TRAINING AND EDUCATION

PROGRAMME

FOR

MACHINIST CANDIDATES

1st, 2nd and 3rd academic term and seagoing service term

Version 1.0

Dated 23rd November 1999

Qualifications
The admission requirements for machinist candidates are

- Valid health certificate, compare with medical examination for seafarers plus
- certificate of apprenticeship from the iron and steel industry or
- marine mechanic certificate or
- marine assistant certificate with supplementary skilled craftsman training.

Taxonomy
The taxonomy described in appendix 1 has been applied for statements of purpose and objectives (classification of training objectives).

Aim
After having completed the 3rd academic term of the education and met the requirements for engine room service, the machinist shall be able to be a part of the crew of merchant ships powered by main machinery of 750-2999 kW propulsion power as chief engineer with a 1st class machinist certificate. Working as a machinist, the person concerned is to attend to tasks as supervisor on board a merchant ship with regard to existing rules and standards of safety, environment, occupational safety and social relations.

The education is aimed at a fully qualified machinist, who:

- complies with the requirements of the STCW 95 convention so that certificates at the operational level can be issued in accordance with chapter III/3
- can participate in the safety- and environment preparedness of merchant ships
- during training and education has acquired skills and developed the ability to:
    - cooperate
    - demonstrate responsible behaviour
    - demonstrate professional as well as social flexibility
    - attend to the managerial tasks attached to the job as machinist

These objectives are considered on the basis of practical as well as theoretical training and education by means of:

- motivating the student for higher education and developing his ability to independently acquire knowledge as well as to be active in his own learning
- goal-directed qualifying the student as a problem-solver with focus on information retrieval and the development of cooperative and managerial skills through the form and content of the education
- qualifying the student to apply information technology as a natural tool
- offering continuous craftsman training and seagoing training in the fields of marine engineering and marine technology
- giving an understanding of the construction and outfitting of ships
- giving an understanding of the mechanical engineering operation on ships
- continuously training personal safety as well as the safety of the ship in theory and practice
- further training to meet the requirements of the STCW convention as stated above
- seagoing sea training which:
    - develops and implements the learned skills
    - prepares for additional education
    - ensures that the trainee obtains sufficient routine in frequent practical tasks on board
    - efficiently contributes to compliance with the standard of competence in the trade

The colleges are responsible for:

- working out training sequence and –schemes based on the aims and objectives described in the training and education programme of the training college's administration, including syllabus and statement of teaching methods and –means
- the education being included in an approved system standards of competence, and that it is conducted and evaluated in conformity with training and education programmes
- the conduct of final assessments in conformity with the training and education programmes
- documentation for fulfilment of admittance requirements during the enrolment of students
- allocation of merits for relevant training and explanatory and concise statements merit to the college administration office
- registration and report of assessment results for the individual student as well as approval of the training record book in connection with the starting of the 3rd academic term at the latest
- guidance of the student regarding the actual training and education programme, including academic terms at the college, seagoing service with engine room service and training record book.

The college administration is responsible for:

- working out and maintaining training and education programmes, including training record books
- calibrating the colleges' allocation of merits
- auditing at the training centres
- issuing certificates of competency

The shipping company is responsible for:

- organisation, implementation and evaluation of the training in accordance with the training record book, including guidance and direction of the trainee
- involving and guiding the trainee in tasks of significance to the education in connection with the safety and operation of the ship
- being instrumental in the efficient and exemplary conduct of the training at sea

The student is responsible for:

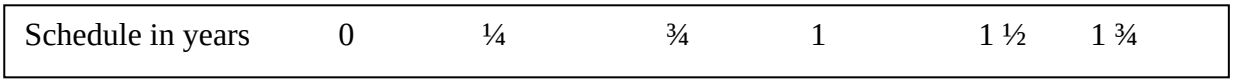
- taking part in his studies and consequently being active in his own learning
- the training record book being an active and constituent part of the training
- the presentation of the training record book at the actual college, when the stated tasks are completed and before the start of the 3rd academic term of the education at the latest.

