives

1.	The aim of subject is to provide basic knowledge and skills in structure, operation and maintenance of marine refrigeration, ventilation and air conditioning systems, essential for safety technical service of such ship equipment
2.	Program is accordance with training program in general outline of operation and management level in engineering department of mechanical specialities no 8 (Rozporządzenie Ministra Infrastruktury i Rozwoju z dnia 28 lutego 2014 r. poz. 536)

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Explain basic principles of structure and operation of compressor refrigeration unit and its essential parts: compressor, condenser, evaporator and expansion valve	K_W04; K_W07
EKP2	Operate refrigeration unit, perform inspection of its basic parameters and assess a general technical condition of refrigeration system	K_U02; K_U13
EKP3	Know basic processes of humid air and illustrate them at Mollier diagram (h-X)	K_ W04; K_W07
EKP4	Interpret operation parameters of unit and system in comparison with ventilation or air conditioning installation operation manual	K_U08; K_U13; K_U16; K_U22
EKP5	Cooperate in the group with different tasks, understand rules of cooperation, participate actively in assessing of tasks carried out by group members	K_K03; K_K05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester 05

No	Content	Number of aching	

		L	C	Lab/P	Reference to EKP of the
1.	Basis of refrigeration technology: a) Keeping and transport of food b) Keeping and transoport of other cargoes	1			EKP1
2.	Basic parameters of climatic comfort	2			EKP2
3.	Thermodynamic basis of refrigeration cycles	1			EKP2
4.	Refrigeration cycles used on ships: a) Signs and symbols which are used in refrigeration diagrams b) Classification and applying of refrigeration cycles c) Refrigerants, properties, symbols, applying, replacement d) Household refrigerators and freezers e) Provision plant f) Refrigerated hold g) Refrigerated containers h) Air conditioning i) Refrigeration cycles operation parameters	4			EKP1
5.	Compressors and refrigerating unit: a) Classification and applying of refrigeration compressors b) Structure, principle of operation, operation parameters and maintenance of reciprocating compressors c) Structure, principle of operation, operation parameters and maintenance of screw compressors d) Structure, principle of operation, operation parameters and maintenance of spiral compressors e) Structure, principle of operation, operation parameters and maintenance of refrigerating unit f) Structure, principle of operation, operation parameters and maintenance of household refrigerators and freezers g) Capacity control of compressors h) Control-measuring devices i) Most often failures of operation, ways of fixing	3			EKP1
6.	Refrigeration apparatus: a) Heat exchangers(condensers, heaters, evaporators) b) Driers c) Oil separators d) Degasifiers e) Vents f) Refrigerant pumps g) Oil and regrigerant vessels	3			EKP2
7.	Auxiliary installations for: a) Refrigerant b) Oil c) Defrosting of evaporator (air cooler)	1			EKP1
8.	Operation of compressor with refrigeration installation	2			EKP1
9.	Automation of control for refrigeration units and installations: a) Control-measuring devices b) Safety devices of refrigeration installations c) Pressure, temperature and liquid levels control systems	2			EKP1
10.	Maintenance relating refrigeration installations and operation parameters adjustment: a) Preparing for start and operation of installation	4			EKP2

	b) Control and adjustment of temperature c) Tightness control d) Inspection of refrigerant level and its filling e) Inspection of oil level and its filling f) Defrosting of evaporator g) Stop installation h) Most often failures of operation, symptoms and ways of fixing				
11.	Room ventilation and air coditioning: air temperature and humidity adjustment	2			EKP1
12.	Refrigerated holds ventilation:	1			EKP1
13.	Heat balance of refrigerated room and ambient condition influence on balance components	1			EKP1
14.	Safety issues for refrigeration instalations	1			EKP2
15.	Maintenance	1			EKP2
16.	Classification societies regulations for refrigeration installations, ship papers	1			EKP1

Semester 07

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Applying diagrams of refrigeration installations in order to explain principle of operation, preparing for start, stop, disassembling equipment, their replacement, condenser cleaning, refrigerant and oil filling, draw back the refrigerant, overhauls, maintenance.		2		EKP1
2.	Adjustment of expansion valves		2		EKP1, EKP2
3.	Refrigerant recycling operation using recycling unit		2		EKP1, EKP2
4.	Filling oil and refrigerant in the system		2		EKP1, EKP2
5.	Fixing leaks of refrigerant in the installation		1		EKP1, EKP2
6.	Examination of one stage compressor refrigeration unit		2		EKP1
7.	Performing service with two-rooms provision plant simulator		2		EKP2
8.	Examination of basic heat-humidity processes of air in the air conditioning unit		2		EKP3, EKP4
9.	Performing cargo-handling operations with gas carrier simulator			2	EKP1, EKP2
10.	Some problems of refrigeration units sevice on board the ships			2	EKP2
11.	Some problems of ship engine room ventilation systems service			2	EKP4
12.	Some problems of ship air conditioning systems service			2	EKP4
13.	The legal aspects and classification societies regulations for safety operation of refrigeration installation			2	EKP2, EKP4

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	**Test**	**Oral exam**	**Written exam**	**Pass test**	**Report**	**Project**	**Presentation**	**Practical final work**	**Others**
EKP1				**X**					
EKP2					**X**		**X**	**X** (during lab.)	

EKP3				**X**					
EKP4					**X**		**X**	**X** (during lab.)	
EKP5								**X** (during lab.)	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
05	Student achieved assumed aims of the study and fulfill requirements of STCW convention regarding passing the subject. He attended lectures (3 absences without justification are allowed) Lecture: passing by written exam of lecture issues
07	Student achieved assumed aims of study. Performed and passed the lab and seminar classes, according to timetable. Final mark of the lab report and the seminar presentation

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	**Estimated number of hours devoted to the activity**			
	L, C	Lab	P	S
Contact hours	30	15		10
Reading literature	15			
Preparing for laboratories, project classes		10		10
Preparing for the exam, the pass test	15			
Drafting documentation of a project/report		10		10
Participating in pass tests and exams	4			
Participating in consultation hours		5		
Total number of hours	64	40		30
Number of ECTS points	**2**	**1**		**1**
Summary number of ECTS points for the course	**4**			
Student's workload connected with practical classes	65 h – 2 ECTS			
Student's workload during the classes involving direct participation of academic teachers	64 h – 4 ECTS			

Literature:

Primary literature

1. Bonca Z.: Chłodnictwo okrętowe. Wyd. Akademii Morskiej w Gdyni, 2006
2. Bonca Z.: Automatyka chłodnicza i klimatyzacyjna. Wyd. WSM w Gdyni, 2000
3. Bonca Z. Dziubek R.: Zagadnienia obliczeniowe z chłodnictwa i klimatyzacji. Wyd. WSM w Gdyni, 2000
4. Bonca Z., Depta A.: Wentylacja i klimatyzacja okrętowa. Wyd. WSM w Gdyni, 1999
5. Bonca Z. Dziubek R.: Okrętowe urządzenia chłodnicze. Laboratorium, cz. II, Wyd. WSM w Gdyni, 1996
6. Bonca Z. Dziubek R.: Budowa i eksploatacja kontenerów chłodniczych. Wyd. WSM w
7. Gdyni, 1994

Secondary literature

1. Ullrich H.J: Technika Chłodnicza. Poradnik. Tom I i II. Wyd. MASTA, Gdańsk 1998, 1999.
2. Ullrich H.J.: Technika Klimatyzacyjna. Wyd. MASTA, Gdańsk 2001

