



**THE MINIMUM STANDARD OF COMPETENCE FOR OFFICERS IN CHARGE
AS ENGINEERING WATCH IN A MANNED ENGINE – ROOM
OR DESIGNATED DUTY ENGINEERS IN A PERIODICALLY
UNMANNED ENGINE – ROOM**

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ABSTRACT

The maritime education and training system at The Maritime University of Constantza, Romania including training in mechanical and electrical workshop and requirements for the teaching staff and trainers, different teaching syllabus, examinations, assessment and evaluation methods, resources and educational techniques, including the use of simulators, are presented in the paper.

For certification as officer in charge of on engineering watch in a manned engine – room, our students shall follow a program of on – board training, at the school-vessel Neptun and on laboratories. After this program, follows examinations and evaluation methods which we present in next tables by functions : marine engineering (the operational level), electrical, electronic and control engineering, maintenance and repair, control of the ship operation and the operational level.

Every student will be required to demonstrate ability to undertake, at the operational level, the tasks, duties and responsibilities which we listed in a table (in column 1). The minimum knowledge, understanding and proficiency required of ratings forming part of on engine of ratings forming part of on engine – room is listed in

the same tables, column 2, and the methods for demonstrating competence in column 3.

Next we present the efficiency of STCW 95 in our hyperteaching syllabus and practice.

Educational techniques at the students level including using engine-room simulation equipment, is able to simulate a real main or auxiliary machinery system. They incorporate facilities for simulation of a appropriate main or auxiliary propulsion machinery equipment and control panels, simulate sub – system that include boiler, steering gear, electrical power general and distribution systems, cooling water, refrigeration, bilge and ballast systems.

The evaluation and assessment of students are periodically and consistent in credits.

All of these offer to the new third engineer – officer the capabilities in order to manage any situation which can appear an any kind of merchant vessel.

SPECIFICATION OF MINIMUM STANDARD OF COMPETENCE FOR OFFICERS IN CHARGE OF AN ENGINEERING WATCH IN A MANNED ENGINE – ROOM OR DESIGNATED DUTY ENGINEERS IN A PERIODICALLY UNMANNED ENGINE – ROOM

Function : Marine engineering – the operational lever

Competence	Knowledge, understanding and proficiency (at teaching syllabus)	Methods for demonstrating competence	Criteria for evaluating competence
<p>1</p> <p>Use appropriate tools for fabrication and repair operations typically performed on ships</p>	<p align="center">2</p> <p>Characteristics and limitations of materials used in construction and repair of ships and equipment (at <i>Naval Materials technology and Strength of materials</i>)</p> <p>Characteristics and limitations of processes used for fabrication and repair (at <i>Engineering knowledge, hand and power tools and Mechanical drawing</i>)</p> <p>Properties and parameters considered in the fabrication and repair of systems and components (at <i>Machinery bodies, fabrication processing and assembly, Machinery and Maintenance repair and re-assembly</i>)</p> <p>Application of safe working practices in the workshop environment (at each technical teaching syllabus)</p>	<p align="center">3</p> <p>Assessment of evidence obtained from one or more of the following :</p> <ol style="list-style-type: none"> approved workshop skills training (in the naval practice); the teaching syllabus are finished by exams – trim . I- II and 8 credits approved practices experience and test; the teaching syllabus are finished by exams trim. I-II-III and 12 credits <p>(naval practice at school training vessel Neptun) – in the 4 – 5th year</p>	<p align="center">4</p> <p>Identification of important parameters for fabrication of typical ship related components is appropriate</p> <p>Selection of material is appropriate</p> <p>Fabrication is to designated tolerances</p> <p>Use of equipment and machine tools is appropriate and safe</p>

<p>Use hand tools and measuring equipment for dismantling, maintenance, repair and re-assembly of shipboard plant and equipment</p>	<p>Design characteristics and selection of materials in construction of equipment (at <i>Naval materials technology</i>)</p> <p>Interpretation of machinery drawings and hand books (<i>Technical drawing and description geometry, Machinery bodies, Machinery</i>)</p> <p>Operational characteristics of equipment and systems (at technical teaching syllabus - Table 1 and Table 2)</p>	<p>Assessment of evidence obtained from one or more of the following :</p> <ol style="list-style-type: none"> 1. approved workshop skills training (general practice and training programs) 2. approved practical experience and tests (in laboratories, by training simulator - Table 3) 	<p>Safety procedures followed are appropriate</p> <p>Selection of tools and spare gear is appropriate</p> <p>Dismantling, inspecting, repairing and reassembling equipment is in accordance with manuals and good practice</p> <p>Re - commissioning and performance testing is in accordance with manuals and good practice</p>
<p>Use hand tools, electrical and electronic measuring and test equipment for fault finding, maintenance and repair operations</p>	<p>Safety requirements for working on shipboard electrical systems (<i>Ship electrical actions and plants</i>)</p> <p>Construction and operational characteristics of shipboard AC and DC electrical systems equipment (<i>Ship electrical actions and plants</i>)</p> <p>Construction and operation of electrical test and measuring equipment (<i>Electrical measuring and transducers</i>)</p>	<p>Assessment of evidence obtained from one or more of the following :</p> <ol style="list-style-type: none"> 1. approved workshop skills training (in laboratories) 2. approved practical experience and tests 	<p>Implementation of safety procedures is satisfactory</p> <p>Selection and use of test equipment is appropriate and interpretation of results is accurate</p> <p>Selection of procedures for the conduct of repair and maintenance is in accordance with manuals and good practice (<i>Ship electrical actions and plants, Electrical measuring and transducers</i>)</p> <p>Commissioning and performance</p>