Training and Education Subjects

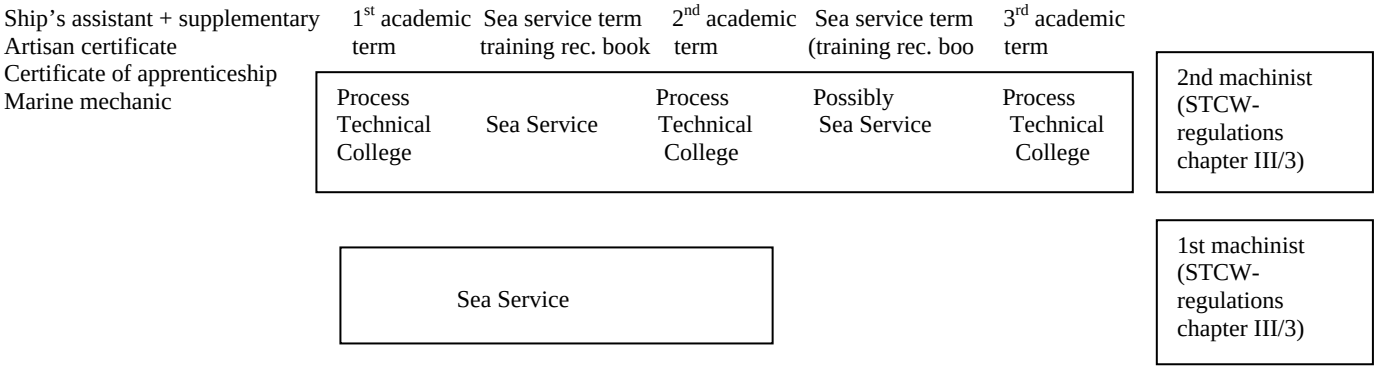
The subjects laid down in the training programme are as follows:

Guidelines concerning numbers of lessons are included in annex 2

Implementation of the training and education programme for machinists



Starting levels



Additional remarks for students with marine mechanic or corresponding certificates of competence
Reduced training period can be expected, as training programmes for marine mechanics include elements, which form a part of the training and education programme for machinists.

Description of Subjects

Subject: Seagoing service

The effective period of navigation between the 1st, 2nd or 3rd academic term must include at least 6 months' engine room service and be carried out in accordance with the training record book for machinists. The book has to be approved by the Danish Maritime Authority. Students who can meet these requirements for navigation time by means of earlier education and/or occupation are exempted from the rule.

Approved training record books for machinist training are:
Training record book for marine mechanics
Training record book for deck officers and engineering officers (chapters regarding service on deck are not compulsory).

Before starting the 3rd academic term, the training record book shall be verified by the college.

The total effective period of navigation for certification as 1st machinist must include 24 months of engine room service, during 12 of which he shall complete tasks that prescribe a 2nd machinist certificate of competency.

Additional remarks
In order to obtain maritime trading certificate under the Control of Trade by Sea Order as chief engineer in ships powered by main machinery of 750-3000 kW propulsion power (1st machinist) the STCW convention prescribes at least 24 months of approved seagoing service as 1st engineering officer (2nd machinist).

On Danish ships powered by main machinery of 750-3000 kW propulsion power, normally just (are manned with) engage one engineering officer. This officer holds maritime trading certificate etc. as 1st machinist. The post as 1st engineering officer (2nd machinist) does not exist on the ships mentioned above.

The Danish Maritime Authorities informs, that exemption may be granted for applicants with certificates as 2nd machinist with a view to obtaining certification as 1st machinist. Thus persons holding certificate as 2nd machinist may by serving as chief engineer/sole engineer on ships powered by main machinery of 750-1500 kW propulsion power will obtain sufficient navigation time for certification as 1st machinist.

Subject: Automation for machinists

Purpose
The machinist is to acquire adequate knowledge of data collection, data log reading, distributed control and control technology to be capable of acting rationally and correctly when monitoring and operating the ship's control systems.

Objectives
After having completed his training and education, the machinist shall:

- understand the mode of operation of common measure value indicators and converters,
- be familiar with fundamental concepts of distributed control and steering technology, including PLC controls,
- have a basic comprehension regarding the structure of control systems on ships, including gyro-, log-, engine alarm- and fire alarm installations.

