

**ANNEX B OF CMO NO. 20, SERIES OF 2015
BACHELOR OF SCIENCE IN MARINE TRANSPORTATION
COURSE SPECIFICATIONS**

Course Code	:	Seam 4
Course Descriptive Title	:	Cargo Handling and Stowage (Dangerous Goods and Inspections)
Course Credits	:	3 units
Lecture Contact Hours per Week	:	3 hours
Laboratory Contact Hours per Week	:	1 hour
Prerequisite	:	Seam 2B, Seam 3
Reference/s	:	<ol style="list-style-type: none"> 1. Table A-II/1 of the 1978 STCW Code as amended Function: Cargo handling and stowage at the operational level 2. Table A-II/2 of the 1978 STCW Code as amended Function: Cargo handling and stowage at the management level 3. Annex A of CMO No. 20, Series of 2015 (Curriculum Mapping for BSMT)

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes	Knowledge of safe handling, stowage and securing of cargoes, including dangerous, hazardous and harmful cargoes, and their effect on the safety of life and of the ship	Dangerous, hazardous and harmful cargoes <ul style="list-style-type: none"> - Explains the different types of containment covered by the term "packaged form" - Describes the classification of dangerous goods in the International Maritime Dangerous Goods (IMDG) Code - Explains the properties, characteristics and physical state of the different substances, 	8

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<p>materials and articles covered by the 9 classes of the IMDG Code</p> <ul style="list-style-type: none"> - Identifies the marking, labelling and placarding of dangerous goods as required by the IMDG Code and DGs in limited quantities, e.g. schedule 18 - States that the duty officer should have information on the quantities, types of package, proper shipping names (correct technical names), classification, stowage and segregation of the dangerous goods to be handled - States that the duty officer should have information on the special measures to be taken when a certain dangerous cargo is handled - States that the measures to be taken in the event of an incident or accident should be made known and that any necessary equipment and sufficient crew to operate it should be available - Explain where to look for damage and defects most commonly encountered due to: <ul style="list-style-type: none"> - loading and unloading operation - corrosion - severe weather conditions - Explains that the actions to be taken are laid down in the IMO Emergency Procedures for Ships Carrying Dangerous Goods (EmS), the IMO Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG) and the International Medical Guide for Ships (IMGS) - States that any incident or accident during the handling of dangerous goods should be reported immediately to the person in charge of the operation and all cargo operations to be ceased - Explains that the IMDG Code lays down the packing requirements - States that any doubts about the suitability and integrity of packages should be reported to the master or chief mate 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - States the fire precautions which should be taken when carrying dangerous goods - Describes the precautions which should be taken while loading or discharging explosives - Explains with the aid of diagrams, the meaning of the following stowage and segregation requirements for the different types of ships: <ul style="list-style-type: none"> - on deck only - on deck or under deck - away from - separated from - separated by a complete compartment or hold from - separated longitudinally by an intervening complete compartment or hold 	
		<p>Oil tanker piping and pumping arrangements</p> <p><i>Tanker Arrangement</i></p> <ul style="list-style-type: none"> - Describes, for crude carriers and product tankers, the general arrangement of: <ul style="list-style-type: none"> - cargo tanks - pump-rooms - segregated ballast tanks - slop tanks - cofferdams - peak tanks - deep tanks - accommodation - ventilators leading to accommodation and machinery spaces <p><i>Cargo Piping System</i></p>	4

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - Describes the direct pipeline arrangement in crude carriers - Describes the ring-main system in a product tanker - Describes the piping arrangements in a pump-room - Describes the system of individual deep-well pumps for a product tanker - Explains the arrangement and use of: <ul style="list-style-type: none"> - deck lines - drop lines - stripping lines - crossovers - bypasses - master valves - tank suction valves - sea suction valves <p><i>Cargo Pumps</i></p> <ul style="list-style-type: none"> - Describes the main operating features of centrifugal pumps - Explains why most cargo pumps are of centrifugal type - Describes the main operating features of the following positive-displacement pumps: <ul style="list-style-type: none"> - reciprocating - screw - States the applications for which positive-displacement pumps are most suitable - Describes how eductors work and gives examples of their use - Describes the conditions for which the pumps are being used such as stripping - Describes the safe handling of chemical cargoes - Describes the safe handling of liquefied gas cargoes 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - Describes the used of ship/shore checklist - Describe the importance of setting the right pumping rate during the loading and unloading operation 	
Inspect and report defects and damage to cargo spaces, hatch covers and ballast tanks	Understanding of the purpose of the "enhanced survey programme"	Enhanced survey programme <ul style="list-style-type: none"> - Describes the guidelines on the Enhanced Programme of Inspections during surveys of Oil Tankers 	1
Plan and ensure safe loading, stowage, securing, care during the voyage and unloading cargoes	General knowledge of tankers and tanker operations	Terms and definitions <ul style="list-style-type: none"> - Defines petroleum as crude oil and liquid hydrocarbon products derived from it - States that petroleum gases, principally methane, are extracted from crude oils before shipment - Explains that 'spiked crude' has additional petroleum gas, usually butane, dissolved in it before shipment - States that 'sour crude' contains appreciable amounts of hydrogen sulphide or organic sulphur compounds - States that products derived from crude oil include naphtha (gasolines), kerosene, gas oil, diesel oils, lubricating oils, waxes and residual oils such as fuel oil and bitumen - Explains that vapour pressure of any liquid increases with increasing temperature - Defines Reid Vapour Pressure (RVP) - Explains why the pressure in a tank is not necessarily the same as the RVP of the oil it contains, even at the standard temperature 	1

