



Erasmus+



Maritime University of Szczecin

Courses in English for Erasmus Students

General Subjects &

Faculty of Mechatronics and Electrical

Engineering &

Faculty of Marine Engineering

academic year 2021/2022

winter semester

Szczecin 2021

	Type of the subjects	Name of the subject	Code	Semester
1	GENERAL	INTRODUCTION TO MARITIME SOCIOLOGY	FN	Winter semester
2	GENERAL	INFORMATION TECHNOLOGY semester 1	FN	Winter semester
3	GENERAL	MATHEMATICS semester 1	FN	Winter semester
4	GENERAL	MATHEMATICS semester 3	FN	Winter semester
5	GENERAL	PHYSICS semester 1	FN	Winter semester
6	GENERAL	COMPUTER SCIENCE semester 1	FN	Winter semester
7	GENERAL	AUTOMATION FN	FN	Winter semester
8	GENERAL	ELECTRICAL AND ELECTRONIC ENGINEERING semester 1	FN	Winter semester
9	GENERAL	MACHINE CONSTRUCTION AND ENGINEERING GRAPHICS semester 1	FN	Winter semester
10	SPECIALIZED	ELECTRICAL ENGINEERING	FMEE	Winter semester
11	SPECIALIZED	POWEELECTRONICS	FMEE	Winter semester
12	SPECIALIZED	ELECTRONICS	FMEE	Winter semester
13	SPECIALIZED	AUTOMATION FMEE	FMEE	Winter semester
14	SPECIALIZED	HIGH VOLTAGE LECTURE	FMEE	Winter semester
15	SPECIALIZED	HIGH VOLTAGE LABORATORIES	FMEE	Winter semester
16	SPECIALIZED	REPAIR TECHNOLOGY I	FME	Winter semester
17	SPECIALIZED	USE OF FUELS AND LUBRICANTS	FME	Winter semester
18	SPECIALIZED	MARINE POWER PLANTS I	FME	Winter semester
19	SPECIALIZED	INTRODUCTION TO SHIP CONSTRUCTION AND CREW ORGANIZATION	FME	Winter semester
20	SPECIALIZED	ECOLOGICAL ASPECTS OF SHIP OPERATION	FME	Winter semester

GENERAL SUBJECTS

INTRODUCTION TO MARITIME SOCIOLOGY	
Semester	Winter semester
Number of ECTS	1
Number of classes	LECTURE 15h
Description	<p>1. Sociology as a scientific discipline. Diversity of research aims in sociology. Characteristics of research methods in sociology: experiment, questionnaires and polls, observation, historical research.</p> <p>2. Major related, economic and cultural bases of social life. Social inequalities. Inequality in access to economic resources. Influence of the social environment on an individual.</p> <p>3. Race, nationality, nation: discrimination and ethnic prejudice. Characteristics of basic symbolic systems in society: language, systems of values, belief systems, systems of norms and knowledge resources. Cultural differences and prejudices.</p> <p>4. Globalization and its international determinants. Social dimension of globalization in maritime economy. Leadership and Teamwork; Human Element, Leadership and Management (HELM) – STCW 2010, Manila Amendments</p> <p>5. Working environment and life on a ship. Specifics of seafarer's and fisherman's jobs. Conditions of work at sea. Ship as an enclosed institution.</p> <p>6. Intercultural communication at work at sea. Awareness of cultural difference, inborn traits, attitudes, behavior and intercultural interactions.</p> <p>7. Types (and kinds) of social bonds. Social bonds on a ship. Ship's crew as a small integrated social group. Informal social structures on a ship.</p> <p>8. Sociological aspects of managing and conning a sea-going ship, team work.</p> <p>9. Professional preparation for work at sea. Job adaptation of seaman and fisherman. Motivations and needs of a seafarer on a ship versus stress and job adaptation.</p> <p>10. Psychosocial factors of occupational accidents of seamen and fishermen. Human error, situational awareness. Awareness of automation of performed actions.</p> <p>11. Specifics of seamen and fishermen jobs and their social consequences in life on land, including family life.</p> <p>12. Influence of work at sea on personality. Free time of seamen and fishermen. Complacency, boredom.</p>