3. Praca zbiorowa: Nowe czynniki chłodnicze i nośniki ciepła. Poradnik 2004, Wyd. MASTA, Gdańsk 2004
4. Targański W., Staniszewski D.: Odzysk ciepła w instalacjach chłodniczych i klimatyzacyjnych. Wyd. MASTA, Gdańsk 2007.
5. Chorowski M.: Kriotechnika. Podstawy i zastosowania. Wyd. MASTA, Gdańsk 2007

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
dr inż. Zenon Bonca	*KSO*
2. The other people conducting the course:	
dr inż. Dariusz Nanowski	*KSO*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	34	Course :	**Marine Electrical Engineering and Electronics**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
V	2	2					33			
VII E	4	2		1		1	45			
Total number during the studies:										

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

6.	Knowledge and skills in the secondary school
7.	Knowledge and skills for previous semesters

Course objectives

8.	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
9.	The program is compatible with the framework extended training program at the operational level and management in the department of mechanical engineering with a mechanical specialization est. No. 8 (Regulation of the Minister of Infrastructure and Development of 28 February 2014. Pos. 536)

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	discuss the design and operation of transformers and rotating machines	K_W03; K_W04 K_W07,K_U07
EKP2	explain the basic concepts of electrical engineering and marine power engineering	K_W03K_U15; K_U16;
EKP3	discuss Electric drives of machinery and deck devices	K_W09, K_U13;,K_U22
EKP4	maintain components, electronic systems and power electronics	K_W12, K_K02; , K_U15, K_U21

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester V

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Transformers: **(8.11. p.6)**	3			EKP1

	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.				
2.	Rotating machines: **(8.11. p.7)** 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.	19			EKP1
3.	Installations for voltages above 1 kV on ships: **(8.11. p.15)** 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			EKP1
4.	Measurements and documentation of the insulation condition: **(8.11. p.16)** a) insulation materials, b) insulation materials classes, c) protection degree of electrical machines.	3			EKP2

Semester VII

No	Program content	Number of hours			Reference to EKP of the course
		L	C	Lab	
1.	Electric drives of marine equipment: **(8.11. p.8)** a) objectives and structure of the drive system, characteristics of the drive motor and load, the operating point of the drive set,	10		2	EKP3

	the 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.				
2.	Fundamentals of marine electrotechnics: **(8.11. p.10)** 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.	10		2	EKP2
3.	Components and electronic systems and power electronics, maintenance and replacement: **(8.11. p.12)** 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 r) direct and indirect frequency converters, cycloconverters.			3	EKP4
4.	Marine electric power engineering **(8.11. p.13)** 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,	10			EKP2

	- 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 1 kV, h) lighting installation, i) emergency supply and lighting, j) *shore connection,* *k) electrical installation and equipment in hazardous areas,* *l) software of equipment for control of ship engine room.*				
5.	Signaling and alarm systems on the ship. **(8.11. p.17)**	1		1	EKP2
6.	Ship internal communication device. **(8.11. p.18)**	1		1	EKP2
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. p.19)	5		1	EKP2
8.	Exploitation of marine electrical equipment: **(8.11. p.20, 24)** 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. Guidelines for safe work with electrical equipment on the ship	4			EKP2
9.	The impact of work of electronic devices on the interference in the electric grid**(8.11. p.21)**	1			EKP2
10.	Technical documentation - wiring diagrams, symbols, interpretation, localization of faults. **(8.11. p.21)**			1	EKP4
11.	Electrical Workshop: **(8.11. p. 25, 26)** a) processing of ends of wires and cables, b) disassembly, repair and assembly of electrical lighting casing , c) maintenance and repair of switchgears, motors, generators, d) disassembly, repair and assembly of container terminal contact, single and three phase, e) disassembly, repair and assembly of switches and manifolds sockets of different types, f) ways of laying cables. Characteristics of chemicals used in repairs and maintenance of electrical equipment, MSDS cards.			2	EKP4
12.	Security of motors and generators: **(8.11. p. 28)** a) checking of the thermo-bimetal relay,	2		1	EKP4

	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.				
13.	Introduction to digital circuits, **(8.11. p. 29)** Control systems: software support of digital control systems of engine room equipment.	1		1	EKP4

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1				**x**					
EKP2				**x**					
EKP3					**x**				
EKP4					**x**				

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –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.
VII	A student achieved the expected learning outcomes. He attended the laboratory. Laboratories: 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. Evaluation index after successful completion of the 2 tests.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	78	15	10	
Reading literature	20			
Preparing for laboratories, project classes		15		
Preparing for the exam, the pass test	20			
Drafting documentation of a project/report		15		
Participating in pass tests and exams	4			
Participating in consultation hours				
Total number of hours	122	45	10	
Number of ECTS points	**2**	**4**		
Summary number of ECTS points for the course	**6**			
Student's workload connected with practical classes	60			
Student's workload during the classes involving direct participation of academic teachers	94			

Literature:

Primary literature
1. Electrotechnics&Electronics for Mechanicians PWN 2. Marine Electrical Engineering , P. Wyszkowski PWN
Secondary literature
1. Electrotechnics&electronics F.Przeździecki PWN

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Dr R. Kostyszyn	
2. The other people conducting the course:	
Prof. T. Tarasiuk	
Dr A. Kasprowicz	

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	35	Course :	**Marine Control System**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
VII E	3	1		1		1	15	4	11	10
Total number during the studies:							**40**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills in the field of automation and robotics, machine operation, as necessary for the realization of the subject.
2.	Knowledge and skills in the marine power plant, piston engines, marine boilers, marine turbines, machinery and marine equipment, to be useful for the implementation of the object.
3.	The program is compatible with the framework extended training program at the operational level and management in the department of mechanical engineering with a specialization est. No. 8 (Regulation of the Minister of Infrastructure and Development of 28 February 2014. Pos. 536)

Course objectives

4.	To provide basic knowledge and skills in the field of major marine control systems on the ship.
5.	To provide knowledge and skills in the field of specialist marine control systems depend on the type of vessel.

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Read the control diagrams of marine systems.	K_W04; K_W09; K_U08; K_U09; K_U13; K_U15
EKP2	Discuss trends of elements of ship control systems	K_W04; K_W09; K_U08; K_U09; K_U13; K_U15; K_U20
EKP3	Describe the structure, selection and operation of controls temperature, pressure, level, flow, rotation speed, fuel viscosity.	K_W04; K_W09; K_U08; K_U09; K_U12; K_U15; K_U20
EKP4	Describe controls combustion piston engines driving fixed pitch propellers and variable pitch propellers.	K_W04; K_W09; K_U08; K_U09; K_U13; K_U15; K_U20
EKP5	Describe computer systems, marine control, marine information systems, process control systems integrated production and	K_W04; K_W09; K_U08; K_U09;

	distribution of electricity in the ship, cargo handling equipment and control systems on the ship.	K_U13; K_U15; K_U20
EKP6	Characterized: controls the combustion piston main engines, systems control mechanisms and auxiliary equipment, marine electric power control systems, control and adjustments of marine boilers.	K_W02; K_W04 K_U05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester I

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Symbols used in the marine control diagrams showing the operation of control systems. (8.12. P. 7)	2			EKP1
2.	Integrated process control systems for producing and distributing electricity on board, static and dynamic parameters characterizing the quality of the electricity generation process. (8.12. P. 10)	4			EKP1;
3.	Construction and operation of control systems of selected marine installations (8.12. P. 11) a) producing steam, b) the viscosity of the fuel, c) compressors and pumps, d) oil separators, e) the sewage treatment plant.	6			EKP2
4.	Control systems of loading equipment. (8.12. p. 15)	3			EKP3
5.	Control systems of combustion piston main engines driving propellers witch fixed pitch. (8.12. P. 8)		2	4S	EKP4
6.	Control systems of combustion piston main engines driving propellers witch variable pitch. (8.12. P. 9)		2	4S	EKP4
7.	Construction and operation of control systems of selected marine installations (8.12. P. 19) a) producing steam, b) the viscosity of the fuel, c) compressors and pumps, d) oil separators, e) the sewage treatment plant.			6L	EKP5 EKP6
8.	Controllers PLC used in marine systems. (8.12. P. 20)			2L 2S	EKP5 EKP6
9.	Speed controllers of marine diesel engines: - mechanical, - electronic.			3L	EKP5 EKP6
10.	**Total**	15	4	11L 10S	

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1			**X**		**X**	**X**	**X**	**X** (during the lab.)	