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - States that the flashpoint of a liquid is the lowest temperature at which it gives off sufficient gas to form a flammable mixture in a flashpoint apparatus - Explains why flashpoint cannot be used as an absolute measure of safety - States that flammable means capable of being ignited and of burning - Defines upper flammable limit, lower flammable limit and flammable range and states approximate values for petroleum products - Defines the auto-ignition temperature as the temperature at which a flammable material will ignite without initiation by a spark or flame and will continue to burn - Describes the viscosity of a fluid as a measure of its resistance to flow - States that viscosity increases as the temperature decreases - Defines pour point as the lowest temperature at which an oil is observed to flow - Appreciates that crude carriers in particular have significant residues in tanks which must be accounted for in order to calculate the cargo loaded - Calculates the volume of dry residue as a uniform layer on the tank bottom - Calculates the volume of liquid residues as a wedge on the tank bottom - Knows the limitation of application of wedge calculation - Contents and Application of the International Safety Guide for Oil Tankers and Terminals (ISGOTT) 	
		Contents and application of ISGOTT	2

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - Explains that ISGOTT provides operational advice to directly assist personnel involved in tanker and terminal operations, including guidance on, and examples of, certain aspects of tanker and terminal operations and how they may be managed - Identifies the contents of ISGOTT - States that terminal, local or national regulations may also be applicable and should be known by those concerned - Outlines the general precautions to be taken on tankers regarding: <ul style="list-style-type: none"> - smoking, matches and cigarette lighters - naked lights - the galley - electrical equipment - use of tools - entry to enclosed spaces and pump-rooms - Lists the information which should be exchanged between the ship and the terminal before arrival - States that safety procedures are agreed between the tanker and the terminal and include: <ul style="list-style-type: none"> - means of summoning emergency services - availability and use of fire-fighting and other emergency equipment - actions to be taken in case of fire or other emergency - emergency evacuation of the berth - States that fire-fighting equipment should be ready for immediate use - States that main engines and other equipment essential for manoeuvring should be ready for use at short notice and the written agreement of the terminal and port authority should be obtained for any work or repairs which would immobilize the ship 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - States that detailed loading or discharging plans are agreed between the ship and the terminal - Explains that safety measures against pollution and actions to take in case of an accident are agreed before transfer of cargo commences - States that, before starting cargo transfer, the responsible officer and the terminal representative must formally agree that they are ready to do so safely - States that the terminal should be notified of the intention to use crude oil washing (COW) at least 24 hours in advance - Explains that tanks should be maintained in an inert condition throughout all operations except when entry to tanks for inspection or repair is necessary - Explains that the inert gas should have an oxygen content not exceeding 5% by volume - States that the oxygen content of cargo tanks should not exceed 8% by volume - Explains that the inert-gas plant will be used to: <ul style="list-style-type: none"> - inert empty cargo tanks - supply inert gas during cargo discharging, deballasting, crude oil washing and tank cleaning - purge tanks prior to gas-freeing - top-up the pressure when necessary during a voyage - Explains that, in the event of a failure of the inert gas system, discharge of cargo or ballast or tank cleaning should be stopped, to prevent air being drawn into the tanks, and operations should only be resumed when a supply of inert gas has been restored - Describes the hold and tank arrangements of combination carriers 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - Describes the safety aspects relating to the operation of double hull tankers - Outlines the change-over from oil to dry bulk cargo and from dry bulk cargo to oil 	
		<p>Oil tanker operations and related pollution- prevention regulations</p> <ul style="list-style-type: none"> - Defines segregated ballast, clean ballast, dirty ballast, slop tank - Briefly describes an inert gas system (IGS) and sketches the distribution of inert gas to tanks - Explains the reasons for ballasting - States that the capacity and arrangement of segregated ballast tanks is intended to provide sufficient weight, to provide a satisfactory trim and to ensure full immersion of the propeller for normal conditions of sea passages - States that on rare occasions weather conditions may be so severe that additional ballast is needed for the safety of the ship - States that in crude oil tankers equipped with COW the additional ballast would be carried in tanks that have been washed with crude oil - States that the additional ballast must be treated as dirty ballast - Explains why a ship may have only clean or segregated ballast on board upon arrival at a loading port - States the criteria for the discharge of oil from cargo-tank areas of oil tankers - Outlines the procedures for changing ballast at sea - States that, before loading clean ballast, cargo pumps and lines to be used are flushed with clean water into a dirty ballast or slop tank 	3