<p>testing of equipment and systems brought back into service after repair is in accordance with manuals and good practice</p>			<p>Maintain a safe engineering watch</p>
<p>The conduct, handover and relief of the watch conforms with accepted principles and procedures The frequency and extend of monitoring of engineering equipment and systems conforms to manufacturers recommendations and accepted principles and procedures, including Principles to be observed in keeping an engineering watch</p> <p>A proper record is maintained of the movements and activities relating to the ship's engineering systems</p>	<p>Assessment of evidence obtained from one or more of the following :</p> <ol style="list-style-type: none"> 1. approved in - service experience 2. approved training ship experience (at school shipboard training vessel Neptune) 3. approved simulator training , where appropriate (at Diesel engines, Machines and Ship power plants Department) 4. approved laboratory equipment training (Ship theory and Construction Laboratory, Hydraulic and hydraulic machines Laboratory, Diesel engines Laboratory, Auxiliary steam boilers and evaporators) 	<p>Thorough knowledge of Principles to be observed in keeping an engineering watch, including:</p> <ol style="list-style-type: none"> 1. duties associated with taking over and accepting a watch (<i>Ship electrical actions and plants, Diesel engines, Main and auxiliary machinery</i>) 2. routine duties undertaken during a watch (<i>Ship electrical actions and plants, Diesel engines, Main and auxiliary machinery</i>) 3. maintenance of the machinery space log – book and the significance of the readings taken (<i>Ship electrical actions and plants, Diesel engines, Main and auxiliary machinery</i>) 4. duties associated with handing over a watch (<i>Ship electrical actions and plants, Diesel engines, Main and auxiliary machinery</i>) <p>Safety and emergency procedures; change-over of remote/ automatic to local control of</p>	

	all systems	<p>Safety precautions to be observed during a watch and immediate actions to be taken in the event of fire or accident, with particular reference to oil systems</p> <p>Adequate knowledge of the English language to enable the officer to use engineering publications and to perform engineering duties</p> <p>(the students may be able to use technical charts and other nautical publications, to understand technical information and messages concerning ship's safety and operation, to be able to use and understand the Standard Marine Navigational Vocabulary)</p>	<p>Examination and assessment of evidence obtained from practical instruction (exams and nautical practice)</p> <p>the English language is studied in the first, second and third year and finished by exams and 5 credits</p>	<p>English language publications relevant to engineering duties are correctly interpreted</p> <p>Communications are clear and understood</p>
<p>Use English in written and oral form</p>	<p>Operate main and auxiliary machinery and associated control systems</p>	<p>Main and auxiliary machinery (studied at <i>Auxiliary steam boilers and evaporators, Hydraulics and Hydraulic machines, Marine auxiliary machinery and Installation, principles, performances and supercharging of Marine Diesel Engines, Dynamics components and Auxiliary Systems of Marine Diesel Engines, Naval Mechanical Automations, Operation and maintenance of Main and Auxiliary machinery. Ship electrical actions and plants. Electrical measurements and transducers</i>) :</p>	<p>Examination and assessment of evidence obtained from one or more of the following :</p> <ol style="list-style-type: none"> 1. approved in - service experience; the teaching syllabus are studied beginning from 3 to 5 year and finished by exams in the trim. V-VI-VII-VIII with credits from min.4 to max. 15 2. approved training ship 	<p>Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations and avoid pollution of the marine environment</p> <p>Deviations from the norm are promptly identified</p> <p>The output of plant and engineering systems consistently meets requirements, including</p>

