ELECTRICAL ENGINEERING FACULTY

PROGRAMME of STUDIES		
Faculty of Electrical Engineering		
B.Sc. Programme	**Section:**	**Electrotechnics**

Fall (winter) semester
(September-January)

Course title/description	ECTS points
Materials technology Description: Conductivity, dielectric constant, magnetic permeability. Classification of electrical materials. Conducting materials. Conductivity of metals. Semiconducting materials. Semiconductors. Dielectric materials. Dielectric materials polarization. Dielectric constant. Dielectric strength. Durability of dielectric materials. Combustibility. Classification and applications of dielecrtric materials. Magnetic materials. Diamagnetic, paramagnetic and ferromagnetic.	2
Fundamentals of electrotechnics I Descriptions: Electrical principles, D.C circuit theory. Linear circuit elements, series circuits, parallel networks, potential divider, current divider. Calculation of D.C circuit quantities with the help of circuit laws and theorems. Nonlinear circuit elements. Alternating voltage and currents, waveforms, the equation of a sinusoidal waveform, combination of waveforms, single phase a.c circuits. Revision of complex numbers, application of complex numbers to A.C networks.	6
English Description: Grammar review: to be, to have, there is, numbers, pronouns, adjectives, possesives, nouns, plural, using different tenses. Communicating in simple every day situations. English phonetics basics. Fundamentals of engineering classification. Electrics and Electronics - basic vocabulary. Electronic diagrams: Joining information from the diagrams and the texts, electric symbols. Basics of mathematics (matrix, integrals, differential calculus etc.).	2
Fundamentals of electrotechnics II Description: Introduction to the Mathcad. Multi-loop DC Circuit (star-delta conversion). The principle of superposition and reciprocity. Thevenin 's theorem , the characteristic of a nonlinear element. The parameters of equivalent coil circuit with and without iron core. Reactive power compensation. Voltage and current resonance and ferroresonance. Three-phase systems. The mean and RMS values. Harmonic analysis of analytic and non-analytic periodical functions	2
Electromagnetic Field Theory Description: Basic formulas and theorems of the vector analysis. Coulomb's law, and the definition of the values of the electric field for point charges. Electrical and magnetic phenomena. Theory of Magnetic circuits. Mutual coils. Method for determining characteristic quantities of electric and magnetic field. Gauss law and Ampere's law for the simple symmetric cases. Biot-Savart law. Maxwell's equations.	2
Metrology Description: Calibration and expanding ranges of instruments. Measurements of large resistance and insulation resistance and bridge impedance measurements. Testing of the electromechanical instruments. Rectifier voltmeters. Analog and digital time and frequency measurements. Electronic oscilloscope. Power measurements in single-phase and three phase system. Wheatstone, Thomson and impedance bridges.	2
Electrical Machines Description: Introduction to electric machines theory; basic principles and concepts, design elements, construction materials, definitions and classification. DC and AC machines; structure, principle of operation, basic characteristics, exploitation properties. Transformers; structure, basis of operation, 3-phase transformers, exploitation properties.	3
Electronics and Power Electronics Description: Working conditions of power components. Thyristors. Triacs. Power transistors. Power converters. Rectifiers. Safety arrangements of thyristor and transistorsystems. Active and passive power.	4