Evaluation
Internal plus training record book for seagoing service term.

Subject: Fire-fighting for machinists

Purpose
The student is to acquire the practical and theoretical skills required for operation and maintenance of the ship's fire-fighting appliances and smoke diving equipment in conformity with appurtenant manuals. Furthermore, he must be able to take charge as chief fire officer on board.

Objectives
After having completed training and education, the machinist shall:

- meet the demands for fire-fighting training in conformity with regulation VI/3 of the STCW Convention, including smoke diving
- have completed an authorised course in fire-fighting for ship's officers, compare the circular letter in force
- be able to organise and lead fire prevention on board ships, including evaluating and determining the requisite extent of fire protection in connection with different working situations on board a ship
- ensure responsible behaviour on board when handling open fire and inflammable material
- be able to organise and lead adequate instruction to persons on board concerning the fire preparedness of the ship
- be able to organise and instruct fire-fighting on board to the necessary extent required, including determining the efficiency of a given fire-fighting effort on board a ship
- be capable of planning and evaluating the fire preparedness on board.

Evaluation
Examination, certificate and training record book for seagoing service term.

Remarks
The machinist is meeting the requirements stipulated in regulation VI/1 of the STCW Convention.

Subject: Maritime English for machinists

Purpose
The student is to acquire sufficient knowledge of oral and written communication in English to attend to his duties as a machinist on board a merchant ship engaged in international trade.

Objectives
After having completed training and education, the machinist shall:

- be capable of understanding English-language signposting and marking of common occurrence in ports and ships as well as elementary safety- and working procedures and similar directions,
- be capable of carrying on a conversation in English about observations and events related to day-to-day operations on board the ship
- have acquired sufficient active English vocabulary in the fields of marine technology, engineering theory and workshop engineering to account for commands and events in connection with engineering watch/engine room service,
- be able to consult topical English-language technical manuals.

Evaluation
Examination plus training record book for seagoing service term.

Subject: General subjects for machinists

Purpose
The training purpose of the general subjects is to impart the basic knowledge required for the remaining subjects to the student.

Objectives
When mathematics, physics and chemistry cannot be implemented naturally into the remaining subjects, the student must be educated supplementary in these subjects.

Evaluation
Internal.

Subject: Information Technology for machinists

Purpose
The Education in IT includes the acquisition of a computer driver's licence (EDCL), and is aimed at giving the student skills, which consider his application of computer equipment for training as well as for occupational use.

Objectives
We refer to "Dansk Dataforening, kompetancemål" (Competence objectives laid down by The Danish Association of Computer Science) for description of content and educational aims for the modules required in order to obtain the computer driver's license:

1. Basic information technology
2. The computer and its control systems
3. Word-processing
4. Spreadsheet
5. Presentation
6. Information networks

Remarks
Self-tuition may be applied predominantly, and additional teaching ought to be differentiated in accordance with the level of the individual student.

Evaluation
Acquisition of the computer driver's license includes one theoretical test and six practical tests at one of the test-centres accredited by Dansk Dataforening (The Danish Association of Computer Science).
The technical collage will pay the fee for the course certificate (Computer Skill Card).

Subject: Refrigeration for machinists

Purpose
The machinist is to acquire knowledge of normal plus abnormal operating conditions for refrigeration plants with one-step compression, including cold storage/refrigeration containers and provisions cooling/refrigeration plants with associated systems. Furthermore in a responsible manner being able to start, stop and stripping these plants as well as undertaking simple troubleshooting-, repair- and maintenance tasks.

Objectives
After having completed training and education, the machinist shall:

- be familiar with the design of refrigeration plants complete with systems, instrumentation and refrigerants
- be familiar with conditions for humid air
- have an understanding of safety aspects in connection with operation, troubleshooting, repair and maintenance of refrigeration plants, including familiarization with technical precepts for cold storage/refrigeration plants
- be familiar with the preparation, starting, operation, surveillance, stopping and stripping of refrigeration plants, including being capable of carrying out leakage testing/searching plus filling of refrigerant and lubricating oil.

Evaluation
Internal plus training record book for seagoing service term.