EKP2			**X**				**X**		
EKP3			**X**		**X**	**X**	**X**	**X** (during the lab.)	
EKP4			**X**		**X**	**X**	**X**	**X** (during the lab.)	
EKP5			**X**		**X**	**X**	**X**	**X** (during the lab.)	
EKP6			**X**		**X**	**X**	**X**	**X** (during the lab.)	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
VII	The student achieved the expected effects of the course and meets the requirements of the STCW Convention relating to complete the course. Attended lectures - the absence is allowed 1, attended the seminars - the absence is allowed 1. Lecture: written exam. Laboratories: execution and completion of all laboratory, according to the schedule, the assessment of the average of the laboratory work and the report. Seminars: project preparation or presentation of the selected installation ship and its presentation in a group discussion at the end. Evaluation index - the average of the three forms of activity 40% lecture, 40% lab and the seminar 20%.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	15	15		10
Reading literature	6	10		
Preparing for laboratories, project classes		10		5
Preparing for the exam, the pass test	5			
Drafting documentation of a project/report		10		
Participating in pass tests and exams	2			
Participating in consultation hours	2	2		3
Total number of hours	30	47		18
Number of ECTS points	**1**	**1.5**		**0.5**
Summary number of ECTS points for the course	**3**			
Student's workload connected with practical classes	6+10+10+5+5+10=46 h - 1.5 ECTS			
Student's workload during the classes involving direct participation of academic teachers	15+15+10+2+2+2+3=49 h - 1.5 ECTS			

Literature:

Primary literature
1. Dorf R.C., Bishop R.H. Modern Control Systems. Addison – Wesley & Sons Inc., 1998
2. Woodward instruction of Governor UG and PGA.
Secondary literature
1. Operating records of selected marine equipment

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
dr inż. Andrzej Mielewczyk	*KPT*
2. The other people conducting the course:	
dr inż. Hoang Nguyen	*KPT*
mgr inż. Wojciech Frąckowiak	*KPT*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 17.12.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	36	Course :	**Operating Fluids**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
III	4	2		2			30		30	
Total number during the studies:							60			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills in the range of secondary school
2.	The program is compatible with the framework extended training program at the operational level and management in the department of mechanical engineering with the specialization in Appendix 8 (Regulation of the Minister of Infrastructure and Development, February 28, 2014. Item 536)

Course objectives

1.	Relay the basic knowledge in the range of fuels, lubricants and water used on seagoing ships.
2.	Learn skills of performing and interpreting of analyses necessary to safety use of fuels, lubricants and water on seagoing ships.

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	safely use of operating fluids	K_W02 K_W06 K_U01 K_U05
EKP2	prepare a solution to the problem in the range of mechanical engineering	K_U03
EKP3	use norms and technical standards connected to materials and theirs testing	K_W09 K_U21
EKP4	make use of professional literature to interpret research results	K_U01 K_U05
EKP5	work in a group taking in its different roles, understand cooperation rules	K_K05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester III

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	

1.	Viscosity, density, definitions, units, basic method of measurement.	1		1	EKP1 EKP4 EKP5
2.	Kinds of friction, lubrication, wear.	1			EKP1
3.	Kinds of operating fluids used on seagoing ships, theirs properties and basic classifications: a) natural water, b) technical water: - sea water, - boiler water, - engines cooling water, - sanitary water, - potable water, c) fuels, d) lubricants, e) hydraulic fluids, f) refrigerants, g) thermal oils, h) chemicals used to clean and maintenance, i) additives to chosen operating fluids: - additives to boiler water, - additives to cooling water, - additives to evaporator water, - additives to sea water, - additives to fuels, j) air, k) combustion gases.	10		4	EKP1 EKP4 EKP5
4.	Receiving methods of chosen operating fluids: a) water, b) fuel, c) lubricants, d) hydraulic fluids, e) thermal oils.	2			EKP2
5.	Effects of origin and production processes of chosen operating fluids on theirs properties: a) water, b) fuels, c) lubricants, d) hydraulic fluids.	1			EKP2
6.	Influence of operating fluids properties on systems operating: a) technical water: - sea water, - boiler water, - engines cooling water, - sanitary water, - potable water, b) fuels, c) lubricants, d) hydraulic fluids, e) refrigerants, f) thermal oils, g) chemicals used to clean and maintenance,	8		4	EKP1 EKP3 EKP4 EKP5

	h) additives to chosen operating fluids: - additives to boiler water, - additives to cooling water, - additives to evaporator water, - additives to sea water, - additives to fuels, i) air, j) combustion gases.				
7.	Operating problems of chosen systems: a) supply system, b) combustion chamber (piston engine, boiler), c) forced lubricating and cooling system, d) cylinder lubricating oil system, e) hydraulic systems, f) thermal oil systems.	2			EKP1 EKP2
8.	Operating fluids sampling rules and theirs influence on the analyses.	0,5		1	EKP1 EKP4 EKP5
9.	Ageing and impurities of chosen operating fluids: a) boiler water, b) cooling water, c) fuel, d) lubricants, e) hydraulic fluids, f) thermal oils.	1		1	EKP1 EKP3 EKP4 EKP5
10.	Chosen operating fluids analyses: a) boiler water, b) cooling water, c) fuel, d) lubricants, e) hydraulic fluids, f) thermal oils.			8	EKP1 EKP4 EKP5
11.	Stages of operating fluids use: a) selection, b) order, c) reception, d) storage, e) operating properties control, f) boundary values of operating fluids parameters, g) regeneration, h) change, i) utilization.	1		1	EKP2 EKP4 EKP5
12.	Problems with interchangeability and miscibility of chosen operating fluids.	0,5			EKP1
13.	Substitutes of chosen operating fluids: a) fuel, b) lubricating oils, c) hydraulic fluids, d) greases, e) thermal oils.	1			EKP1
14.	Commercial specification as a basis of operating fluids identification and theirs usability in expected application.			1	EKP1 EKP4

					EKP5
15.	Interpretation of the basis analyses of chosen operating fluids samples.			1	EKP3 EKP4 EKP5
16.	Taking operating decisions on the basis of chosen operating fluids analyses results, using of the instructions: a) boiler water, b) cooling water, c) fuel, d) lubricating oils, e) hydraulic fluids, f) thermal oils.	1		1	EKP3 EKP4 EKP5
17.	Personal protectives and necessary safety measures when using operating fluids or chemicals, using Material Safety Data Sheets (MSDS).			1	EKP1 EKP3 EKP4
18.	Basic analysis of chosen operating fluids by means of ship's mobile test kits and selection of additives: a) boiler water, b) cooling water, c) fuel, d) lubricating oils, e) hydraulic fluids, f) thermal oils.			6	EKP1 EKP4 EKP5