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INFORMATION TECHNOLOGY – module 1	
Semester	Winter semester
Number of ECTS	1
Number of classes	LECTURE 15h
Description	<ol style="list-style-type: none">1. Sources of information – quantity of information, coding, compression, decompression, archiving of information.2. Means and standards of communicating information. Formats of data.3. Standards of data transmission. Solutions used in data transmission. Methods of sound transmission. Methods of image transmission.4. The subject and methods of information technology. Basic concepts.5. Information society: knowledge society, digital world, digitized documents, systems of document circulation.6. Hardware. Classification of hardware. Representation of data in computer systems. Hardware classification.7. Hardware items.8. Computer networks. The Internet. Network services.9. System software.10. User software. Programming – phases of programming.11. Programming and its phases.12. IT systems. Structure of IT system creation process.13. IT applications in the maritime economy.14. Selected legal issues: copyright, data security.15. Development trends in information technology.

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MATHEMATICS– module 1	
Semester	Winter semester
Number of ECTS	7
Number of classes	LECTURE 15h + CLASSES 30h
Description	<p>1. Differential calculus of single real variable function: supplementary knowledge of cyclometric functions, limits of sequences and functions, function derivative and differential, derivatives and differentials of higher orders, theorems on mean value, Taylor formula, monotonicity, extremes, convexity and concavity, points of inflexion, asymptotes, deL'Hospital rules, investigation of a behaviour of a function.</p> <p>2. Integral calculus of single real variable function: indefinite integral, fundamental integration methods and theorems, integration of rational, irrational and trigonometric functions, definite integral (Riemann's definition), fundamental theorems and properties of definite integral, Newton-Leibnitz theorem, improper integrals, use of definite integral in geometry.</p> <p>3. Differential and integral calculus of multi-variable function: definition of two-variable function, boundary and continuity of two-variable function, partial derivatives, derivatives of the composite function, exact differential, partial derivatives and exact differentials of higher orders, Taylor formula, multi-variable function extremes, definition and properties of double integral and triple integral, reduction of multiple integrals to iterated integrals, curvilinear directed and undirected integrals, Green's theorem</p>

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MATHEMATICS– module 3	
Semester	Winter semester
Number of ECTS	7 ECTS
Number of classes	LECTURE 15h+ CLASSES 15h
Description	<p>1. Ordinary differential equations: selected types of first order equations, selected types of second order differential equations: particular cases, linear differential equations of second order with constant coefficients;</p> <p>2. Probability calculus: elementary events, random events, definition of probability, properties of probability, conditional probability, independence of random events, Bernoulli scheme, total probability, Bayes formula, random variables, probability distributions of random variables, parameters of random variables, 2D discrete and continuous random variables, covariance, correlation coefficients, correlated random variables, independence of random variables.</p> <p>3. Fundamentals of mathematical statistics: basic terms and theorems, some probability distributions occurring in mathematical statistics, estimators, confidence intervals, statistical hypotheses and their verification, statistical tests.</p>

PHYSICS – module 1	
Semester	Winter semester
Number of ECTS	5
Number of classes	LECTURE 15h+ CLASSES 15+ LABORATORIES 15h
Description	<ol style="list-style-type: none"> 1. Determination of gravitational acceleration by a Kater's pendulum. 2. Determination of the heat of fusion and vaporization. 3. Examination of free vibrations of a string by the resonance method. 4. Determination of the rigidity modulus using a torsional pendulum. 5. Determination of gyroscope moment of inertia. 6. Determination of c_p/c_v ratio. 7. Determination of logarithmic decrement of damping. 8. Determination of the speed of sound in the air. 9. Measurement of dynamic viscosity and the dependence of viscosity on temperature.

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COMPUTER SCIENCE – module1	
Semester	Winter semester
Number of ECTS	2
Number of classes	LABORATORIES 30h
Description	<ol style="list-style-type: none"> 1. Construction of a PC. 2. Operating systems – structure and configuration. 3. Operation of selected utility programs. 4. Operation of selected application programs. 5. Word processor MS Word. 6. Computer networks – LAN. 7. Computer networks – Internet, WWW, FTP, e-mail, browsing for information. 8. Spreadsheet MS Excel. 9. Databases – MS Access. 10. E-mail.