	<p>1. preparation of main machinery and preparation of auxiliary machinery for operation (at school training vessel Neptun)</p> <p>2. operation of steam boilers (at simulator), including combustion systems</p> <p>3. methods of checking water level in steam boilers and action necessary if water level is abnormal</p> <p>4. location of common faults in machinery and plant in engine and boiler rooms and action necessary to prevent damage (at school manned engine - room's vessel Neptun)</p>	<p>experience</p> <p>3. approved simulator training, where appropriate</p> <p>4. approved laboratory equipment training (in laboratories of Electromechanical Faculty)</p>	<p>bridge orders relating to changes in speed and direction</p> <p>The causes of machinery malfunctions are promptly identified and actions are designed to ensure the overall safety of the ship and the plant, having regard to the prevailing circumstances and conditions</p>
<p>Operate pumping and control associated systems</p>	<p>Pumping systems :</p> <p>1. routine pumping operations (by Laboratory of <i>Ship electrical actions and plants, Laboratory of Hydraulics and Hydraulic machines, Laboratory of Ship electrical actions and machines</i>)</p> <p>2. operation of bilge, ballast and cargo pumping systems (by <i>Laboratory of Marine Auxiliary Machinery and Installations</i>)</p>	<p>Examination and assessment of evidence obtained from one or more of the following :</p> <p>1. approved in-service experience; the teaching syllabus are studied in the 3 –4 school year and finished by exams with 9 credits; 15 credits</p> <p>2. approved training ship experience (school vessel Neptun)</p>	<p>Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations and avoid pollution of the marine environment</p>

			3. approved simulator training , where appropriate 4. approved laboratory equipment training (the laboratories of Electromechanical Faculty)	
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Function : Electrical, electronic and control engineering – the operational level

Competence	Knowledge, Understanding and proficiency (at teaching syllabus)	Methods for demonstrating competence	Criteria for evaluating competence
1 Operate alternators, generators and control systems	2 Generating plant Appropriate basic electrical knowledge and skills (at <i>Electrotechnics</i> Preparing , starting, coupling and changing over alternators or generators (at <i>Ship electrical actions and machines</i>) Location of common faults and action to prevent damage	3 Examination and assessment of evidence obtained from one or more of the following : 1. approved in – service experience; the teaching syllabus by exams in trim. IV and V with 9 credits, respective 9 credits and exam in the 3 school year 2. approved training ship experience	4 Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations

	Location of common faults and action to prevent damage (<i>Electrical Control Systems</i>)	3. approved simulator training, where appropriate (<i>Ship Electrical actions and plants Laboratory, Ship Electrical actions and machines</i>) approved laboratory equipment training (<i>Ship Electrical actions Electrical actions and machines</i>)	
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Function : Maintenance and repair - the operational level

Competence	Knowledge, Understanding and proficiency (at teaching syllabus)	Methods for demonstrating competence	Criteria for evaluating competence
1 Maintain marine engineering systems, including control systems	2 Appropriate basic mechanical knowledge and skills (studied at <i>Marine Auxiliary Machinery and Installations, Ship Electrical plants, Operation and maintenance of main and auxiliary machinery, Naval Mechanical automations</i>) Safe isolation of electrical and other types of plant and equipment required before personnel are permitted to work on such plant or equipment (<i>Safety and Emergency procedures by school vessel Neptune</i>) Undertake maintenance and repair to plant	3 Examination and assessment of evidence obtained from one or more of the following: 1. approved in – service experience 2. approved training ship experience 3. approved laboratory equipment training	4 Isolation, dismantling and re- assembly of plant and equipment is in accordance with accepted practices and procedures. Action taken leads to the restoration of plant by the method most suitable and appropriate to the prevailing circumstances and conditions

	and equipment	
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Functions : Controlling the operation of the ship and the operational level

Competence	Knowledge, Understanding and proficiency (at teaching syllabus)	Methods for demonstrating competence	Criteria for evaluating competence
1 Ensure compliance with pollution - prevention requirements	2 Knowledge of the precautions to be taken to prevent pollution of the marine environment (studied at <i>Prevention of pollution of the Marine environment and anti - pollution procedures</i>) Anti - pollution procedures and all associated equipment (at <i>Prevention of pollution, Marine Auxiliary Machinery and Installations</i>)	3 Examination and assessment of evidence obtained from one or more of the following: 1. approved in - service experience; exam in the trim. VII 2. approved training ship experience (Course of Prevention of pollution)	4 Procedures for monitoring shipboard operations and ensuring compliance with MARPOL requirements are fully observed
Maintain seaworthiness of the ship	Ship stability (studied by <i>Ship construction, stability and damage control</i>)	Examination and assessment of evidence obtained from one or more of the following:	The stability conditions comply with the IMO intact stability criteria