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1				x					
EKP2				x					
EKP3					x			x	
EKP4					x			x	
EKP5					x			x	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
III	Student assumed expected learning outcomes and meets the requirements of the STCW Convention relating to complete the course. Attended lectures (limit – 3 absences). Lecture: pass-test of the lecture. Laboratory: carrying out and passing all laboratory exercises according to schedule. The final note is an average for notes of lecture and laboratory.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	30	30		
Reading literature	5			
Preparing for laboratories, project classes		30		
Preparing for the exam, the pass test	5			
Drafting documentation of a project/report		10		
Participating in pass tests and exams	3			
Participating in consultation hours		5		
Total number of hours	43	75		
Number of ECTS points	**1,5**	**2,5**		
Summary number of ECTS points for the course	**4**			
Student's workload connected with practical classes	30+30+10+5=75			
Student's workload during the classes involving direct participation of academic teachers	30+5+5+3=43			

Literature:

Primary literature
1. K. Barcewicz - Ćwiczenia laboratoryjne z chemii paliw, smarów i wody. Copyright by Gdynia Maritime University, Gdynia 2006. 2. J. Stańda - Woda do kotłów parowych i obiegów chłodzących siłowni cieplnych. Copyright by WNT, Warszawa 1999. 3. P. Urbański - Paliwa i smary. Copyright by Foundation of Marine Merchant Academy in Gdynia Development, Gdynia 1999.
Secondary literature
1. A. Podniało - Paliwa, oleje i smary w ekologicznej eksploatacji. Copyright by WNT, Warszawa 2002. 2. R. Czarny – Smary plastyczne. Copyright by WNT, Warszawa 2004. 3. S. Żmijewska, W. Trześniowski – Badania jakości wody stosowanej na statkach. Copyright by Szczecin Maritime University, Szczecin 2005.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Mgr inż. Hanna Miller *Dr inż. Andrzej Młynarczak*	*KChiTP* *KSO*
2. The other people conducting the course:	
Dr inż. Magda Morawska	*KChiTP*
Mgr inż. Grzegorz Sikora	*KSO*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam

ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects

Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	37	Course :	**Marine Law and Insurances**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
VIIIE	2	1					15			
Total number during the studies:							**15**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills in the range of secondary school
2.	The course programme is in conformity with the extended training course on operational and management level in engineering department in mechanical speciality, annex No. 8 (A Directive of Ministry of Infrastructure and Development, 28th February, 2014, pos.536)

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

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	describe basic notions in the range of marine law, marine administration	K_W10 K_W11
EKP2	discuss international requirements of navigation safety, international conventions and regulations concerning to marine environment protection	K_W10 K_K06
EKP3	explain matters concerning to marine insurances	K_W10

K_W10, K_W11; K_K06: K_W10 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester VIII

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Basic notions, range of regulation and sources of marine law (8.16 p.1)	1			EKP1
2.	Vessel notion: - vessel state flag; - vessel register; - ship-owner; - ship's operator;	1			EKP1

	- ship time charterer (8.16 p.2)				
3.	Marine administration: competences, inspections, certificates: - control of ship navigation ability; - responsibility of law offending (8.16 p.3).	1			EKP1
4.	Sanitary, custom and passport clearance (8.16 p.4).	1			EKP1
5.	Ship law status at sea: - sea area partition; - consequences of law offending for ships and crew responsibility (8.16 p.5).	1			EKP1
6.	Ship and crew certificates and documents required international conventions (enumerated in pp. 7 and 8) (8.16 p.6)	2			EKP1
7.	International requirements of navigation safety: - law regulations concerning to shipment status; - law regulations concerning safety of live at sea (SOLAS Convention) ; - law regulations concerning training standards, issuing certificates and watchkeeping (8.16 p.7)	6			EKP2
8.	International conventions and regulations concerning to marine environment protection (MARPOL Convention) (8.16 p.8)	2			EKP2
9.	International and domestic regulations of labour law (8.16 p.9)	1			EKP2
10.	Ship's insurance: - marine insurance matter; - insurance risk; - exceptions; - preparing of after accident documentation (8.16 p.10).	1			EKP3

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1			**X**						
EKP2			**X**						
EKP3			**X**						

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
VIII	Student obtained required educational effects and fulfill requirements of STCW Convention. Positive grade of written examination.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	15			
Reading literature	20			
Preparing for laboratories, project classes				
Preparing for the exam, the pass test	10			

Drafting documentation of a project/report				
Participating in pass tests and exams	5			
Participating in consultation hours				
Total number of hours	50			
Number of ECTS points	**2**			
Summary number of ECTS points for the course	**2**			
Student's workload connected with practical classes	35			
Student's workload during the classes involving direct participation of academic teachers	15			

Literature:

Primary literature
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.
Secondary literature
1. Ship technical documentation. 2. Check lists. 3. Popowska H., „Prawo i ubezpieczenia morskie", Gdańsk 2009.

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Jerzy Herdzik	*Marine Power Plant Department*
2. The other people conducting the course:	
Andrzej Młynarczak	*Marine Power Plant Department*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P – project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 20.12.2014 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	38	Course :	**Engine Room Simulator**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
VII	2			3					44	
Total number during the studies:							**44**			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	High school knowledge
2.	Program is compatible with Annex 8 of Rozporządzenie Ministra Infrastruktury i Rozwoju dated 28 lFebruary 2014 r. position. 536

Course objectives

1.	The transfer the knowledge about the engine room safe operation is the aim of this course.

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	name the main components of the engine room and the monitoring equipment	K_W03, K_W04
EKP2	prepare engine room for the operation, prepare the auxiliary systems and main engine, follow the operation rules and procedures	K_W09, K_U09, K_U15, K_U20
EKP3	diagnose the ship engine room, recognize the faults and fix them	
EKP4	act as team playing the different roles and understand the team management rules.	K_U02, K_K03, K_K05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester VII

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Familiarization: Plant arrangements List the machinery and associated systems and equipment which form the simulated plant, such as: -Tanks -Valves -Pipe systems -Pumps			4	EKP1

	-Heat exchangers -Oil treatment plant -Line filters -Electric generators (Diesel & Steam) -Main propulsion unit -Local controls -Distant controls Describe how the machinery and associated systems and quipment are arranged and linked together to form the plant, and compiles a block diagram illustrating this. Describe the relationship between the block diagram and the plant Mimic. Describe and lists the instrumentation used in the simulated plant to measure and indicate: -Pressure -Temperature -Fluid level -volume/mass (quantity) -Flow rate -Speed of rotation -Torque/power -Voltage -Current -CO2 content (of exhaust gases) -Pressure/volume in the engine cylinder (”Indicator diagram”) Describe the alarms that are used to indicate malfunctions and faults. State that the machinery units forming the plant can be controlled from: -A position adjacent to the units in the engine room (local control); -A console in the control room (central control); -The bridge (bridge control). State that operation of the main propulsion unit can be monitored from the instructor room, and faults introduced as required by the training programme.				
2.	State that safe practices must always be used when preparing machinery units and associated systems for start up and operation. Discuss the safe practices to be used for: -Opening and closing valves; -Starting and running pumps; -Operating water-circulation systems; -Admitting steam into a steam system; -Firing up an oil-fired boiler; -Filling oil tanks; -Operating centrifuges; -Keeping bilges empty; -Disposing of oil wastes. State that as far as practicable a check-list should be used for all machinery units and systems when: -Preparing for use; -Starting up; -Entering normal operating mode.			12	EKP2, EKP3, EKP4