AUTOMATION FN	
Semester	Winter semester
Number of ECTS	2
Number of classes	LECTURE 15h + LABORATORIES 15h
Description	<ol style="list-style-type: none"> 1, Basic concepts of automation. Structure, principle of operation, and block diagram of a ship's heading automatic control system. 2. Signal conversion in automation. Operator and spectral transfer functions, time-varying characteristics of elements and systems. 3. Characteristics and properties of basic linear elements. 4. Analogue continuous controllers - characteristics, properties, settings. 5. Requirements for control systems (stability and control quality). 6. Basic concepts of digital technology in automation. 7. Marine computer automatic control systems

ELECTRICAL AND ELECTRONIC ENGINEERING module 1	
Semester	Winter semester
Number of ECTS	2
Number of classes	LECTURE 15h + LABORATORIES 15h
Description	<p>1.General: voltage, intensity, electromotive force of a source of voltage; direct current (DC) circuits - Ohm's and Kirchoff's laws; energy and power in DC circuits.</p> <p>2. Marine batteries: types, principle of operation and use/maintenance.</p> <p>3. AC circuits - basic concepts, RLC circuits, reactance, impedance, active / reactive power, complex and apparent power, AC effective (rms) and mean values, electromagnetic induction and self-induction.</p> <p>4. Three-phase circuits: inland and shipboard power grids, their parameters types of connection, power of three-phase receivers.</p> <p>5. Electrical measurements: notations, principle of operation of basic measuring instruments; measurement of electrical parameters of RLC elements in electric circuits.</p> <p>6. DC machines: construction and principle of operation, types and basic characteristics of DC machines.</p> <p>7. AC machines: asynchronous machine, construction and principle of operation, its motoring operation; synchronous machine, construction and principle of operation, generator operation.</p> <p>8. Transformers: construction and principle of operation, working modes of transformers.</p> <p>9. Marine electrotechnology. 9.1. Generation and distribution of electric power on a ship. 9.2. Emergency power supply, starting up an emergency generating set.</p> <p>10. Protection against electrocuting: risks and protective measures in: a) grounded networks; b) insulated networks.</p>

MACHINE CONSTRUCTION AND ENGINEERING GRAPHICS	
Semester	Winter semester
Number of ECTS	3
Number of classes	LECTURE 15h + CLASSES 15h + LABORATORIES 15h
Description	<p>1.Principles of rectangular projection.</p> <p>2. Cross-sections and intersection of solids, axonometry.</p> <p>3. Simplified representation.</p> <p>4. Sequence of dimensions recording.</p> <p>5. Temporary and permanent joints.</p> <p>6. Characteristics of working and assembly drawings.</p> <p>7. Use of CAD programs for creating and edition of construction drawings.</p> <p>8. The concept of a machine, classification of machines by use.</p>

SPECIALIZED SUBJECTS -description

Faculty of Mechatronics and Electromechanics

ELECTRICAL ENGINEERING	
Semester	Winter
Number of ECTS	3
Number of classes	Lectures 30h + Classes 30h
Description	<p>LECTURE Ohm and Kirchhoff's laws. AC and DC circuits. Units and quantities. Resistor, induction coil and capacitor physical properties. Simple and branched circuits. Direct current circuits and properties. Alternating current properties. Electrical machines (DC and AC), AC generators, electrical batteries. Magnetic and electrostatic fields. Electrical installations and shock protection.</p> <p>CLASSES Mathematical calculations and theoretical analysis of basic electrical circuits. Learning the basic physical laws of electrical engineering.</p>
Requirements to participate in subject	Knowledge of physics and mathematics High school level

POWER ELECTRONICS	
Semester	Winter semester
Number of ECTS	3
Number of classes	Lectures 30 hours + Laboratories 15 hours
Description	<p>Lecture Power electronics devices – types, properties, control. Boost, buck DC converters – principle of operation, DC-DC dual active bridge, properties, and principle of operation, AC-DC controlled rectifiers – properties, AC-DC-AC inverters – one, three phases principle of operation, 3-level voltage source inverter. Programming converters control systems.</p> <p>Laboratories Manual exercises and connecting boost, buck DC converters. Programming 1-phase voltage inverter, programming 3-phase voltage inverter, programming multilevel inverter. Testing DC-DC DAB converter as stand-alone source. DAB converter in parallel work with AC-DC machine active converter. Generating mode of AC motors and generators with use of back-to-back inverter.</p>