Remarks
The following drills form among other things part of the training:

1. Deflation of a refrigeration plant's gas filling. Deflation is carried out so that spillage of refrigerant into the atmosphere is avoided.
2. Testing of refrigeration plants and adjustment of safety fittings, compare notice on refrigeration.
3. Adjustment- and troubleshooting drills.

Subject: Marine technology for machinists

Purpose
The student is to acquire appropriate knowledge of the construction of the ship and conditions regarding stability, buoyancy, draught, trim and hull loads to carry out his work as a machinist.

Objectives
After having completed training and education, the machinist shall:

- be able to describe the general construction of different topical types of merchant ships, the arrangement of their interior, fittings and characteristics by applying the names and appellations used on board
- be familiar with ship design drawings
- be familiar with the concepts of centre of gravity, centre of buoyancy, floating centre, draught and trim
- be familiar with factors that influence the stability of the ship, including loss of buoyancy, wind affects, sea, leakages, free liquid surfaces and cargo shearing
- be familiar with the ship's load-line marks.

Evaluation
Examination plus training record book for seagoing service term.

Remarks
The marine mechanic partially fulfils the requirements.

Subject: Medical care for machinists

Purpose
The student is to acquire adequate knowledge and skills in order for him to obtain proficiency in giving advanced first aid during accidents and sudden illness.

Objectives
After having completed training and education, the machinist shall:

- have passed an advanced course in first aid approved by the First Aid Committee with satisfactory results
- be familiar with the risk of being infected with tropical diseases and be able to take precautions against infection
- be able to give an account of the impact of the sun/the heat on humans
- be able to give an account of the impact of the cold on humans, including the effects of stay in water
- be familiar with sexually transmitted diseases.

Evaluation
Examination and certificate.

Remarks
The marine mechanic fulfils the objectives.

Subject: Basic safety at sea for machinists

Purpose
The student is to acquire adequate knowledge of the safety organization and safety rolls (boat-, fire- and MOB rolls) in order to enter into the rolls at a functional level. The student shall be capable of applying personal protective clothing and equipment and survival techniques as well as applying and maintaining the safety equipment, including lifeboats and life rafts under management and professional guidance.

Objectives
After having completed training and education, the student shall:

- be capable of applying and testing personal protective clothing and equipment correctly
- be able to make out the alarm signals used on merchant ships, be able to explain the composition of the safety rolls and be able to demonstrate correct behaviour in compliance with these
- be capable of utilizing pyrotechnic emergency signals and equipment plus be able to give an account of the use of distress radios and life buoys
- be able to give an account of the function and organization of lifeboats and life rafts together with corrective measures for stay in these
- be able to demonstrate lowering of lifeboats, life rafts and MOB boats
- be informed about the maintenance of lifesaving equipment.

Evaluation
Internal plus training record book for seagoing service term.

Remarks
The marine mechanic fulfils the objectives.

Subject: Safety at sea, occupational safety and pollution protection for machinists

Purpose
The student is to acquire the practical and theoretical skills necessary in order to attend to his duties as a machinist and responsible for safety and environment.

Objectives
After having completed training and education, the machinist shall:

- see to it, that responsible behaviour is displayed regarding protection of the surrounding environment
- be able to take corrective measures to protect the persons on board during an emergency
- be able to take corrective measures in circumstance of average and accidents
- comply with the demands stipulated in regulation VI/2 of the STCW Convention concerning lifeboats and life rafts
- comply with the demands stipulated in regulation V/1 of the STCW Convention ("Tanker Familiarization Course")
- be capable of organizing and implementing adequate instruction to people on board regarding the safety of ship, pollution prevention and occupational safety, including the use of emergency- and safety equipment plus personal protective clothing and equipment
- be able to participate in the planning and conducting of safety drills on board
- be able to handle the maintenance of safety- and emergency equipment plus personal protective clothing and equipment
- be able to manage the employment of workplace assessments (APV) and workplace directions (APB)
- appreciate the psychical working environment, chemical working environment and risk valuations regarding the state of safety on board
- be able to participate in the safety organization of the ship
- be capable of applying, identifying and working out procedures in accordance with the SMS ("Safety Management System") of the ship
- be capable of carrying out evaluation and audit of the ship's directions and procedures regarding working environment and occupational safety.

