

GDYNIA MARITIME UNIVERSITY
Academic year 2024/2025
Faculty of Marine Engineering
Erasmus Faculty Coordinator – Justyna Molenda
Courses in English

Semester I (Winter)

Code	Name	Description/Content	ECTS	Teacher's name
	English	Maritime English.	1	
	Fundamentals of Control Engineering & Robotics	Taxonomy of the control systems. Linearity and linearization. Laplace's transformation. Mathematical models of linear continuous control systems. Linear objects' response to typical inputs. Fundamental elements of control systems and their characteristics. Block diagrams. PID controllers. Stability and quality of control systems. Relay systems. Robotics – taxonomy, structures of manipulators, equations of movement.	2	
	Fundamentals of Electrotechnics & Electronics I	Basic terms. Simple electrical circuit. Direct, alternating and three-phase current. Power. Simple current circuits. Transformer. Electric machinery.	3	
	Fundamentals of Machine Elements Design & CAD I	Machine life cycle. Introduction to design. Conceptual design and innovation. Quantitative and systematic methods for design. Tolerances and fits. Friction and wear. Lubricants. Hydrodynamics of lubrication. Rolling contact bearings. Journal and thrust bearings. Screws, fasteners and connections, welding and other joints. Springs and flexible mechanical elements. Clutches, brakes and couplings. Fatigue.	3	

	Fundamentals of Manufacturing Engineering I	Basic quantities. Founding. Plastic working. Uniting. Bases of cutting.	3	
	Fundamentals of Manufacturing Engineering III	Basis of manufacturing engineering. Manual treatment with elements of repair. Electrical and gas welding. Automatic machines. Turning – basic information. External and internal turning. Electric Workshop. Dismantling, assembling and repair of electrical installations.	4	
	Industrial Control Systems	Taxonomy of digital control systems. Function discretization, the transform Z, pulse generator and extrapolator, a step function. Digital control system and its replacement transfer function. Digital controller algorithms: PID, deadbeat, position, velocity. Tuning of controller parameters. Construction of the PLC - programmable logic control. Programming the PLC in ladder language. Network control and monitoring systems. Data processing and SCADA systems. Data visualization.	3	
	Internal Combustion Engines	Theory and general principles – theoretical heat cycle; practical cycles; working cycles; parameters – efficiency, mean indicated and effective pressure, power. Torque, mean piston speed, fuel consumption; fuels and lubes: chemistry and treatment; engine performances; scavenging, turbocharging; fuel injection and combustion. Frame, thrust bearing, cylinder liner, cylinder cover, piston, connecting rod, crankshaft, camshaft, valve, turbocharger system, injection system. Operation and maintenance, diagnostics.	3	
	Machine Elements - design exercises II	Design of gear	2	

	Machining Processing of Materials	Fundamentals of machining. Mechanics of cutting. Cutting forces and power. Characteristics of the machine tool. Tools geometry, wear and failure. Turning and grinding conditions selection.	3	
	Management of Maintenance Services	System of maintenance marine engine, standard overhauled marine engine. Maintenance of repair overhauled plan, documentation of technical maintenance	2	
	Marine Auxiliary Machines & Equipment II	Construction, operation and maintenance of centrifugal separators, hydraulic machinery, steering gears and controllable pitch propellers system. Deck machinery.	3	
	Marine Internal Combustion Engines II	Construction – bedplate, columns, cylinder block, thrust bearing, cylinder liner, cylinder cover, piston, connecting rod, crankshaft, camshaft, crosshead, valve, turbocharger system, injection system, starting and reversing air system.	2	
	Marine Power Plants II	Ship resistance characteristics. Operation area of the main engines. Co-operation of the system engine - ship propeller. Safety procedures during the watch keeping. Efficiency of energetic systems. Trends in marine power plant development.	2	
	Marine Propulsion Plant	Ship resistance. Engine characteristic curves. Fixed and controllable pitch propellers. Propulsion characteristics.	2	
	Marine Refrigeration & Air Conditioning I	Refrigerating cycles – thermodynamic basis, marine refrigerating plant and air conditioning equipment, cooling agents, calculations and maintenance – practical presentation.	2	

	Marine Turbines	<p>Basic of steam turbine theory, working principle, power, torque, efficiency, steam-condensate systems of turbine plant, characteristics, power adjustment, construction, operation and maintenance.</p> <p>Basic of gas turbine theory, working principle, construction and operation.</p>	4	
	Material Science I	Metals and alloys. Fundamentals of metal properties. Iron-carbon system. Basic of thermal treatment of metals. Characteristic properties of iron-based alloys with regard to chemical composition, manufacturing technology, structure and properties.	2	
	Material Science III	Practical presentation of research technology of metals and alloys by means of macroscopic and microscopic studies and measurement of hardness.	2	
	Metrology & Measurement Systems	Unit of quantity. Accuracy and errors of measurement. Hierarchy scheme of measuring instruments. Procedure of measurement. Least squares method. Ultrasonic, pneumatic measurement.	3	
	Naval Architecture & Ship Construction I	Ship's hull geometry, lines plan and principal dimensions, IMO and classification societies, freeboard, floatation, stability at small angles and stability in damaged condition, free surface effects, dynamic stability.	3	
	Occupational Safety and Ergonomics	Aims, objectives and benefits of subject. Work stress - causes, preventative and protective measures. Physiological, psychological and mechanical factors of hazards. Prevention against hazards. Definition and scope of ergonomics and systems of	2	