Microprocessor Control Systems Description: Microprocessor's arithmetic. Microprocessor information coding. Architecture of microprocessor system. Microcontroller core architecture, memory map, instruction set. Assembler language. Adressing modes. On-chip peripherials: I/O port, timer/conter, serial communication interfaces, AD and DA converters, watchdog. EEPORM and FLASH memory of the microcontroller. ISP/IAP programming modes. Microcontroller programming languages.	2
Fundamentals of Control Engineering Description: Dynamic correction of control systems. Composite control systems. Digital control systems. Non-linear control systems. Extremal regulation. Optimal control. Adaptive control. Game control.	2
High Voltage Description: Technic and Engineering. Ionization and deionization processes. Nature and forming of electric stresses, insulation configurations. Break-down strength of gases, solid and liquid dielectrics, discharge development, partial discharges. Exploitation insulation systems. Inner and outer over voltage characteristic, atmospheric discharges, overvoltage and lighting protection.	2
Digital Circuits Theory and Technology Description: Synthesis of combinational circuits, characteristics of digital circuits. Arithmetical blocks. Bistable flip-flops. Synthesis of sequential circuits. Counters and registers of integrate scale. Circuits of time dependences. Circuits of steering a stepper motor, an anchor lift. Steering the crane model with programmable circuits CPLD or FPGA. Computer simulation of advanced digital circuits.	2
Programmable Logic Controllers Description: PLC construction, Hardware, PC-PLC Communication, Editors. Memory organization: memory areas, Data types, addressing. Bit and Byte Access., Programming: logic functions, edge detection, bit memory, flip-flops, timers, counters, wave generators, Program structure: Functions, Function Blocks, Data blocks. Interrupts, Examples: pump control, direction detection, industrial sequence control systems	3
Ship Electrical Drives Control Systems Description: Drive system with DC and AC machine. DC and AC motor automatic control systems. Marine and industrial applications.	3
Power System Control & Automation Description: Visualization of ship power system. SCADA Systems, PLC programming. Simple computation, data processing computers, wired type & stores programmed type computers, computer control (AI, AO, DI, DO). Application of computers on merchant ships for performance monitoring & maintenance data.	1
Ship Electrical Drives Control Systems Description: Equations of motion. Energy storing. Machinery characteristics – parameters, schemes, equations, power distribution, starting, braking, control. Marine and industrial applications. Ship diesel-electric propulsion systems.	3
Ship Electrical Power Generation and Distribution Description: Marine electrical power plants. Shaft generators. Synchronization and work in parallel of ship's generators. Ship voltage regulators. Protection of ship generators. Emergency power plants. Systems of electrical energy transmission and distribution on ships. Functions and structure of ship switchboards. Ship cables. Power management systems on ships. Main electric propulsion.	2
Marine Power System - Control & Automation Description: Automation of Ship Electrical Power Plant and Auxiliary systems. Diesel generators. Shaft generator. Turbo generator. Shore supply. Emergency generator. Main switchboard. Emergency switchboard. Consumers. Feeders. Earth Monitoring etc.	3
Electronavigational Equipment Description: GPS, DGPS, EGNOS -theory, errors, gyrocompasses – theory, structure, deviations, logs – theory, structure echosounders – structure, range, integrated bridge systems, azipods - structure, applications, exemplary marine devices of all equipments	3
Marine Communication Equipment Description: Radionavigation, communications and technical systems. GMDSS. Emergency. Antennas. Radio and telephone communications on ship. Automatic telephone operator. EPIRB. Transceiver. Satellite communications terminals. Signals.	2

Marine Electric Equipment Maintenance Description: Specifics of the operation and diagnostics. Conduct operational and diagnostic methodology. Standard power cable dimensions. Marine installation equipment. Cable installation technology. Mounting electric equipment and devices. Maintenance and diagnostics. DC machine diagnostics. Asynchronous and synchronous machine diagnostics. Electrical machines repair.	3
Ship's Monitoring Systems and Instrumentation Description: Types of engine room and deck monitoring systems. Measurement and executive line used in monitoring and control systems. Sensors. Transducers analog and programmable (HART). Diagnostic, repairing, calibration, commissioning of measuring temperature, pressure, level etc. Electronic ship's fire monitoring systems.	2
Computer Area Network Description: Origins of computer networks. Organization of the ISO OSI reference model. The signals in the network and transmission media. Network topologies. Hardware resources and organization of the network. The basic properties of selected local networks. IEEE 802 Standards. Ethernet, types, media, methods of access to the communication channel. Upper layer protocols, TCP / IP stack. Network operating systems and utilities. Network administration. Safety.	2
Explosion Protection Engineering Description: Nature of flammable materials. Gas, dust grouping. Temperature codes. Ship's hazardous area (gas, dust). Types of explosion-proof protection for electrical equipment, particularly: Ex d, Ex e, Ex p, Ex i. Combined (hybrid) methods of protection. Wiring systems. Maintenance of electrical equipment in hazardous area. IECEX versus ATEX and North America approach. Ex certificates.	2
Power Conditioning Systems Description: Overview of the conditioning, methods and systems. Introduction to theory of instantaneous power. Series and shunt compensators. DVR systems. Passive, active and hybrid systems. Reserve and uninterruptible power supply systems - classification, structure and the functional possibilities. Energy storage systems.	2

Plan nr: 1st_EO/2014-2015/05