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - Describes how to dispose of dirty ballast - Describes how to decant the water contents of the slop tank - States that a final flushing of cargo pumps and lines to be used for discharge of clean ballast is made to the sea through the oil monitoring and control system - Explains that the operation of discharging dirty ballast, decanting the slop tanks and flushing lines must be done when more than 50 nautical miles from the nearest land and outside a special area - States that only segregated or clean ballast may be discharged within 50 nautical miles of land or inside a special area - Explains the reasons for tank cleaning - Briefly describes the use of fixed and portable machines for tank cleaning - Describes the use of slop tanks during tank cleaning - States that an inert atmosphere should be maintained in tanks during tank cleaning in ships fitted with IGS - Briefly describes crude oil washing and the reasons for requiring it in crude oil tankers of 20000 dwt and above - States that crude oil washing can only be carried out with fixed washing machines in inerted tanks - States that the oil residues in the slop tank resulting from tank cleaning and disposal of dirty ballast may be: <ul style="list-style-type: none"> - pumped ashore at the loading terminal - retained on board and segregated from the next cargo - retained on board and the new cargo loaded on top of them - States that the process of tank cleaning, changing ballast, decanting the water from slop tanks and 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<p>loading the next cargo over the retained oil is known as the load-on-top procedure</p> <ul style="list-style-type: none"> - States that details of cargo operations, ballasting and deballasting, tank cleaning, discharge of water from slop tanks and disposal of residues are entered in the ship's Oil Record Book - Defines gas-freeing as the replacement of hydrocarbon vapours or inert gas by air - Lists the reasons for gas-freeing - Explains why inert gas is used to purge the tanks of hydrocarbon vapours before introducing air on suitably equipped ships - States that a mechanical fixed system is used or portable fans are used - States that checks are made during gas-freeing with combustible-gas indicators, oxygen meters and toxic-gas detectors - States that the supply of inert gas to the tank is shut off - Explains the need to maintain ventilation and to check the atmosphere frequently when persons are working in a tank - Appreciates that the change of volume with temperature of oils is not linear - States that cargo calculation is carried out as if the oil were at a standard temperature - Understands that the volume of the oil must be corrected from its actual temperature when measured to the standard temperature - States that the cargo calculation is carried out as if the density of the oil was that at the standard temperature - Explains that the density of oil must be corrected from its actual density to that at the standard temperature - Appreciates that different types of oils have different coefficients of expansion and that there 	

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		<p>are separate Petroleum Measurement Tables for Crude Oils, Products and Lubricating Oils</p> <ul style="list-style-type: none"> - Understands the difference between mass and weight in air and that one or the other may be required by different administrations 	
		<p>Chemical tankers</p> <ul style="list-style-type: none"> - States that modern chemical tankers have evolved from oil product tankers to take account of special carriage requirements and associated hazards - Explains that dedicated service usually means that the tanker is designed for the carriage of a particular type of chemical and transports the same type of cargo on each voyage - Explains that a chemical tanker engaged in parcel trade moves a variety of relatively small lots of chemicals between a number of ports - Lists the most important of the rules governing chemical tankers as: <ul style="list-style-type: none"> - international rules and regulations - national rules and regulations - classification society rules - States that the sea transport of liquid chemicals in bulk is internationally regulated, as regards safety and pollution aspects, through Conventions adopted by the International Maritime Organization (IMO) - Explains that the Convention requirements are supplemented by recommendations, specifications and Codes adopted by IMO - States that the IMO Conventions covering the carriage of chemicals in bulk are: 	3

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> – the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, Chapter VII – the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the 1978 – Protocol (MARPOL 73)78), as amended, Annex II – States that the most important Codes and standards covering the transport of liquid chemicals are: the Bulk Chemical Codes <ul style="list-style-type: none"> – Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code) – International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC) Code – Standards for Procedures and Arrangements for the discharge of Noxious Liquid Substances (P and A Standards) – Defines a chemical tanker as a cargo ship constructed or adapted and used for the carriage in bulk of any liquid product listed in Chapter 17 of the IBC Code – Explains that products are included in the list in Chapter 17 because of their safety hazards or because of their pollution hazards or both – States that safety hazards may be one or more of the following: <ul style="list-style-type: none"> – fire hazard in excess of that of petroleum products – toxicity – corrosivity – reactivity with water, air or other chemicals or self-reaction (polymerization, decomposition) 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - States that, in addition to the survey requirements for any ship, chemical tankers must undergo surveys of the cargo-containment and handling arrangements for the issue of an International Certificate Fitness for the Carriage of Dangerous Chemicals in Bulk - Explains that the Bulk Chemical Codes divide tankers into three ship types, Type 1, Type 2 and Type 3, which reflect the hazard ratings of the cargoes which may be carried - States that a Type 1 ship is intended for the transportation of products considered to present the greatest overall hazards and Type 2 or Type 3 for products of progressively lesser hazards - States that the division into ship types is based on the ship's capability to survive specified damage caused by collision or stranding and the location of the cargo tanks in relation to such damage - Illustrates, by means of sketches, the location of tanks for each type of ship - Explains the following descriptions of tanks: <ul style="list-style-type: none"> - independent - Integral - gravity - pressure - States that all materials used for tank construction and associated piping, valves and pumps must be resistant to the cargo carried - States that some ships have stainless-steel tanks for the carriage of cargoes which cannot be contained in mild steel - Explains that mild-steel tanks are normally coated, to protect cargoes from contamination by steel and to make cleaning, gas-freeing and inspection easier - States that no single coating is suitable for all cargoes and that the coating manufacturers 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<p>compatibility data must be used when planning a cargo</p> <ul style="list-style-type: none"> - Explains that cofferdams and other void spaces may be included in the cargo- tank area to provide segregation of groups of tanks - Illustrates typical tank arrangements by means of simple sketches - States that the heating medium may be steam, water or thermal oils - Explains that the heating system may use coils fitted inside the tank or a heat exchanger placed outside the tank - Describes, with the aid of a drawing, a cargo heating system that uses a heat exchanger placed outside the tank - States that there is suitable protective clothing on board which must be worn by all personnel engaged in loading or discharging operations - States that, for certain cargoes, there must be respiratory and eye-protection equipment for every person on board for emergency escape - States that equipment for evaluation of atmospheres in tanks and other enclosed spaces is provided for: <ul style="list-style-type: none"> - detection of flammable gases - measurement of oxygen content - measurement of concentration of toxic gas - Describes how to use an absorption tube gas detector for measuring the concentration of a gas - Explains what is meant by: <ul style="list-style-type: none"> - the threshold limit value (TLV) of a product - the odour threshold - States that the atmosphere in tanks and enclosed spaces must be considered dangerous unless appropriate checks prove otherwise 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - States that information about cargoes to be handled is essential to the safety of the vessel and crew - States that information for each product may be found on cargo data sheets contained in safety guides or provided by the manufacturer or shipper - States that, if sufficient information necessary for the safe handling and carriage of a cargo is not available, the cargo must not be loaded - States that information necessary for the safe carriage of a cargo includes: <ul style="list-style-type: none"> - a full description of the physical and chemical properties, including reactivity, necessary for its safe containment - action to take in the event of spills or leaks - countermeasures against accidental personal contact - fire-fighting procedures and fire-fighting media - procedures for cargo transfer, tank cleaning, gas-freeing and ballasting - details of the stabilizer or inhibitor added to those cargoes, which require one (on the manufacturer's certificate, in the absence of which the cargo should be refused) - First Aid procedures, including the use of specific antidotes for poisons - States that tanks are normally subject to thorough inspection and testing for cleanliness before loading - Explains, with the aid of a simple drawing, how cargo is routed from the manifold to tanks on a chemical tanker with separate lines for each tank - Explains, with the aid of a simple drawing, a closed circuit' loading operation using a vapour-return line - States that samples are taken from the lines and tanks during loading for purposes of quality control 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> – States that visual and audible high-level alarms and a tank overflow control system are required for many chemicals – States that personnel involved in unloading should check the information in the relevant data sheets and take all necessary precautions, including the wearing of appropriate protective clothing – States that, prior to discharging, samples from tanks and lines are analysed to check if the product has been contaminated on board during the passage – Explains, with the aid of a simple drawing, how cargo is routed from tank to the manifold on a tanker with deepwell pumps and separate lines from each tank – States that, in tanks containing cargoes that present a major fire hazard, inert gas or nitrogen is used to maintain a small positive pressure during unloading, to prevent air from entering the tanks 	
		<p>Tank cleaning and control of pollution in chemical tankers</p> <ul style="list-style-type: none"> – States that different cargoes require different tank-cleaning procedures – States that most tank cleaning can be done with hot or cold seawater or fresh water, or by ventilation alone, although a few cargoes require special solvents – States that fixed or portable tank-washing machines are used – Lists phases in a tank-cleaning operation as: <ul style="list-style-type: none"> – prewash – main wash – fresh water rinse – gas-freeing – drying 	2