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Requirements to participate in subject	Knowledge of physics and mathematics, basics of electrotechnics and electronics. High school level
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ELECTRONICS	
Semester	Winter semester
Number of ECTS	3
Number of classes	15 Classes+ 30 Laboratories
Description	The subject focuses on the basics of electronics, especially in practical terms, such as repair and diagnostics of common electronic devices. Students learn about the principle of operation of the most common components of electronics and the development trends of this discipline of science.
Requirements to participate in subject	Basic Electrical Engineering, Mathematics, Physics

AUTOMATION FMEE	
Semester	Winter
Number of ECTS	3
Number of classes	Lecture 30h Classes 30h Laboratories 20h+ 10h Symulator
Description	<p>LECTURE Classification of control systems, models of electrical and electromechanical dynamic systems, the Laplace transform, transfer function, the block diagrams of automatic control systems, block diagram transformations, basic systems control time and frequency characteristics, stability of dynamic systems. Stability criteria for linear systems. Control systems, their tasks and structure. The evaluation of the quality of control; static accuracy and static error, Basic control regulators: P, I, PI, PD and PID. Digital control, the Z-transform, basic digital control algorithms.</p> <p>CLASSES The simple differential equations calculations with operational method. The Laplace transforms and their properties; calculation of the inverse Laplace transform. The equations of electrical and electromechanical dynamic systems. State-space equations and solutions. Determination of the time and frequency characteristics. The Nyquist stability criterion for feedback control systems. Static accuracy and static error calculation.</p> <p>LABORATORIES+ SYMULATORS Introduction to Matlab and Simulink. Differential equations in Matlab calculations. Modelling of simple electrical elements and the determination of their dynamic characteristics. Creating dynamic systems state-space models. Linear controller and its structure. Synthesis of P, I, PI PID controllers. Feedback stability analysis of chosen systems.</p>
Requirements to participate in subject	Fundamentals of physics, Complex numbers algebra, Fundamentals of calculus – derivatives and integrals

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HIGH VOLTAGE LECTURE	
Semester	Winter
Number of ECTS	3
Number of classes	Lecture 30h
Description	Physical properties of high voltages. Insulations materials and dielectrics properties of solid, gas and air insulators. Partial discharges in MV cables, switchgears, machines. Testing for PD. Medium voltage installations – cables, switchgears, machines. Personal protection equipment used in MV installations. Operation with withdrawable MV switchgear. Insulation tests.
Requirements to participate in subject	Knowledge of physics and mathematics, electrical machines course. High school level

HIGH VOLTAGE LABORATORIES	
Semester	Winter
Number of ECTS	3
Number of classes	LABORATORIES 30h
Description	Personal protective equipment – use and handling. MV presence testers and electrical isolation procedures. Operation with MV withdrawable switchgear and circuit breaker. Use of portable leads (earthing). Operation with MV protection system. Operation on stationary switchgear with insulating switch. Testing of thermal protections. Testing of MV cables – insulation test, PI, DAR, DD tests.
Requirements to participate in subject	Knowledge of physics and mathematics, electrical machines course. High school level

FACULTY OF MARINE ENGINEERING

REPAIR TECHNOLOGY I	
Semester	winter
Number of ECTS	2
Number of classes	Lectures 24h + Laboratories 24h
Description	Description: The subject enables the student to acquire knowledge of: - practically use methods of machine component quality assessment; - methods of joining elements in dis/assembly of a machine, its subassemblies and components; can manage a team and assign duties; can plan and safely conduct marine machinery repairs; - methods of repairs or reconditioning and has skills of repairing / reconditioning a component by a chosen method; can estimate costs and cost-effectiveness of a repair or reconditioning.