	State the operational requirements for connecting an electric generator into the electrical system in the terms of: -Speed; -Voltage; -Frequency; -Synchronization. Demonstrate by the use of the simulated plant, a checklist and the procedures for: -The opening and closing of valves in a system; -The circulation of seawater; -Firing up the steam boiler; -Operating a fuel oil centrifuge; -Pumping out bilges.				
3.	General procedures Prepare, start up, and put in to the normal operating mode: -The seawater circulating system; -The freshwater circulating system; -The compressed air system; -The fuel centrifuge. Prepare, start up, and run the diesel electric generator. Synchronize, Parallel and load share. Prepare and raise steam to normal working pressure Put the steam boiler on line. Apply preparation procedures, including: -Checking the seawater circulation through heat exchangers; -Checking the freshwater circulation through engine and heat exchangers; -Checking the lubricating-oil circulation through engine and heat exchangers; -Confirming that the engine turning gear is disconnected; -Checking the fuel oil circulation through heaters to injection pump inlets; -Confirming that compressed air is available for starting; -Confirming that the engine cylinder lubrication is functioning; -Turning the engine with starting air for one revolution with indicator cocks open. Apply preparation procedures, including: -Confirming that all indicator cocks are closed; -Confirming fuel oil circulation; -Confirming of bridge order for engine movement; -Application of starting air for 3-4 revolutions; -Moving fuel control to required speed position. Establish normal running mode and observe operating conditions, including: -Temperatures of lubricating oil and cooling water; -Temperatures of exhaust gas from each cylinder; -Temperatures of engine exhaust gas at inlet and exit from turbo charger; -Engine speed and power output; -Maintaining a check on fuel oil supply (service tank); -Maintaining a check on fuel viscosity and temperature;			3	EKP2, EKP3, EKP4

	-Applying changes of engine speed and power as directed by the bridge and note change s in operating conditions.				
4.	MAIN ENGINE OPERATION Prepare, start and run the main propulsion unit and associated systems. Set the main propulsion unit controls to maximum full ahead sea power as directed from bridge control, or Apply manoeuvring procedures and use the controls to obtain required power outputs			4	EKP3,EKP4, EKP4
5.	Routine duties undertaken during a watch At regular intervals: inspect all operational machinery, noting operating conditions and correcting any deviations from the normal mode Operate the oil centrifuges as necessary Check the steam production plant periodically and adjust as necessary -CO2 content of exhaust gas -exhaust gas inlet and outlet temperatures if operating on waste heat The seawater temperature periodically and adjust the heat exchanger control valves in order to maintain the engine cooling water and lubricating oil within the correct operational range Check that the main engine cylinder lubrication is within the correct range Check the electrical system voltage and load and, if two or more generators are operating, that the load is properly balanced Check the pressure in compressed air storage tanks and top up Inspect bilge and under floor spaces and clear them using the bilge pump and complying with any anti-pollution regulations State that when serving on an actual ship the watch keeping routines and duties would also include responsibilities related to: -steering gear -propeller shaft casing and bearings -domestic freshwater -water for sanitary use			3	EKP3,EKP4, EKP4
6.	Propulsion system operation engine-propeller-hull. -Operating point setting. -Operating point assessment. -Selection of the propeller curve -Selection of the efficient operating point			3	EKP3,EKP4, EKP4
7.	Environment protection -Bilge system operation and monitoring -Sewage plant operation			2	EKP3,EKP4, EKP4
8.	Duties associated with taking over and accepting a watch Enter the machinery space 15 minutes before the change of watch Inspect all operating units, noting operational conditions and any deviations from the normal mode Check steam boiler water level Inspect bilge Note engine telegraph instruction and check engine control position and related speed			4	EKP3,EKP4, EKP4

	Check quantities and levels in engine room service tanks Examine the engine room log Receive an oral report from the engineer officer in charge of the watch for the period of watch keeping now completed Enter in the engine room log any abnormal operational conditions noted during inspection Accept, if satisfied, responsibility for the machinery space operation				
9.	Troubleshooting Locate and apply remedial action for the following malfunctions or faults not limited to: -Fuel injection timing (early/late); -Worn piston rings in one cylinder; -Fire in the scavenge air space; -Fouled turbo charger (exhaust side); -Fouled turbo charger (air side); -Fouled turbo charger air filters; -Fouled scavenge air cooler/ports; -Blackout; -Clogged auxiliary machinery oil filters; -Overheated main bearing; -Fouled heat exchanger surfaces; -Lubricating-oil circulation pump failure; -Flooded bilge sump; -Bridge control failure.			4	EKP3,EKP4, EKP4
10.	Propulsion system operation. Operation with main engine limited availability. Engine power limitation means. Operation in the extreme ambient conditions.			2	EKP3,EKP4, EKP4
11.	Engine room emergency operation -Blackout (causes and restoring from) -Main engine emergency operation (cylinder switched off)			2	EKP3,EKP4, EKP4

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1		**X**						**X**	
EKP2		**X**						**X**	
EKP3		**X**						**X**	
EKP4								**X**	

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
VII	Student has achieved the planned training goals. Student has successfully attended all practical exercises. The final grade is a mean value from the theoretical and practical grade.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours		44		
Reading literature				
Preparing for laboratories, project classes		2		
Preparing for the exam, the pass test				
Drafting documentation of a project/report				
Participating in pass tests and exams				
Participating in consultation hours		1		
Total number of hours		47		
Number of ECTS points		**2**		
Summary number of ECTS points for the course	**2**			
Student's workload connected with practical classes	44h – 2 ECTS			
Student's workload during the classes involving direct participation of academic teachers	44+1=45h 2 ECTS			

Literature:

Primary literature
1. Chell N.: Operation and Maintenance of Machinery in Motorships, IMarEST MEP Series, Volume 1, Part 18 2. Griffiths, Marine Medium Speed Engines, IMarEST MEP Series, Volume 1, Part 3
Secondary literature
1. Henshall S.H.: Slow Speed Diesel Engines, IMarEST MEP Series, Volume 2, Part 17

Persons condcuting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Dr. Mariusz Giernalczyk prof. AM *Chief Engineer*	*KSO*
2. The other people conducting the course:	
Dr Wojciech Gałecki	*KSO*
Dr, Jerzy Kreft	*KSO*

Explanation of the abbreviations used:

L – lectures,
C– classes,
L – laboratory
P –project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITYFACULTYOF MARINE ENGINEERING			
No	39	Course:	**Marine Propulsion Plant**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
V E	2	2					30			
Total number during the studies:							30			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Knowledge and skills at level of high school
2.	The program is compatible with frames of extended training program at operational and management level in machinery department for mechanical specialty (Directives of Ministry of Infrastructure and Transportation of Republic of Poland (dated 28 Feb. 2014 r. p. 536)

Course objectives

1.	The general objective is to hand over basic knowledge and skills necessary for safe exploitation of ships technical equipment, in scope of ships propulsion systems

Educational Effects for the whole Course(EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	Describe ship's propulsion and energetic system	KW_03; KW_08
EKP2	Describe components of ships' resistance and influence of outer conditions at resistance	KW_04
EKP3	Explain the basis of cooperation of the set: engine – hull – screw propeller	KW_03
EKP4	Explain basis of work of ships propulsors	KW_03
EKP5	Present kinds of ship's maintenance surveys and its organisation	KW_05; KW_09; KW_12
EKP6		
EKP7		