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> – inspection and testing – Explains the use of slop tanks to hold cargo residues and tank washings – Explains, with the aid of a simple drawing, the cycle of a tank-washing system from the seawater inlet to the slop tank – States that Annex II of the MARPOL 73/78 Convention contains regulations for the control of pollution by noxious liquid cargoes carried in bulk or tank washings from such cargoes – States that as per the amendments of Annex II of MARPOL, which entered into force on 1 January 2007, a revised annex a new four-category pollution category system for noxious liquid substances; the previous A, B, C and D category system has become X, Y Z and OS. – States that every chemical tanker is required to have a Certificate of Fitness (CoF) indicating that it is certified to carry certain products. The issuance of a CoF will also require a revised Procedures and Arrangements (P&A) Manual. – States that each ship which is certified for the carriage of noxious liquid substances in bulk must be provided with a Procedures and Arrangements (P and A) Manual that has been approved by the Administration and a Cargo Record Book – States that the master must ensure that no discharges into the sea of cargo residues or residue/water mixtures containing substances of Category X, Y, Z or OS take place unless they are made in full compliance with the P and A Manual – States that carrying out operations in accordance with the ship's P and A Manual ensures that the pollution regulations are complied with – States that pollution-prevention procedures during cargo transfer, ballasting and tank cleaning should include keeping a watch on: 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> – levels in cargo, slop or ballast tanks – hoses or loading arms – pumps, valves, gaskets, connections and hatches – spill pans and scuppers – alarms and instrumentation – co-ordination of operational signals – water around vessel – States that personnel on watch should be present at all times during operations and regularly carry out the inspections mentioned in the above – States that entries should be made in the Cargo Record Book, on a tank-to-tank basis, of: <ul style="list-style-type: none"> – loading – internal transfer of cargo – unloading – mandatory prewash in accordance with P and A Manual – cleaning of cargo tanks – discharge into the sea of tank washings – ballasting of cargo tanks – discharge of ballast water from cargo tanks – accidental or other exceptional discharge control by authorized surveyors 	
		<p>Gas tankers</p> <ul style="list-style-type: none"> – States that the transport by sea of liquid gases in bulk is internationally regulated with regard to safety, through standards laid down by IMO – States that Chapter VII of the IMO International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, makes the provisions of the International Code for the Construction and 	3