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	<p>Attending the lectures and classes in the subject, the student acquires skills related to:</p> <ul style="list-style-type: none"> - impart skills of assessing machine parts quality through inspection, workshop measurements and nondestructive tests; - impart skills of carrying out repairs of marine machinery, taking into account technical supervision and verification of assembly and disassembly of components, systems and units, using various methods of connections; - impart skills of assessing the degree of wear and qualifying an element for repairs or reconditioning, performance of repairs or reconditioning of selected machine elements. <p>Related subjects:</p> <ul style="list-style-type: none"> - marine machinery and equipment, - piston internal combustion engines and control systems, - metrology and measurement systems.
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USE OF FUELS AND LUBRICANTS	
Semester	Winter
Number of ECTS	2 ECTS
Number of classes	Lectures 30h
Description	<p>The subject enables the student to acquire knowledge of:</p> <ul style="list-style-type: none"> - concepts of density, viscosity, calorific value and self-ignition properties of petroleum products and their practical use in marine power plant operation; - effect of petroleum product viscosity and its relation to temperature and pressure on the problem of fuel composition, lubrication of slide bearings, flow resistance in pipelines, gravitational sedimentation, effectiveness of centrifugal purifiers, fuel atomization in the engine/boiler combustion chamber, combustion process and quality, fuel consumption, carbon deposits, wear of engine parts, engine failure rate, turbine and waste-heat boiler contamination; - effect of the crude oil composition and refining method on fuel self-ignition properties; - methods for the determination of self-ignition properties of distillate and residual fuels; - effect of catalyst particles on fuel purification methods and the resultant engine performance; - structure of residual fuels and problems with their stability; - parameters describing fuel properties and their influence on marine power plant operation (temperatures of: flash point, setting point, pumpability, turbidity, cold filter plugging; water content, sulphur content, vanadium content, incineration residue, carbon residue); - types and classification of marine fuels by viscosity and by quality; - principles and method of making use of the classification society supervision of marine fuel quality; - effect of friction on phenomena occurring in shipboard mechanisms; - effect of lubricating oil viscosity on phenomena occurring in the lubricated device; - ISO oil viscosity classification, SAE viscosity classes of engine oils, quality classification of lubricating oils;

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	<ul style="list-style-type: none"> - oil function in a trunk-piston engine and related quality requirements; - effect of base oil production method and type of upgrading additives on the properties of the final product; - oil requirements for shipboard use, principles of oil care during operation; - changes taking place in oil during operation and factors affecting its ageing; - properties of greases and their choice for various applications. <p>Attending the lectures and classes in the subject, the student acquires skills related to:</p> <ul style="list-style-type: none"> - use of ASTM, ISO/PN tables while calculating the density of petroleum products; - calculation of fuel densities at various temperatures; - calculation of fuel supply, choice of purifier water disk and identification of tank sounding errors; - use of the viscosity-temperature chart, tables, slide rules and viscosity-temperature conversion formulas, and the assessment of errors and reliability of calculating methods; - checking the correctness of operation of viscosity controllers; - prevention of fuel stability loss and methods of fuel stability determination by the ASTM filter paper method. - determination and assessment of water content in fuel or oil by shipboard methods; - determination of petroleum product viscosity by shipboard methods; - interpretation of fuel / lube oil laboratory analysis results; - sampling fuels and lube oils for lab analysis; - choice of oils for various shipboard applications; - use of equipment and installation for lube oil care; - choice of greases for various shipboard applications.
Requirements to participate in subject	<p>Related subjects:</p> <ul style="list-style-type: none"> - Mathematics, - Physics, - Technical Thermodynamics, - Technical Chemistry

REFRIGERATION AND AIR CONDITIONING	
Semester	Winter
Number of ECTS	5
Number of classes	Lectures 30h+ Laboratories 30h + Simulators 5h
Description	<p>Description:</p> <p>The subject enables the student to acquire knowledge of:</p> <ul style="list-style-type: none"> - thermodynamic principles of refrigeration and air conditioning installation operation; - technology of food storage and climatic comfort; - solutions to refrigeration and air conditioning installations used in shipbuilding; - construction of refrigeration and air conditioning devices; - automatic control of refrigeration and air conditioning devices; - operation/maintenance and repairs of refrigeration and air conditioning devices; - trials and acceptance of refrigeration and air conditioning installations as required by classification societies. <p>Attending the lectures and classes in the subject, the student acquires skills related to:</p> <ul style="list-style-type: none"> - identification of refrigeration and air conditioning installation concept / design based on documentation reading and visual inspection of the actual installation. - start-up, trials, regular operation (checking pressures, temperatures, relative humidity, electric current intensity, noise, etc.) and shutdown of refrigeration and air conditioning installations; - periodical maintenance: replenishing coolants and cooling media, filling up or replacement of lube oil, venting, frosting, detection and stopping of leaks, dewatering of the installation; - periodic repairs of refrigeration and air conditioning devices;