Evaluation
Internal plus training record book for seagoing service term.

Remarks
The marine mechanic meets the requirements stipulated in regulation V/1 and V/2 of the STCW Convention.
The marine mechanic is familiar with the remaining partial elements of the objectives.

Subject: Maritime Law and ship's management for machinists

Purpose
The student is to acquire adequate knowledge of national and international legislation as well as regulations regarding administration, safety and environment in order for him to be familiar with his duties and obligations as a machinist in this context.

Objectives
After having completed his training and education, the machinist shall:

- be familiar with the contents and purpose of Maritime Law and The Seamen's Act
- be familiar with protest and reporting of protest
- be familiar with compulsory industrial injury insurance
- be familiar with the duties and responsibilities of the shipmaster in general
- be familiar with international conventions and their implementation in Danish legislation, including regulations for supervision and classing of ships, issue of certificates and port state control
- be able to note the need for development and readjustment of procedures for fulfilment of quality-, environment- and safety monitoring systems
- be familiar with working environment legislation and "Notices from the Danish Maritime Authority"
- be familiar with general maintenance policies

Evaluation
Internal plus training record book for seagoing service term.

Remarks
The marine mechanic is in his capacity of rank-and-filer of the crew familiar with several partial elements of the objectives.

Subject: Watch-keeping duties for machinists

Purpose
The student is to acquire the watch-keeping skills required for his unassisted conduct of an engineering watch.

Objectives
After having completed training and education, the machinist shall:

- be able to use the notice on watch on ships and perform the duties for engineering watch mentioned here
- be able to keep a engineering log
- be able to use checklists, procedures and directions in connection with watch-keeping
- be capable of applying Danish as well as English terminology in connection with watch-keeping
- be capable of assessing a given situation, which may occur during an engineering watch at sea, at anchor or in port, and be able to determine which measures to take as well as to monitor that the situation is conducted as assessed
- have completed an approved full-mission engine room simulator course, in accordance with the circular letter in force

Evaluation
Examination plus training record book for seagoing service term.

Remarks
The marine mechanic is in his capacity of rank-and-filer of the crew familiar with several partial elements of the objectives.

Subject: Electrotechnology for machinists

Purpose

The machinist is to acquire adequate electro technological qualifications to be capable of taking charge of the operation and maintenance of electrical plants. The machinist is to be capable of controlling the electric appliances under normal conditions as well as in extreme situations. Furthermore, he is to be capable of completing simple troubleshooting tasks

Objectives
After having completed training and education, the machinist shall:

- be able to apply elementary concepts of electro technology, including voltage, current, impedances and electrical power,
- be familiar with relevant methods and models for elementary direct circuit and alternating current circuit calculations
- be able to select and utilise appropriate measuring instruments in connection with measurement of electric plants plus have an understanding regarding the accuracy of the measurements
- be familiar with basic principles of structure and mode of operation of generators, engines, transformers and storage batteries
- have an understanding of methods and appliances for surplus power protection of circuits
- understand the principles regarding the layout of electric plants on ships, including system voltages, division into sections, reserve- and emergency supply options
- be familiar with the principles involved in the layout of power supply boards and surveillance of the power supply plant
- have an understanding of the interaction between the propelling engine, the generator and the excitation equipment in connection with parallel operation, including equipment for load distribution
- have an understanding of the interaction between the propelling engine, the generator, the synchronising equipment and the protective equipment in connection closing and opening of generators
- be able to arrange safe work operations, including troubleshooting and repair of minor malfunctions in power plants.

Evaluation
Examination plus training record book for seagoing service term.

Remarks
Lessons shall include laboratory drills.

Subject: Auxiliary systems and service systems for machinists

Purpose
The machinist is to acquire sufficient knowledge of fuel systems, tank units, suction units, sanitary installations, fire-fighting systems, inert gas systems, stern tube systems, ventilation systems and freshwater systems to operate and maintain these systems in a safe and environmentally responsible manner, plus to complete common troubleshooting tasks.