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<p>Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) mandatory</p> <ul style="list-style-type: none"> - States that a liquefied gas is the liquid form of a substance that at normal atmospheric temperatures and pressures would be a gas - States that liquefied gas products transported by gas tankers are listed in Chapter 19 of the IGC Code - States that some of those substances are also covered by the IBC Code divides gas cargoes into four groups as: <ul style="list-style-type: none"> - liquefied natural gas (LNG) - liquefied petroleum gas (LPG) - liquefied ethylene gas (LEG) - chemical gases - States that LNG is natural gas from which impurities have been removed, and consists mainly of methane - States that LPG is the common name for petroleum gases consisting mainly of butane and propane - Lists chlorine, ammonia and vinyl chloride monomer as examples of chemical gases - States that, in addition to the surveys required for all ships, gas tankers must undergo surveys of the cargo-containment equipment and cargo-handling arrangements for the issue of an International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk - States that the Certificate of Fitness lists the cargoes which may be carried by the ship and may also stipulate conditions for carriage - Explains the following terms used in the IGC Code: <ul style="list-style-type: none"> - boiling point - cargo area - cargo containment system 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - gas carrier - gas-dangerous space or zone - gas-safe space - hold space - interbarrier space - MAR VS - primary barrier - secondary barrier tank dome - Explains that the IGC divides ships into four types, IG, 2G, 2PG and 3G - States that a Type 1G ship is intended for the transportation of products considered to present the greatest overall hazard and Types 2G/2PG and 3G for products of progressively lesser hazards - States that the division into ship types is based on the ship's capability to survive specified damage caused by collision or stranding and the location of the cargo tanks in relation to such damage - Describes, in simple terms: <ul style="list-style-type: none"> - integral tank - membrane tank - semi-membrane tank - independent tank - internally insulated tank - Explains, in simple terms, the division of independent tanks into: <ul style="list-style-type: none"> - Type A, generally a self-supporting prismatic tank - Type B, generally a self-supporting spherical tank - Type C, generally a self-supporting cylindrical pressure tank - States that a cargo tank has shut off valves located as close to the tank as possible for all liquid and vapour connections except for safety relief valves 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - States that regulations require remotely operated emergency shutdown (ESD) valves in the cargo piping system - States that the operation of the ESD system also stops pumps and compressors - States that all cargo tanks must be provided with a pressure-relief system - States that all equipment and piping which can be isolated when full of liquid must be provided with a pressure-relief system - States that cargo pumps are usually centrifugal, either deepwell pumps or submerged electric pumps, in the tanks with deck-mounted booster pumps, if required - Describes the uses of cargo heaters and vaporizers - Explains the effect of transfer of heat to the cargo on cargo temperature and tank pressure - States that, except for fully pressurized vessels, means for controlling the pressure must be provided - States that pressure in cargo tanks may be controlled by: <ul style="list-style-type: none"> - insulation of tanks, to reduce heat transfer - leading cargo boil-off to the ship's boilers or main engine as fuel (ONLY with LNG) - leading cargo boil-off to the ship's reliquefaction plant, where vapour is liquefied and returned to the tank - cooling the liquid in a heat exchanger (indirect system) - Describes the single-stage direct liquefaction cycle - States that the indirect system is only used for those products which cannot be compressed for safety reasons - States that inert gas is used to inert hold spaces and inter barrier spaces and to purge tanks 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> – States that most gas tankers are fitted with an inert-gas generator – States that the liquid level in cargo tanks is commonly measured by means of float gauges – States that each cargo tank is fitted with a high-level alarm and automatic shutoff valves to prevent overflow – States that each cargo tank is fitted with means for indicating the temperature and pressure – Explains how cargo leakage through the primary barrier can be detected – States that gas tankers have a fixed gas-detection system that gives audible and visual alarms of the accumulation of gas in enclosed spaces such as cargo pump-rooms, compressor rooms, hold spaces and inter-barrier spaces – Describes briefly the arrangements for fire fighting on deck in the cargo area describes the water-spray system for ships carrying flammable or toxic products 	
		<p>Cargo operations in gas tankers</p> <ul style="list-style-type: none"> – States that information for each product may be found on cargo data sheets contained in safety guides or obtained from the shipper – States that information needed before loading includes: <ul style="list-style-type: none"> – a full description of the physical and chemical properties that are necessary for the safe containment of the cargo – action to be taken in the event of spills or leaks – counter-measures against accidental personal contact – fire-fighting procedures and fire-fighting media 	2

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - procedures for cargo transfer, gas-freeing, ballasting, tank cleaning and changing cargoes - special equipment for particular cargoes - minimum temperatures of the inner hull steel - emergency procedures - States that products that react when mixed should only be loaded if the complete cargo systems are separated - States that personnel should be made aware of the hazards and be required to use the appropriate protective equipment provided - States that the master should ensure proper liaison between the ship and the terminal before and throughout cargo-transfer operations - Describes briefly the following cargo operations: <ul style="list-style-type: none"> - drying - inerting - purging - cooling down - loading - cargo conditioning on passage - discharging - changing cargoes - gas-freeing - preparing for tank inspection - States that all operations involving cargo, ballast and bunkers should be carried out in accordance with the applicable international and local pollution regulations - States that some gas cargoes are subject to the regulations of Annex II of MARPOL 73/78 - Explains that a gas tanker requires an International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (NLS Certificate) to carry such products 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - States that such cargoes must be handled in accordance with the Procedures and Arrangements Manual - Understands that the mass of vapour present in the ullage space is included in the calculation of liquefied gasses - Calculates the vapour mass - 	
Carriage of dangerous goods	International regulations, standards, codes and recommendations on the carriage of dangerous cargoes, including the International Maritime Dangerous Goods (IMDG) Code and the International Maritime Solid Bulk Cargoes (IMSBC) Code	<p>International regulations, standards, codes and recommendations on the carriage of dangerous cargoes, including the International Maritime Dangerous Goods (IMDG) Code and the International Maritime Solid Bulk Cargoes (IMSBC) Code</p> <ul style="list-style-type: none"> - Understands and applies the content the of International Regulations Standards, Codes and Recommendations on the carriage of dangerous cargoes, including the International Maritime Dangerous Goods (IMDG) Code, the International Maritime Solid Bulk Cargoes (IMSBC) Code 	3
	Carriage of dangerous, hazardous and harmful cargoes; precautions during loading and unloading and care during the voyage	<p>Dangerous goods in packages</p> <ul style="list-style-type: none"> - States that the IMDG Code is an evolving document and is updated every two years to take account of: <ul style="list-style-type: none"> - new dangerous goods which have to be included - new technology and methods of working with or handling dangerous goods 	10