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	<ul style="list-style-type: none"> - control of measuring and signaling devices operation; - inspection and regulation of refrigeration and air conditioning automatic control; - advantages of refrigeration and air conditioning installations monitoring; - identification and the right response in installation failures; - documenting the operation/maintenance of refrigeration and air conditioning installations; - following the principles resulting from ecological criteria for the storage and recycling of coolants, cooling media, oils; checks for leaks.
Requirements to participate in subject	Related subjects: <ul style="list-style-type: none"> - Mathematics, - Physics, - Engineering Graphics, - Technical Thermodynamics.

MARINE POWER PLANTS I	
Semester	Winter
Number of ECTS	5
Number of classes	Lectures 24h+ Classes 6h + Simulators 24h
Description	Description: The subject enables the student to acquire knowledge of: <ul style="list-style-type: none"> - basic solutions and principles of engineroom watchkeeping; - fundamentals of power plant energy management; - introduction to the construction and principles of operation of diesel and auxiliary power plants; - basic solutions of steam power plant systems. Attending the lectures and classes in the subject, the student acquires skills related to: <ul style="list-style-type: none"> - reading and interpretation of pipeline installation diagrams. - operation of diesel and auxiliary power plants.
Requirements to participate in subject	Related subjects: <ul style="list-style-type: none"> - Mathematics, - Physics, - Mechanics, - Engineering Graphics, - Technical Thermodynamics, - Marine Automatic Control and Measurements, - Use of Fuels and Lubricants, - Marine Piston Engines, - Marine Boilers.

INTRODUCTION TO SHIP CONSTRUCTION AND CREW ORGANIZATION	
Semester	Winter
Number of ECTS	2
Number of classes	Lectures 30h
Description	Description: The subject enables the student to acquire knowledge of: <ul style="list-style-type: none"> - structures of maritime organizations and administration, and the scope of their work; - basic ship types, structural components and hull dimensions; - engineroom arrangement, equipment, propulsion machinery, steering gear, deck equipment, onboard rescue equipment and lifesaving appliances, types of surveys, their scope, docking. Attending the lectures and classes in the subject, the student acquires skills related to:

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	<ul style="list-style-type: none"> - distinguishing various ranges of responsibilities of onboard personnel as required by the STCW Convention, - classification of ship types on the basis of description and pictures; specification of their characteristic features and spatial arrangement, main particulars.
Requirements to participate in subject	Related subjects: <ul style="list-style-type: none"> - Physics, - Technical Chemistry

ECOLOGICAL ASPECTS OF SHIP OPERATION	
Semester	Winter
Number of ECTS	5
Number of classes	Lectures 21 h + Simulators 4h
Description	<p>Description:</p> <p>The subject enables the student to acquire knowledge of:</p> <ul style="list-style-type: none"> - basic concepts of sea ecology, types of pollutants produced on board ship, quantitative analysis of pollution sources; - international, regional and national legal regulations concerning the prevention of pollution at sea; - principles of construction and operation of shipboard environment protection equipment used on motor ships and tankers. <p>Attending the lectures and classes in the subject, the student acquires skills related to:</p> <ul style="list-style-type: none"> - handling environment protection equipment, such as oil separators, sewage treatment plants and incinerators, - performing basic chemical analyses to ascertain the correct work of environment protection devices, - keeping oil record book and waste and sewage records.
Requirements to participate in subject	Related subjects: <ul style="list-style-type: none"> - Physics, - Technical Chemistry

Vocabulary

(A)	Lectures:	The lecturer teaches students interrelated contents of a subject based on his / her knowledge, using various teaching methods.
(C)	Classes:	knowledge and skills are acquired by solving computing problems. The teacher directs students and supervises the classes.
(L)	Laboratories:	knowledge and skills are acquired by performing practical or experimental work. The teacher directs students and supervises the lab classes. Students do practical work or make experiments.
(P)	Project:	The work relates to engineering developments and seeking solutions to technical problems.