	<p>Working knowledge and application of stability, trim and stress tables, diagrams and stress – calculating equipment</p> <p>Understanding of the fundamentals of watertight integrity</p> <p>Understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy</p> <p><i>Ship construction</i></p> <p>General knowledge of the principal structural members of a ship and the proper names for the various parts</p>	<ol style="list-style-type: none"> 1. approved in – service experience 2. approved training ship experience 3. approved simulator training (Laboratory of <i>Ship construction and stability</i>) 4. approved laboratory equipment training (may models of ships made by students at Exam of Diploma); 5. the teaching syllabus are finished by exams and 6 credits in the trim. V - VII 	<p>under all conditions of loading</p> <p>Actions to ensure and maintain the watertight integrity of the ship are in accordance with accepted practice</p>
<p>Prevent , control and fight fire on board</p>	<p><i>Fire prevention and fire – fighting appliances</i> (Course and Laboratory)</p> <p>Knowledge of fire prevention</p> <p>Ability to organize fire drills</p> <p>Knowledge of classes and chemistry of fire (<i>Industrial chemistry, Fire fighting, Ship Electrical actions and plants</i>)</p> <p>Knowledge of fire – fighting systems (<i>Fire fighting.. Marine Auxiliary</i></p>	<p>Assessment of evidence obtained from approved instruction or during attendance at an approved course, including practical demonstration in spaces which provide truly realistic training conditions (e.g. simulated ship board conditions) and, whenever possible and practical, in darkness, of the ability to :</p> <ol style="list-style-type: none"> 1. use various types of portable fire extinguishers 2. use self – contained breathing apparatus 	<p>The type and scale of the problem is promptly identified and initial actions conform with the emergency procedure and contingency plans for the ship</p> <p>Evacuation, emergency shutdown and isolation procedures are appropriate to the nature of the emergency and are</p>

	<p><i>Machinery and Installations)</i></p> <p>Action to be taken in the event of fire, including fires involving oil systems (<i>Ship board training at Neptun</i>)</p>	<ol style="list-style-type: none"> 3. extinguish smaller fires, e.g. electrical fires, oil fires, propane fires 6. extinguish extensive fires with water, using jet and spray nozzles 7. extinguish fires with foam, powder or any other suitable chemical agent 8. enter and pass through, with life – line but without breathing apparatus, a compartment into which high – expansion foam has been injected 9. fight fire in smoke – filled enclosed spaces wearing self – contained breathing apparatus 10. extinguish fire with water fog or any other suitable fire – fighting agent in an accommodation room or simulated engine – room with fire and heavy smoke 11. extinguish oil fire with fog applicator and spray nozzles dry chemical powder or foam applicators 12. effect a rescue in a smoke – filled space wearing breathing apparatus 	<p>implemented promptly</p> <p>The order of priority and the levels and time – scales of making reports and informing personnel on board, are relevant to the nature of the emergency and reflect the urgency of the problem</p>
Operate life – saving	<i>Life saving</i>	Assessment of evidence obtained from	Actions in responding to

<p>appliances</p>	<p>Ability to organize abandon ship drills and knowledge of the operation of survival craft and rescue boats, their launching appliances and arrangements, and their equipment, including radio life – saving appliances, satellite EPIRBs, SARTs, immersion suits and thermal protective aids</p> <p>Knowledge at sea techniques (at <i>Survival at sea and life saving, Marine Auxiliary Machinery and Installation, Ship Electrical actions and plants</i>)</p>	<p>approved instruction or during attendance at an approved course or approved in – service experience and examination, including practical demonstration of competence to :</p> <ol style="list-style-type: none"> 1. don a lifejacket 2. don and use an immersion suit 3. safely jump from a height into the water 4. right an inverted wearing a lifejacket 5. interpret the markings on survival craft as to the number of persons they are intended to carry 6. prepare and safely launch survival craft and clear the ship's side quickly 7. safely recover survival craft and rescue boats <p>using: inflatable liferaft and open or enclosed lifeboat with inboard engine</p> <p>8. the teaching syllabus are finished by exams in the 4 school year with 2 credits and Course of Fire Prevention and Fire Fighting and Course of Survival at sea in life saving</p>	<p>abandon ship and survival situations are appropriate to the prevailing circumstances and conditions and comply with accepted safety practices and standards</p>
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<p>Apply medical first aid on board ship</p>	<p><i>Medical aid:</i> Practical application of medical guides and advice by radio, including the ability to take effective action based on such knowledge in the case of accidents or illnesses that are likely to occur on board ship (studied by <i>First aid</i> Course in the 3 school year in the trim. VI , finished by exam with 2 credits)</p>	<p>Assessment of evidence obtained from approved training Where practicable, approved practical experience at a hospital or similar establishments</p>	<p>Identification of probable cause, nature and extent of injuries or conditions is prompt and treatment minimizes immediate threat to life</p>
<p>Monitor compliance with legislative requirements</p>	<p>Basic working knowledge of the relevant IMO conventions concerning safety of life at sea and protection of the marine environment (studied by <i>Legislation, Organization and ship management</i>)</p>	<p>Assessment of evidence obtained from examination or approved training</p>	<p>Legislative requirements relating to safety of life at sea and protection of the marine environment are correctly identified .</p>

REFERENCES

***** - STCW 95 - STCW Convention. STCW Code, International Maritime Organization, London, 1996.**