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> – safety concerns which arise as a result of experience – Lists the explosives which may be carried on a passenger ship – Describes the contents of the shipper’s declaration of dangerous goods – Identifies the marking and labelling required on packages or cargo units – States why additional labelling may be necessary to meet the requirements for through transport – Verifies that the documentation provided to the ship and the packaging and labelling of packaged dangerous cargo complies with the requirements of the IMDG Code – Explains the actions to take when documentation, packaging, labelling or the condition of packages does not meet the requirements of the IMDG Code – Plans the stowage and segregation of a cargo containing dangerous goods when provided with the loading list, the copies of the shipper’s declarations and the IMDG code to plan a stow and segregation and prepares the dangerous goods manifest and stowage plan for a cargo containing multiple dangerous goods – Extracts the relevant references to EmS and MFAG – Identifies the appropriate action to take in emergency and medical first aid situations involving dangerous goods – Describes the requirements of SOLAS chapter VII on the carriage of dangerous goods – Explains that the IMDG Code should be followed to ensure compliance with the requirements of SOLAS for the carriage of dangerous goods in packaged form – Explains that the Code ensures safety mainly by stipulating the packaging required and the 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<p>segregation from other cargoes with which there could be an adverse reaction</p> <ul style="list-style-type: none"> - States that the Code comprises 7 parts, which is presented in two books; Volume 1 and Volume 2 - States that it is necessary to use both books to obtain the required information when shipping dangerous goods by sea - States that the Code also contains a supplement - Lists the contents of Volume 1 (Parts 1-2 & 4-7 of the Code) which comprises: <ul style="list-style-type: none"> - part 1, general provisions, definitions and training - part 2, classifications - part 4, packing and tank provisions - part 5, consignment procedures - part 6, construction and testing of packagings, intermediate bulk containers (IBCs), large packagings, portable tanks, multi-element gas containers (MEGCS) and road tank vehicles - part 7, requirements concerning transport operations - Lists the contents of Volume 2 (Part 3 and the Appendices of the Code) which comprises: <ul style="list-style-type: none"> - part 3 dangerous goods list (DGL) and limited quantities exceptions - appendix a list of generic and n.o.s. (not otherwise specified) proper shipping names - appendix b glossary of terms - alphabetical index - States that the dangerous goods list (DGL) is the central core of the IMDG Code and presents information on transport requirements in a coded form - States that the supplement contains the following texts related to the Code: 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> – emergency response procedures for ships carrying dangerous goods – medical first aid guide – reporting procedures – IMO/ILO/ECE guidelines for packing cargo transport units – safe use of pesticides in ships – international code for the carriage of packaged irradiated nuclear fuel, plutonium and high-level radioactive wastes on board ships – States that the purpose of the IMDG Code's classification system is: <ul style="list-style-type: none"> – to distinguish between goods which are considered to be dangerous for transport and those which are not – to identify the dangers which are presented by dangerous goods in transport – to ensure that the correct measure are taken to enable these goods to be transported safely without risk to persons or property (both within the port and on the ship) – States that dangerous goods are classified into 9 classes according to properties – States that the way in which different classes of dangerous goods are handled in transport will depend upon these properties and hazards, for example: <ul style="list-style-type: none"> – the type of packaging that can be used – what classes of dangerous goods can be transported together in freight containers – where the goods can be stored within the port and on the ship – Lists the 9 classes of dangerous goods in the IMDG code, which are: <ul style="list-style-type: none"> – class 1 explosives – class 2 gases 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> – class 3 flammable liquids – class 4 flammable solids – class 5 oxidizing substances and organic peroxides – class 6 toxic and infectious substances – class 7 radioactive material – class 8 corrosive substances – class 9 miscellaneous dangerous substances and articles – States that the 9 hazard classes have been established internationally by a United Nations (UN) committee to ensure that all modes of transport (road, rail, air and sea) classify dangerous goods in the same way – States that by testing the dangerous goods according to UN test procedures, a shipper is able to classify dangerous goods according to the 9 hazard classes – Explains that the hazard presented by each class is identified by an internationally accepted hazard warning label (diamond) – States that this hazard warning label appears on the outer packaging of the dangerous goods when they are being transported as a warning to all those working within the transport chain or coming into contact with them – States that these hazard warning labels are pictured inside the front cover of Volume 1 of the IMDG Code – States that the dangerous goods, within each of the 9 hazard classes, are uniquely identified by two pieces of information: <ul style="list-style-type: none"> – a four-digit number known as the UN number which is preceded by the letters UN – the corresponding proper shipping name (PSN) 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> – for example, kerosene is identified in the IMDG Code by its UN number UN 1223 and the PSN Kerosene – States that together the UN Number and PSN uniquely identifies dangerous goods to: <ul style="list-style-type: none"> – enable rapid and precise identification during transport – ensure the correct handling, stowage, segregation etc, – in the event of an emergency, ensure that the correct procedures are followed – Explains that the purpose of using a four-digit number to identify dangerous goods is to enhance safety by: <ul style="list-style-type: none"> – overcoming language barriers- the four-digit number is easily understood in all languages – avoiding confusing similar names- e.g. TITANIUM POWDER, WETTED UN 1352 which is a flammable solid in class 4.1 and has very different transport requirements to TITANIUM POWDER, DRY UN 2546 which is spontaneously combustible in class 4.2 – States the PSN must be used for transport purposes on documentation/labelling etc – States that no alternatives or variations are permitted unless specifically stated – States that the PSN is that part of the name which appears in the Dangerous Goods List or the Alphabetical Index in capital letters only – States that any text in lower case is only descriptive and is not part of the PSN – States that the Dangerous goods list (DGL) is presented across 2 pages of the IMDG Code and is divided into 18 columns for each individual dangerous good listed 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - States that much of the information contained in the DGL is coded to make it easier to present in a table - States that the DGL is arranged in UN Number order; column 1 and column 18 contains the UN Number - States that to look up an entry only the UN Number is required - States that dangerous goods can also be searched using the PSN - Explains that if the UN Number is not given but the dangerous good has the PSN, its associated UN Number can be located by looking at the alphabetical index at the back of Volume 2 of the IMDG code - Explains that the IMDG Code contains clearly defined recommendations for the training of all staff who handle or process dangerous goods shipments for transportation by sea. The full training requirements can be found in the IMDG Code Volume 1, Chapter 1.3 - States that a packing certificate is also required, certifying that a container or vehicle has been properly packed and secured, if loaded with dangerous goods - Describes the information given for individual substances - States that an index of dangerous goods is included in Volume I of the IMDG Code - Explains how to obtain the references to the relevant Emergency Schedule (EmS) and the entry in the Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG) - Describes the information given for individual substances 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - States the requirement for a dangerous goods manifest or stowage plan and describes how they should be prepared - Lists, by headings, the information given in an emergency schedule - Defines dangerous substances‘, port authority‘, regulatory authority‘, designated port office‘ and responsible person‘ as used in the Recommendations on the Safe Transport, Handling and Storage of Dangerous Substances in Port Areas - Explains that a port authority may be empowered to refuse dangerous substances if it is considered that their presence would endanger life or property because of: <ul style="list-style-type: none"> - their condition - the condition of their containment - the condition of their mode of conveyance - conditions in the port area - States that, if any dangerous substance constitutes an unacceptable hazard, the port authority should be able to order the removal of such substance or any ship, package, container, portable tank or vehicle containing it - States that a port authority will normally require notification at least 24 hours in advance of the transport or handling of dangerous substances, including those which are not for discharge at that port - Describes the inspections which may be made by a port authority - States that the designated port officer should be empowered to: <ul style="list-style-type: none"> - direct when and where a ship having any dangerous substances on board may anchor, moor or berth 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> – direct a ship to be moved within or to leave the port area – attach conditions appropriate to local circumstances and the quantity and nature of the dangerous substances – States that the regulatory authority may require signals to be shown while transporting or handling dangerous substance – Describes the signals as: <ul style="list-style-type: none"> – by day, flag 'B' of the International Code of Signals – by night, an all-round fixed red light – Explains how effective communications with the port authority can be maintained – Describes the requirements regarding mooring a ship carrying dangerous substances – States that at all times there should be sufficient crew on board to maintain a proper watch and operate appliances in the case of an emergency, taking into account the nature and quantity of dangerous substances on board – States that a responsible person should be designated to supervise the handling of dangerous goods – Lists the measures which should be taken by the responsible person in connection with: <ul style="list-style-type: none"> – the weather – lighting – protective clothing and equipment – intoxicated persons – fire and other emergency procedures – reporting of incidents and safety precautions – Explains that the port authority should be informed of the intention to carry out repair work when dangerous substances are on board 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - Explains the handling precautions which should be observed regarding: <ul style="list-style-type: none"> - avoidance of damage to packages - access to handling areas - lifting goods over dangerous goods stowed on deck - escape of a dangerous substance from a package entry into enclosed spaces - Describes the special precautions for loading or unloading explosives 	
		<p>Solid bulk cargoes</p> <ul style="list-style-type: none"> - Outlines the contents of the International Maritime Solid Bulk Cargoes (IMSBC Code) - States that the main hazards associated with the shipment of bulk solids are: <ul style="list-style-type: none"> - structural damage due to improper distribution of the cargo - loss or reduction of stability during a voyage - chemical reactions - Lists the information which should be supplied by the shipper to the master before loading - States that a certificate stating the relevant characteristics of the material should be provided to the master at the loading point - Explains that certificates stating transportable moisture limits should be accompanied by a statement that the moisture content is the average moisture content at the time of presenting the certificate - Explains how to distribute a high-density cargo between holds when detailed information is not available 	9