Objectives
After having completed training and education, the machinist shall:

- be able to understand the purpose of and principles for the layout of auxiliary- and service systems
- be able to understand the principles of construction applied for bilge water and sewage processing facilities, including familiarization of existing environmental legislation
- be able to understand the principles of construction applied for freshwater producing facilities, including familiarization of existing legislation
- be familiar with the mode of operation for centrifugal pumps, including knowledge of unacceptable operational conditions
- be familiar with the principles of construction for hand- and servo-controlled closing devices, including knowledge of unacceptable operational conditions
- be capable of attending to the operation of auxiliary- and service systems, plus taking relevant measures on the basis of measuring- and alarm values
- be capable of carrying out troubleshooting, repairs and maintenance of auxiliary- and service systems

Evaluation
Examination plus training record book for seagoing service term.

Remarks
The marine mechanic partially fulfils the objectives.

Subject: Hydraulics and pneumatics for machinists

Purpose
The machinist is to acquire basic knowledge of hydraulic and pneumatic systems and associated components, so that he will be capable of operating and maintaining these systems and components properly.

Objectives
After having completed training and education, the machinist shall:

- be familiar with the structure and mode of operation of pumps, engines, cylinders, accumulators, tanks plus direction valves, closing valves and floor control valves
- be familiar with hydraulic symbols and be capable of implementing documentation
- have an understanding of the handling of hydraulic oil
- be familiar with the principles of construction and building of the systems and installations normally present on board ships, including steering gear, deck machinery, stabilizer fins and adjustable propellers
- be familiar with pneumatic systems and components, including symbols and functional charts plus air processing
- be capable of managing the operation of hydraulic and pneumatic systems, plus on the basis of measurement- and alarm values be capable of taking relevant measures
- be capable of carrying out repairs and maintenance of hydraulic and pneumatic systems.

Evaluation
Internal plus training record book for seagoing service term.

Remarks
Part of the elements of the objectives concerning hydraulics may be fulfilled on the basis of prior skilled craftsman training.
Lessons shall include laboratory drills.

Subject: Boiler theory for machinist

Purpose
The machinist is to acquire sufficient knowledge of auxiliary boilers in order to properly taking charge of operation and maintenance of these plants, so that they operate in a reliable and economical condition, without hazards and in consideration of the environment.

Objectives
After having completed training and education, the machinist shall:

- be familiar with the principles of construction for auxiliary boilers with associated fittings, their mode of operation, structure and application
- be familiar with steam generation in boilers and combustion of oil
- be capable of operating the oil heating- and combustion air system of the boilers
- be capable of handling boiler water
- be familiar with hot water- and hot oil plants
- be familiar with the principles of construction for heat exchangers
- be familiar with the principles for setting of the distributed control-, control-, limitation- and safety systems
- be able to start and maintain the operation of boiler plants, plus to take relevant measures on the basis of measuring- and alarm values
- be capable of carrying out safe and proper repairs and maintenance of boiler plants
- be familiar with regulations for stoking and operating fuelled boilers.

Evaluation
Examination plus training record book for seagoing service term.
Lesson shall include laboratory drills with boiler plants.

Subject: Engineering theory for machinists

Purpose
The machinist is to acquire the knowledge of diesel engines and associated systems required to be in charge of the operation and maintenance of diesel engine plants in a proper and safe manner, their availability and economic operation without hazards and in full consideration of the environment.

Objectives
After having completed training and education, the machinist shall:

- be familiar with the principles of construction for diesel engine types, their mode of operation, structure and their fields of application
- be familiar with the principles of construction for single components of diesel engines
- be familiar with the principles of construction for a ship's main shafting with connected bearings, stuffing boxes, stern tubes and propeller
- be able to carry out operational tests on engine plants
- be familiar with the efficiency of engine plants
- be capable of understanding the necessity of cooling diesel engines
- be capable of carrying out chemical analyses of the of the cooling water condition
- be familiar with the chemical composition of lubricating oils and fuel oils used in motor vessels
- be able to apply filtration and centrifugation in connection with oil purification
- be familiar with the systems connected to diesel engines, including system media and system components plus instrumentation
- be able to start and maintain operation of engine plants, plus on the basis of measuring- and alarm values be able to take relevant measures
- be capable of carrying out repairs and maintenance of diesel engine plants, including measuring of wear parts and alignment control.