		work. Human characteristics, capabilities and limitations.		
	Programming of Technological Machines	Fundamentals of CNC machining. Lathes and milling machines programming. Preparing card: tools library and workholding devices. Programming machining cycles.	2	
	Protection of Intellectual Property	The basic legal concepts in the field of intellectual property protection. Industrial Property Law. The procedure for filling a patent application. Copyright - the subject of copyright protection and the scope of its application conditions.	1	
	Repair Engineering I	Phase manufacturing process disassembly machine, cleaning machine, assembly machine method. Working tools, methods of procedure repair pipeline installation marine power plant, marine engine repair technology, base of metrology in workshop.	2	
	Simulation and Data Processing	Basic of system dynamic modelling and computer simulation. Physical and mathematical models. Computer models, simulation languages and software. Methods of modelling. Modelling processes with distributed parameters.	2	
	Strength of Materials I	Introduction. Hooke's law. Tension and compression. Geometrical characteristics of a section. Torsion. Bending. State of stress. Generalized Hooke's law. Combined stress – basic hypotheses.	4	
	Technical Diagnostics	Basics of technical diagnostics. Technical object as the subject of diagnosis. Diagnostic Analysis. Decomposition of the object. Technical diagnostics of	1	

		machinery and marine equipment.		
	Thermodynamics I	Thermodynamic properties. The laws of thermodynamics. The processes. Entropy. Ideal gas and steam equations. Thermodynamic cycles. Efficiencies of cycles. Heat transfer: heat conduction, forced and free convection, empirical relations, thermal radiation. Heat exchangers.	4	
	Turbines I	Basic of steam turbine theory, working principle, power, torque, efficiency, steam-condensate	4	
	Water, Fuel & Lubricants	Chemical components. Acidity. Reactions. Boiler malfunctions. Waste utilization. Liquid fuel. Grease oil – classification. Laboratory.	4	

Semester II (Spring)

Code	Name	Description/Content	ECTS	Teacher's name
	Engineering Graphics I	Fundamentals of descriptive geometry and projection drawing. Projection of geometrical solids. Cutting geometrical solids with planes. Intersections of geometrical solids.	4	
	Engineering Mechanics I	Fundamental force concepts and principles. Moments and couples. Equilibrium conditions. Free body diagrams. Friction. Center of gravity. Fundamental motion concepts and principles. Displacement, velocity, acceleration and their interrelationship.	4	
	English	Maritime English.	1	
	Fluid mechanics	Definition of fluid mechanic terms. Laws of fluid mechanics. Fluid statics. Kinematics of fluid. Conservation of mass. Fluid	3	

		dynamics. Navier-Stokes equations. Euler's equation. Bernoulli equation. Conservation of energy. Laminar and turbulent flows. Incompressible viscous flow. Empirical relations. Compressible flow.		
	Fundamentals of Control Engineering & Robotics I	Taxonomy of the control systems. Linearity and linearization. Laplace's transformation. Mathematical models of linear continuous control systems. Linear objects' response to typical inputs. Fundamental elements of control systems and their characteristics. Block diagrams. PID controllers. Stability and quality of control systems. Relay systems. Robotics – taxonomy, structures of manipulators, equations of movement.	2	
	Fundamentals of Machine Elements Design & CAD II	Valves, pipes and expansion joints. Shafts and their balancing. Spur gear. Helical, bevel and worm gears. Friction, belt and chain drives. Lubrication of gears. Seals. Laboratory (threaded and welded joints, journal bearings, clutch, springs).	2	
	Fundamentals of Machine Operation & Maintenance I	Structure of operation and maintenance system. Reliability and durability.	1	
	Fundamentals of Manufacturing Engineering II	Cutting and grinding. Erosion machining.	2	
	Machine Elements - design exercises I	Project (design of unit with power screw, design of clutch).	2	
	Marine Auxiliary Machines & Equipment I	Construction, operation and maintenance of marine pumps, marine compressors and fuel treatment plants. Filters and heat exchangers.	2	
	Marine Boilers I	Marine steam boilers – classification. Combustion. Heat transfer. Water natural and forced circulation.	3	

		Construction and operating of main and auxiliary boilers.		
	Marine Internal Combustion Engines I	Theory and general principles – theoretical heat cycle; working cycles; parameters – efficiency, mean indicated and effective pressure, power, torque, mean piston speed, speed, fuel consumption; fuels and lubes: chemistry and treatment; engine performances; scavenging and turbocharging; fuel injection and combustion.	2	
	Marine Power Plants I	Power plants – classification and characterization, efficiency. Construction, operating and maintenance of motor ship systems.	2	
	Material Science II	Non ferrous metal alloys – copper, aluminium, titanium, nickel. Non metallic materials – plastics, wood products, glass and ceramic materials. Structure and properties. Macroscopic and microscopic studies.	3	
	Strength of Materials II	Frames. Elastic strain energy – Castigliano's and Menabrea's theorems. Rods of large curvature. Stability of the rods. Lamé's problem. Evaluation base characteristics of materials. Application of resistance strain gauges. Certification of wire ropes.	3	
	Thermodynamics II	Fundamental measurements of thermodynamic, thermofluid and fluid flow variety properties (such as pressure, temperature, density, specific heat, viscosity, mass flow rate). Investigation of heat transfer and heat exchangers.	3	
	Welding	Basic concepts in welding, welding positions, types of welds. Weldability of metals. Welding methods: MMA, GMA, GTA, FSW, flame welding, plasma and laser	2	

		welding. Flame and plasma cutting. Covered electrodes.		
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