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - States that the loading instrument, loading information and the ship's stability information book and calculator should be used to check the suitability of a proposed stow for stresses and stability - Describes how to prevent shifting of bulk cargo by reducing an excessively high GM - Describes precautions to take before, during and after loading of bulk cargo - Describes the precautions to take to minimise the effect of dust on deck machinery, navigational aids and living quarters - Describes the health hazards which may be associated with bulk materials - States that safety precautions and any appropriate national regulations should be complied with during the handling and carriage of bulk materials - States that a copy of the Medical First Aid Guide for Use in Accidents Involving Dangerous Goods should be on board - Describes how to trim cargoes having an angle of repose: <ul style="list-style-type: none"> - less than or equal to 35 degrees - greater than 35 degrees - Describes how to stow material which flows freely like grain - Explains the IMSBC code method for determining the approximate angle of repose on board ship - Describes the types of cargo which may liquefy during carriage - States that cargoes which may liquefy should not be carried with a moisture content above that of the transportable moisture limit - Explains that such cargoes may look relatively dry when loaded but liquefy as a result of compaction and vibration during the passage 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - States that such cargoes should be trimmed reasonably level, regardless of the angle of repose stated - Explains the precautions to be taken to keep liquids out of holds where such cargoes are carried and the danger of using water to cool a shipment of these materials - States that specially fined or constructed cargo ships may carry materials with a moisture content above the transportable moisture limit if approved by their Administrations - Describes the test for approximately determining the possibility of flow which may be carried out on board ship - States that some materials transported in bulk present hazards because of their chemical properties - Explains that some materials are classified as dangerous goods in the IMDG code while others are Materials Hazardous only in Bulk' (MHB) - States that the IMSBC Code categorizes cargoes into three groups - A, B and C: <ul style="list-style-type: none"> - Group A consist of the cargoes which may liquefy if shipped with moisture content in excess of their transportable moisture limit. - Group B consists of cargoes which possess a chemical hazard which could give rise to a dangerous situation on a ship. - Group C consists of cargoes which are not liable to liquefy (Group A) and do not possess chemical hazards (Group B) - Explains the content and use of the following: that in the added supplement of the IMSBC code, the IMO documents contained are: <ul style="list-style-type: none"> - The BLU code - The BLU manual 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> – MSC/Circ. 908 - Uniform Method of Measurement of the Density of Bulk Cargoes – MSC/Circ. 1146 - Lists of Solid Bulk Cargoes for which a Fixed Gas Fire-extinguishing System may be exempted or for which a Fixed Gas Fire-extinguishing System is Ineffective – Res. A.1050(27) - Recommendations for Entering Enclosed Spaces Aboard Ships – MSC.1/Circ.1264 - Recommendations on the Safe Use of Pesticides in Ships Applicable to the Fumigation of Cargo Holds – BC.1/Circ.66 - Contact Names and Addresses of the Offices of Designated National Competent Authorities Responsible for the Safe Carriage of Grain and Solid Bulk Cargoes – Explains the list of materials possessing chemical hazards is not exhaustive, that the properties listed are for guidance only and that it is essential to obtain currently valid information about bulk materials before loading – Explains the use of the tables for segregation between incompatible bulk materials and between bulk materials and dangerous goods in packaged form – States that the IMDG code should also be consulted for additional requirements regarding the stowage and segregation of packaged dangerous goods – States that particular care should be taken with the segregation of toxic substances and foodstuffs Uses the IMSBC code to extract all necessary information for the safe carriage in bulk of a stated cargo, describes how it should be loaded and lists any special precautions or requirements to be observed during loading, carriage and discharge 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<p>The International Code for the Safe Carriage of Grain in Bulk (International Grain Code)</p> <ul style="list-style-type: none"> - States that the international Grain code apply to all ships to which the SOLAS regulations apply and to cargo ships of less than 500 gross tons - Explains that the International Code for the Safe Carriage of Grain in Bulk (International Grain Code) are based on the recognition that grain like cargoes have a propensity to shift and that even fully loaded cargo spaces may contain voids that allow dangerous cargo shifts - Defines the following terms as used in chapter VI of SOLAS: <ul style="list-style-type: none"> - grain - filled compartment - partly filled compartment - angle of flooding - Explains that the Code requires demonstration, by calculation, that at all times during a voyage the ship will have sufficient intact stability to provide adequate dynamic stability after taking into account an assumed shift of cargo - States the Code requirements for minimum stability in terms of initial meta centric height, angle of heel due to assumed grain shift and residual dynamic stability - Explains that vessels with appropriate design features may be able to meet the required minimum stability criteria after the assumed movement of cargo without taking further physical precautions to reduce the shift of cargo - Explains the stability and grain loading information that is required to be provided for such vessels if they are to receive a Document of Authorisation 	7