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester V

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Ship's energetic and propulsion systems. Power required to ships	2			EKP1

	movement. Efficiency of propulsion system elements. Drive system and its efficiency. Engines for main propulsion and auxiliary 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.				
2.	Resistance of ship's movement. Resistance at open waters. Elements of ships resistance. Towing resistance, wave resistance and aerodynamic resistance	2			EKP2
3.	Ways of determination of hull's resistance. Methods of calculation and modelling in tank tests	2			EKP2
4.	Ships resistance characteristics: a) constructional resistance, operational factors with influence at ships resistance, relation between speed and resistance. b) dead power, contracting speed, relations between speed and outer conditions and fuel consumption, main propulsion, power load.	2			EKP2
5.	Resistance of sailing at limited and shallow waters. Depth of the shallow area, Froude number at shallow waters. Additional phenomena related to water flow around a hull – following stream and sucking force	2			EKP2
6.	Methods of ships steering; a) types of propellers: - types ad 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, b) rudders, construction and mode of operation c) course bearing and course changing, d) manoeuvring	4			EKP3, EKP4
7.	Model research of screw propellers. Hydrodynamic characteristics of a screw. Influence of screw geometry at run screw characteristic curves. Screw's rotary characteristics.	2			EKP4
8.	Modern propulsion systems with shaft generators and rules of its exploitation. Rules of exploitation of PTO PTI systems. Exploitation of turbo generators.	2			EKP4
9.	Characteristics of propulsion systems with fixed pitch propellers. Influence of loading and weather condition at engine running points. Matching the propeller to propulsion system. Heavy propeller and light propeller.	2			EKP3
10.	Characteristics of propulsion systems with Controllable Pitch Propeller. Advantages of the system: variable rotational speed engine and CPP. Reduction gears systems, influence of gear ratio at propulsion system's exploitation, engine layout and running point for propulsion with CPP, optimisation of running point, influence of weather at characteristic of propulsion's efficiency	2			EKP3
11.	Working of propulsion system under manoeuvring – Robinson's curves	1			EKP3
12.	Deck equipment, rescue and salvage equipment	2			
13.	Engine's load diagrams, exploitation limits of maximal and minimal	2			EKP1

	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. Matching of propulsion system elements i.e. piston engine – FPP, redundancy of power and revolutionary speed of the engine in direct propulsion system, calculation of effective load of the engine.				
14.	Ship's inspections and surveys, ranges and aims. Dry dock overhauls. Role of IMO and Classification Societies. Sea trials and Ballard test, general rules and results analysis. Evaluation of propulsion selection based on sea trials and tank tests. Influence of propulsion selection at ships exploitation.	3			EKP5

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1			X						
EKP2			X						
EKP3			X						
EKP4			X						
EKP5			X						
EKP6			X						
EKP7			X						

Criteria for crediting the course:

Semester	Positive grade (a minimum pass–Polish: dostateczny)
V	Student has achieved expected effects of education and fulfils requirements of STCW Convention related to the subject. 100% of presence at lectures. In case of absence (max 10%) individual passing of omitted part. Lecture: written exam

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	30			
Reading literature	10			
Preparing for laboratories, project classes				
Preparing for the exam, the pass test	10			
Drafting documentation of a project/report				
Participating in pass tests and exams	2			
Participating in consultation hours	2			

Total number of hours	54			
Number of ECTS points	**2**			
Summary number of ECTS pointsfor the course	**2**			
Student's workload connected with practical classes				
Student's workload during the classes involving direct participation of academic teachers	30			

Literature:

Primary literature
1.
Secondary literature
1.

Persons condcuting the course:

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course:	
2. The other people conducting the course:	

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S– seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) –an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	40a	Course:	**Marine Internal Combustion Engines Operation & Maintence**
Field/Level of education:			**Mechanical Engineering and Machine Design/ First-degree (engineer)**
Form of studies:			**full - time**
Profile of education:			**practical**
Specialization:			**Marine Propulsion Plant and Offshore Construction Operation**

Semester	ECTS	Number of hoursin the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
VIII	2	2					30			
Total number during the studies:							30			

Prerequisites relating to knowledge, skillsand other competences (if they concern the course)

10.	Knowledge and skills in the field of marine piston engines

Course objectives

11.	The aim of the course is to provide basic knowledge and skills in the field of marine life piston engines, including: procedures to prepare them for motion, starting, loading, current operational control, running the engine in different operating states

Educational Effectsfor the whole Course(EKP) – after completingthe educational cycle

Symbol	After completing the courseaStudent can :	Reference to the field educational effects
EKP1	To describe the process of preparing the engine for motion, its starting, and work in various operating states	K_W02; K_W06; K_W09
EKP2	To describe the most important checks carried out during the ship's engine operation and to assess the significance of selected parameters to control the operation of the engine	K_W07; K_W08; K_U01; K_U15;
EKP3	To indicate links (connections) between typical faults in marine engine operation and operating personal errors	K_U13; K_U15; K_U16
EKP4	To use literature sources, databases, other sources of information; interprets information, formulate opinions and conclusions	K_U01,
EKP5	To make the right decisions in untypical operating conditions	K_K10

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester VIII

No	Content	Number of aching			Reference to EKPof the course
		L	C	Lab/P	
1.	Preparing piston engines for marine movement. Preparation and start systems, commissioning systems: lubricating, cooling, fuel, compressed air. Other preparatory activities. Preparations for work after a long standstill.	4			EKP1
2.	Starting marine engines.	1			EKP1

3.	Running the engine during exit to the sea.	2			EKP1
4.	Current and periodic service of marine engines. Operation systems: piston-crank, working medium exchange, fuel, lubrication and cooling.	4			EKP1 EKP2
5.	Operation systems: piston-connecting rod intake and exhaust, fuel, lubrication and cooling	4			EKP1
6.	Parameters routinely monitored. Evaluation of the operating engine. Correction and adjustment settings - static and dynamic control. Records of engine operating parameters.	4			EKP2
7.	Errors handling result from troubles and malfunctions in marine engines. Remedies.	2			EKP3
8.	Entrance seaport maneuvers, stop and break (disengage) of the engine	1			EKP1
9.	The influence of external conditions on the operation of the engine	2			EKP1
10.	Specific operating conditions marine diesel engine. Emergency maneuver. Engine operation in specific operating conditions (in a storm, the waters restricted and freezed area, of the marine propeller damaged).	4			EKP1;EKP5
11.	Running the engine with a load different from the nominal	2			EKP1;EKP5
12.	Running the engine with a damaged cylinder / cylinders	1			EKP1;EKP5
13.	Running the engine with a defective charging system	1			EKP1;EKP5
14.	Selection of the operating parameters of main engine for a limited stocks fuel	2			EKP1;EKP6

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1				**X**					
EKP2				**X**					
EKP3				**X**					
EKP4				**X**					
EKP5				**X**					

Criteria for crediting the course:

Semester	Positive grade (a minimum pass–Polish: dostateczny)
VIII	Student achieved the expected educational effects of the course, attended lectures (allowed 3 absences). Crediting the course in based on an assessment of the colloquium.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	30			
Reading literature	15			
Preparing for laboratories, project classes				
Preparing for the exam, the pass test	10			
Drafting documentation of a project/report				
Participating in pass tests and exams	2			
Participating in consultation hours	3			
Total number of hours	60			
Number of ECTS points	**2**			
Summary number of ECTS pointsfor the course	**2**			
Student's workload connected with practical classes	-			
Student's workload during the classes involving direct participation of academic teachers	30+2+5=37 - 2ECTS			

Literature:

Primary literature
1. Piotrowski I., Witkowski K.: Eksploatacja okrętowych silników spalinowych. Balic Surveyors Grup Ltd. Sp z o.o Gdynia 2012.
Secondary literature
1. Piotrowski I., Witkowski K.: Eksploatacja okrętowych silników spalinowych. Balic Surveyors Grup Ltd. Sp z o.o Gdynia 2012.