Evaluation
Examination plus training record book for seagoing service term.

Remarks
The marine mechanic partially fulfils the objectives.
Lessons shall include laboratory drills with diesel engine plants.

Annex 1: TAXONOMY (classification of training objectives)

General

In the table below, the taxonomy primarily used for the following goal descriptions is stated. The following applies for this taxonomy:

- The individual steps of the classification explain the behaviour, which is to be demonstrated by a candidate for certification, who has completed training and education.
- The system consists of six classification steps (goal categories). Together they should cover all sorts of objectives within the field of knowledge and intellectual skills, irrespective of the nature and subjects of the training.
- The classification steps are arranged according to complexity. The knowledge objectives are the most simple and the assessment objectives the most complex. When the student for instance succeeds at the analysis level, he will be capable of succeeding at the levels of knowledge, understanding and applying within the same problem complexity or field.
- If the designation "familiar with" is applied, an actual learning is considered non-existing. Consequently, the material that has been worked through is not supposed to be rendered, and check of result is not carried out.

Classification of training objectives (taxonomy) in knowledge and intellectual skills		
The steps of the classification are:	Examples of other suited behavioural terms:	In brief, the steps of classification may be described as follows:
1. Be familiar with: Shall be capable of rendering conveyed information from memory	Describe, explain, acquire, identify, mention, render, recognize	**Familiarization** is defined narrowly as approval or rendering of conveyed information
2. Have an understanding of: Shall in his own words be capable of accounting for conveyed information and implementing it in a known situation according to instruction	Explain, express, interpret, calculate, advance, demonstrate, explain in own words, give examples	**Understanding** includes, that a given information is interpreted, which presupposes a reorganization of given contents
3. Be able to apply: Shall in any normal situation to which conveyed information can be naturally referred to, be able to apply this without further instruction	Apply, choose, solve, distinguish, test, use, carry out, classify, demonstrate, construct, meet with, arrange, utilize, exert , handle, work	**Application** implies the transfer of acquired skills to new situations or new problems, which correspond to already known types
4. Be able to analyse: Shall be able to disintegrate information and account for the distinctive characteristics of the relationship between the different elements	Compare, check, find, exempt, select, infer, analyse, point out, register	**Analysis** of information is the first step of more independently solving of entirely new and unknown problems
5. Be able to form synthesis: Shall be able to compare information to previous experience and through this articulate his own view of the subject	Suggest, produce, combine, conclude, organise, plan	**Synthesis** demands the forming of a new whole. The candidate must collocate their knowledge in a - to them - new way
6. Be able to assess: Shall be able to make assessment of different views on the basis of combined knowledge, application, understanding, analysis and synthesis	Determine, control, assess, consider, criticize, debate, evaluate	**Assessment** implies assessing based on criteria. It is not sufficient to bring forward a subjective estimation. Often an assessment will be characterized by individual opinions, but these will then have to be clearly expressed in the criteria laid down for the assessment.

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Annex 2 : Guidelines for number of lessons

Subject Index for Machinist Training and Education

Subjects	Evaluation	Lesson guide
Automation	Internal + training record book	40
Fire-fighting	Examination, certificate + training record book	70
Maritime English	Examination + training record book	60
General subjects	Internal	40
Computer technology	Examination	10
Refrigeration	Internal + training record book	60
Marine technology	Examination + training record book	30
Medical care	Examination + certificate	60
Basic safety at sea	Internal + training record book	40
Safety at sea, occupational safety and pollution prevention	Internal + training record book	50
Maritime law and administration	Internal + training record book	40
Watch-keeping duty	Examination + training record book	40
Electrotechnology	Examination + training record book	110
Auxiliary systems and service systems	Examination + training record book	50
Hydraulics and pneumatics	Internal + training record book	50
Boiler theory	Examination + training record book	100
Engineering theory	Examination + training record book	110
Total number of lessons	Approximately	960