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> - Explains the method of verifying that the loading of a vessel supplied with a Document of Authorisation meets stability requirements using volumetric heeling moments, cargo details and maximum deadweight heeling moments - Explains that the grain loading stability booklet and associated plans contain all of the information necessary to check that a proposed loading plan complies with the stability requirements of the Regulations at all stages of the voyage - States that in some countries a certificate of loading, certifying that the cargo has been loaded in compliance with the Regulations, is required before sailing - Explains the importance of trimming to fill all of the spaces under decks and hatch covers to the maximum extent possible - States that the ability to comply with the stability criteria should be demonstrated before loading - States that the master should ensure that the ship is upright before proceeding to sea - Explains the use of physical precautions to reduce cargo movement - Describes the use and fitting of longitudinal divisions in both filled and partly filled compartments - Demonstrates the use of Part C of the Code to determine the scantlings for uprights and shifting boards - Describes the construction of a saucer as an alternative to a longitudinal division in a hatchway - Describes the use of bagged grain or other suitable cargo stowed in the wings and ends of a compartment to reduce the heeling effects of a grain shift - Describes methods of securing the free grain surface in partly filled compartments 	

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS	APPROX HOURS
		<ul style="list-style-type: none"> <li data-bbox="1102 264 1755 378">– States that the hatch covers of filled compartments which have no cargo stowed over them should be secured as laid down in the document of authorization <li data-bbox="1102 386 1755 475">– Explains the conditions which must be met before a ship without a document of authorization may load grain <p data-bbox="1052 483 1755 651">Given a ship's data and details of consumption of fuel and of fresh water for an intended voyage, prepares a stowage plan for a cargo of bulk grain and performs the calculations to check that the proposed stowage complies, at all stages of the voyage, with the stability criteria set out in chapter VI of SOLAS 1974</p>	
TOTAL			58