Persons condcuting the course:

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course:	
DSc., DEng., Kazimierz Witkowski	*Department of Marine Power Plant*
2. The other people conducting the course:	
DSc., DEng., Kazimierz Witkowski	*Department of Marine Power Plant*
DEng., Jerzy Herdzik	*Department of Marine Power Plant*
DEng., Jerzy Kreft	*Department of Marine Power Plant*
DEng., Zygmunt Górski	*Department of Marine Power Plant*

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P –project,
S– seminar
E – exam

ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects

Convention STCW – (Standards of Training, Certification and Watchkeeping) –an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING			
No	40b	Course :	**Equipment and Facilities of Drilling Platforms**
Field/Level of education:			**Mechanical Engineering and Machine Design / first-degree**
Form of studies:			**full-time**
Profile of education:			**practical**
Specialization:			**Marine Power Plant and Offshore Construction Operation**

Semester	ECTS	Number of hours in the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
VIII	2	2					30			
Total number during the studies:							30			

Prerequisites relating to knowledge, skills and other competences (if they concern the course)

1.	Marine equipment and machinery, ship power plants systems, marine turbines, marine piston engines, marine environment protection, ship safety management
2.	The course programme is additional for marine engineer course on operational and management level

Course objectives

1.	The course objective is the basic knowledge and skills concerning to equipment on drilling platforms, essential to safe maintenance of offshore facilities technical equipment

Educational Effects for the whole Course (EKP) – after completing the educational cycle

Symbol	After completing the course a Student can :	Reference to the field educational effects
EKP1	enumerate types of offshore mining units	K_W03
EKP2	characterize equipment and systems of offshore drilling platforms	K_W04
EKP3	discuss the requirements of Mobile Offshore Drilling Units Code (MODU Code) concerning to types and number of installed equipment	K_W10

K_W03, K_W04; K_W10 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester VIII

No	Content	Number of aching			Reference to EKP of the course
		L	C	Lab/P	
1.	Types of offshore mining units: - Jack-up platforms; - Column offshore mining units; - Offshore mining vessels; - Offshore mining barges.	8			EKP1
2.	Power plant of offshore mining unit: - Main power plant; - Emergency plant.	4			EKP1
3.	Equipment and systems for gas and liquid minerals extracting, initial storage and processing for delivery:	14			EKP2

	- boilers and compressors production systems; - main fuel systems and fuel tanks; - platform systems: fuel-steam, compressed air, cooling water; - diving systems for platform operation: hyperbaric chambers, diving bell, diving works organization; - fire protection and fire fighting systems. Deck equipment and auxiliary machinery of MODU units.				
4.	Requirements of MODU Code concerning to types and number of installed units.	2			EKP3
5.	Stability systems of offshore units.	2			EKP2

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1				**X**					
EKP2				**X**					
EKP3				**X**					

Criteria for crediting the course:

Semester	Positive grade (a minimum pass –Polish: dostateczny)
VIII	Student obtained required educational effects and fulfill requirements of STCW Convention. Positive grade from pass test.

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	30			
Reading literature	15			
Preparing for laboratories, project classes				
Preparing for the exam, the pass test	10			
Drafting documentation of a project/report				
Participating in pass tests and exams	2			
Participating in consultation hours	3			
Total number of hours	60			
Number of ECTS points	**2**			
Summary number of ECTS points for the course	**2**			
Student's workload connected with practical classes	30			
Student's workload during the classes involving direct participation of academic teachers	30			

Literature:

Primary literature
1. Mather, Angus: Offshore Engineering and Production, Livingston, Witherby Publishing Group Ltd., 2011 2. Requirements concerning mobile offshore drilling units, Polish Register of Shipping, Gdańsk, 2007
Secondary literature
1. Cydejko J., Puchalski L., Rutkowski G.: Statki i technologie off-shore w zarysie, Trademar, Gdynia, 2011

Persons conducting the course :

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course :	
Andrzej Młynarczak	*Marine Power Plant Department*
2. The other people conducting the course:	

Explanation of the abbreviations used:
L – lectures,
C– classes,
L – laboratory
P – project,
S – seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
Convention STCW – (Standards of Training, Certification and Watchkeeping) – an international convention on the requirements concerning seamen training, issuing certificates and watchkeeping.

Updated: 18.12.2014 r.

GDYNIA MARITIME UNIVERSITYFACULTYOF MARINE ENGINEERING			
No	40 c	Course:	**Marine Turbines - Operation & Maintenance**
Field/Level of education:			**Mechanical Engineering and Machine Design / first-degree**
Form of studies:			**full-time**
Profile of education:			**practical**
Specialization:			**Marine Power Plant and Offshore Construction Operation**

Semester	ECTS	Number of hoursin the week					Number of hours in the semester			
		L	C	Lab	P	S	L	C	Lab	P
VIII	2	2					30			
Total number during the studies:							30			

Prerequisites relating to knowledge, skillsand other competences (if they concern the course)

1.	Thermodynamics, steam turbines, steam boilers.

Course objectives

1.	The objective is handing over the knowledge and skills in range of construction and maintaining of steam turbine plants.

Educational Effectsfor the whole Course(EKP) – after completingthe educational cycle

Symbol	After completing the courseaStudent can :	Reference to the field educational effects
EKP1	To utilize general knowledge about construction, fabrication and exploitation of ships mechanisms, to utilize technical knowledge, necessary for proper sustainment, maintenance and exploitation of ships mechanisms and systems and for safe managing of exploitation of ships power plant.	K_W03;K_W04
EKP2	To utilize self – learning capabilities for rising professional competence, To utilize analytic methods, simulation and experiments for creating and resolving practical engineering problems, typical for ships power plants, To utilize the knowledge for interpretation of phenomena taking place in machines and systems of a ship.	K_U05;K_U09;KU_13
EKP3	To cooperate within task group playing different roles, and to show understanding of cooperation's rules.	K_K05

K_W02, K_U08; K_K05 – effects symbols for the educational effects for the field (W-knowledge, U-skills, K-social competences)

Program content:

Semester VIII

No	Content	Number of aching			Reference to EKPof the course
		L	C	Lab/P	
1.	Overview of main boilers constructions. Main elements of boiler's construction: water and steam take – off drums; radiation and convection heated surfaces; steam drying; feeding pipelines; water	2			EKP1

	and air heaters, steam super heaters.				
2.	Regulation methods: temperature of super heated steam; steam pressure; water level in boiler.	2			EKP2
3.	Boilers with fluidal burners. Steam preheating methods in fluidal heaters.				EKP1
4.	Starting, working under constant and variable load and shut down of a boiler. Engagement of steam boiler.	2			EKP1 EKP3
5.	Supervising of working boiler. Maintenance routines. Boiler's foaming.	2			EKP2
6.	Boiler's conservation routines before short and long term out of work.	1			EKP2
7.	Overview of modern constructions of auxiliary boilers, fired, utilization and combined.	4			EKP1 EKP2 EKP5
8.	Exploitation of marine steam turbines – exploitation of turbine's systems: - Lubricating oil system - Heating steam and blow-by system - Steam seal system - Valves governing hydraulic system - Automatic control and emergency systems.	7			EKP2
9.	Exploitation of marine steam turbines – typical modes of work: Preparation to start, worming up, start, setting under load, stop and shut down routines. Typical maintenance routines in exploitation and classification.	4			EKP3
10.	The Rules of Classification Societies about Marine Steam Turbine Propulsion.	4			EKP3

Methods of verifying educational effects /in correlation with particular effects/:

Symbol of EKP	Test	Oral exam	Written exam	Pass test	Report	Project	Presentation	Practical final work	Others
EKP1				**X**					
EKP2				**X**					
EKP3				**X**					
EKP4									
EKP5									
EKP6									
EKP7									

Criteria for crediting the course:

Semester	Positive grade (a minimum pass–Polish: dostateczny)
VIII	Student achieved expected effects of education if was present at lectures (3 absences are permissible) and presented adequate knowledge. Lectures: pass test. Note is written down in the student's index after passing the pass test

Note: A Student is credited with the grade higher than a minimum pass, if the educational effects exceed the required minimum.

Student's own work:

Form of activity	Estimated number of hours devoted to the activity			
	L, C	Lab	P	S
Contact hours	30			
Reading literature	10			
Preparing for laboratories, project classes				
Preparing for the exam, the pass test	10			
Drafting documentation of a project/report				
Participating in pass tests and exams	1			
Participating in consultation hours	2			
Total number of hours	53			
Number of ECTS points	**2**			
Summary number of ECTS pointsfor the course	**2**			
Student's workload connected with practical classes	0			
Student's workload during the classes involving direct participation of academic teachers	30+2+1=33 – 2 ECTS			

Literature:

Primary literature
2.
Secondary literature
2.

Persons condcuting the course:

Title/degree, name and surname	*Didactic unit*
1. Person responsible for the course:	
2. The other people conducting the course:	

Explanation of the abbreviations used:

L – lectures,
C– classes,
L – laboratory
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S– seminar
E – exam
ECTS - (European Credit Transfer System) points defined in the European accumulation and transfer system being the measure of student's average workload that is indispensable to obtain the anticipated educational effects
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Updated: 16.01.2013 r.

GDYNIA MARITIME UNIVERSITY FACULTY OF MARINE ENGINEERING

Field/Level of education: Mechanical Engineering and Machine Design

Profile of education: Practical

Specialization: Marine Propulsion Plant and Offshore Construction Operation

Decision of Council of Marine Engineering Faculty 19.04.2012 r. correction 22.05.2014

Gdynia Maritime University — FACULTY of MARINE ENGINEERING — PLAN of STUDY

Speciality: MARINE POWER PLANT ENGINEERING AND OFFSHORE CONSTRUCTION ENGINEERING

FIRST LEVEL OF STUDY — STATIONARY STUDIES — Bachelor of Engineering

Magagement Level

The timetable programmatic in years: I Year (Sem. I, Sem. II), II Year (Sem. III, Sem. IV), III Year (Sem. V, Sem. VI), IV Year (Sem. VII, Sem.VIII)

No	Name of subjects	Hours: Total	including: Le	Ex	Lab	p\s	ECTS	Sem. I w	c	l/p	ECTS	Sem. II w	c	l/p	ECTS	Sem. III w	c	l/p	ECTS	Sem. IV w	c	l	p	ECTS	Sem. V w	c	l	p	ECTS	Sem. VI w	c	l/p	ECTS	Sem. VII w	c	l/p	S	ECTS	Sem.VIII W	c	l/p	S	ECTS
1	English*	180		180			8						2		1		2		1		2			1		2			1						2			2		2			2
2	Fundamentals of Informatics	45	15		30		3					1		2	3																												
3	Labor Sociology**	30	30				2	2			2																																
4	Fundamentals of Economics and Management	30	30				2					2			2																												
5	Protection of Intellectual Property	10	10				1	1			1																																
6	Occupational Safety and Ergonomics	15	15				1	1			1																																
7	Physical Education	60		60			0						1		0		1		0		2			0																			
8	Mathematics I, II	150	60	90			13	2	4		8	2	2		5																												
9	Physics I, II	120	45	45	30		10	2	3		7	1		2	3																												
10	Engineering Mechanics* I, II	90	60	30			8					2	1		4	2	1		4																								
11	Strength of Materials I, II	105	45	30	30		8									2	1		4	1	1	2		4																			
12	Fluid Mechanics	45	30	15			3													2	1			3																			
13	Engineering Graphics * I,II, III	75	15		60		7					1		2	4			2	3																								
14	Fundamentals of Machine Elements Design &	120	60		60		7									2			3	2				2			4		2		PRAKTYKA MORSKA												
15	Machine Elements - design exercises I,II	30				30	4																1	2				1	2														
16	Fundamentals of Machine Operation & Mainte	30	30				2													1				1															1				1
17	Material Science* I,II,III	90	45		45		8	2			3	1		2	3			1	2																								
18	Fundamentals of Manufacturing Engineering I,	120	45		75		8	2			3	1		1	3			4	2																								
19	Thermodynamics* I,II	105	45	30	30		7									2	2		4	1			2	3																			
20	Fundamentals of Electrotechnics & Electronics	60	30	15	15		5	2	1		3			1	2																												
21	Fundamentals of Control Engineering & Robot	45	30		15		5													2				3			1		2														
22	Metrology & Measurement Systems	45	15		30		3									1		2	3																								
23	Marine Environment Protection*	25	25				2	2			2																																
24	Repair Engineering* I, II,III	100	60		30	10	7																		2				2					1			1	2	1		2		3
25	Naval Architecture & Ship Construction* I,II,III	75	60	15			6																		2				3					2	1			3					
26	Marine Power Plants* I,II,III	85	60	15		10	7													2				2	1	1			2					1			1	3					
27	Technical Diagnostics*	15	6		9		1																		0,5		0,5		1														
28	Management of Ship Operation Safety* I,II	40	20	10		10	4																														1	1	2	1			3
29	Marine Internal Combustion Engines* I,II,III	105	65		30	10	7													2				2	1		1		2					1,1		1	1	3					
30	Marine Boilers* I,II	59	34	15		10	4													2	1			3													1	1					
31	Marine Turbines*	60	30	15	15		4																		2	1	1		4														
32	Marine Auxiliary Machines & Equipment* I,II,III	130	90		30	10	9													2				2	2		1		3					2		1	1	4					
33	Marine Refrigeration & Air Conditioning* I,II	55	30		15	10	4																		2				2							1	1	2					
34	Marine Electrotechnics & Electronics* I,II	103	78		15	10	6																		2				2					3		1	1	4					
35	Marine Control Systems*	40	15	4	11	10	3																											1		1	1	3					
36	Water, Fuel & Lubricants*	60	30		30		4									2		2	4																								
37	The Law and Marine Insurance*	15	15				2																																1				2
38	Engine Room Simulator*	44			44		2																													3		2					
39	Marine Propulsion Plant*	30	30				2																		2				2														
40	Mar. Internal Combust. Engine-Operation & Ma Machines of Offshore Drilling Units** Marine Turbines - Operation & Maintenance**	30	30				3																																2				3
41	Marine practice* I,II	0					32																PM	2								PM	30										
42	Diploma Thesis Seminar	30				30	1																																			2	1
43	Diploma Thesis Work	0				D	15																																			D	15
	Total	**2701**	1333	569	649	150	240	16	8	0	30	11	6	10	30	11	7	11	30	17	7	2	3	30	17	4	8,5	1	30			0	30	11	3	8	9	30	7	3	2	2	30
	Number of houres per week							25				28				29				31					31					0				31					14				
	Number of exams		20					3				2				2				3					2					0				5					3				

Training course /III or IV semester/

No	Name	Sem. II c	Sem. II l/p
1	SAR	x	x
2	Fire protection [BFF]	x	x
3	First Medical Aid	x	
4	Individual life-saving- technicses	x	

***- OBJECTS ACCORDING TO STCW 78/95**

**** - Subjects to choose by students**

MARINE PRACTICE	
2 months	II year
min. 5 months	III year

☐ - exam

L-lecture
E-exercise
L-laboratory
P - project
S - seminar

Subject	types of classes	Semester	Hours	ECTS
Offshore Drilling Unit Power Plants-	elective classes	VII	lecture-30	2
Physical Education	elective classes	I-VIII	2 hours/sem.	1/sem.