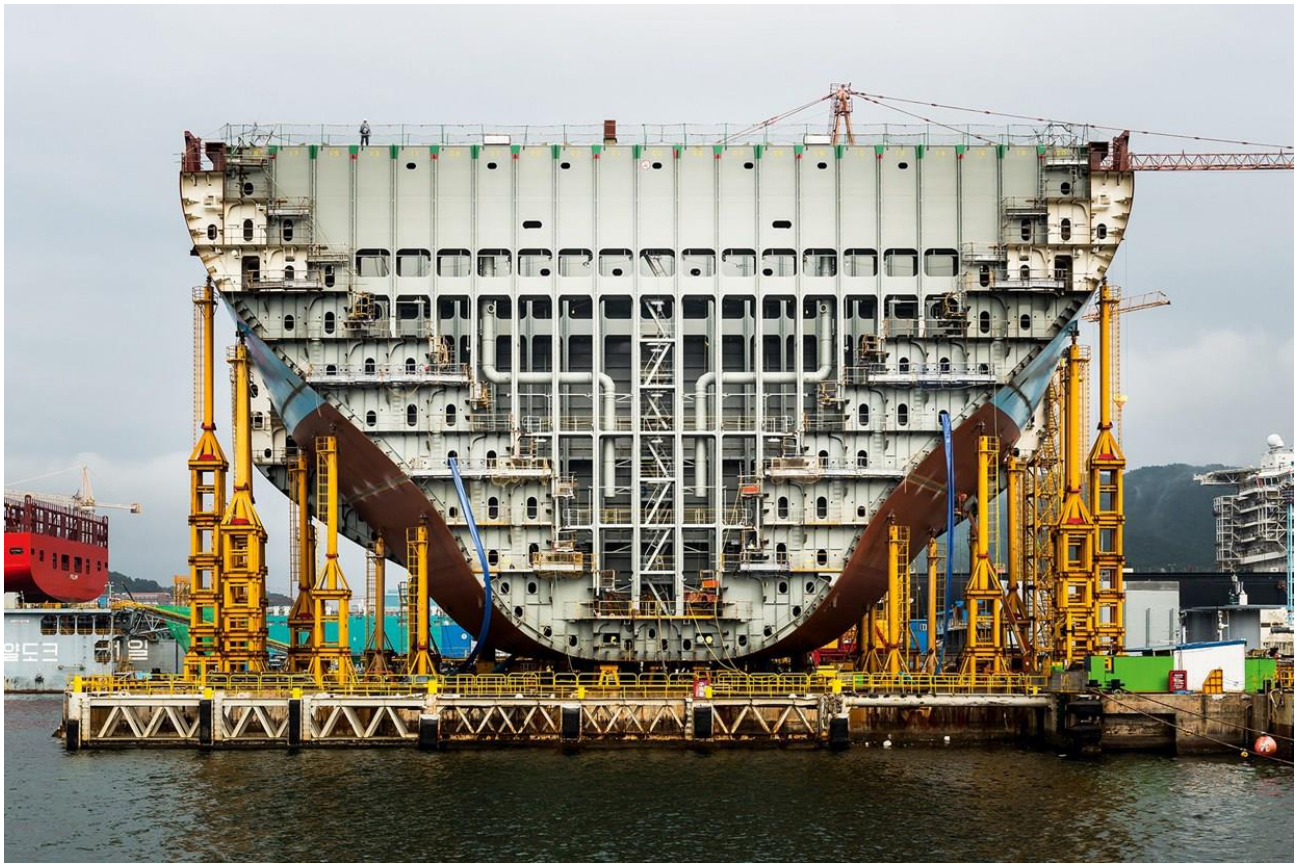

Model Curriculum

QP Name: Design Engineer - Hull and Structures

QP Code: CSC/Q0406

QP Version: 1.0

NSQF Level: 7

Model Curriculum Version: 1.0

Capital Goods Skills Council
Awfis, L-9, Connaught Place, New Delhi - 110001

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Training Parameters

Sector	Capital Goods
Sub-Sector	Strategic Manufacturing – Ship Building
Occupation	Design
Country	India
NSQF Level	7
Aligned to NCO/ISCO/ISIC Code	NCO-2015/ 7123.9900
Minimum Educational Qualification and Experience	B.Tech (Degree in Naval Architecture) with 5 years of experience in the relevant field
Pre-Requisite License or Training	NA
Minimum Job Entry Age	23 years
Last Reviewed On	31/03/2022
Next Review Date	31/03/2025
NSQC Approval Date	31/03/2022
QP Version	1.0
Model Curriculum Creation Date	31/03/2022
Model Curriculum Valid Up to Date	31/03/2025
Model Curriculum Version	1.0
Minimum Duration of the Course	720 Hours
Maximum Duration of the Course	720 Hours

Program Overview

This section summarizes the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills.

- Demonstrate the steps involved in preparing for designing of hull and structures of naval ships.
- Demonstrate the designing procedures for hull and hull structures of naval ships.
- Demonstrate the designing procedures for the internal structures for naval ships
- Perform the various post-designing activities for ships and marine systems
- Apply appropriate health and safety practices at the workplace
- Discuss the importance of working effectively in a collaborative environment
- Demonstrate sustainable practices to be adopted at the workplace

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
Bridge Module	***08:00 Hours***	***00:00 Hours***	***00:00 Hours***	***00:00 Hours***	**08:00 Hours**
Module 1: Introduction to the sector and the job role	08:00 Hours	00:00 Hours	00:00 Hours	00:00 Hours	08:00 Hours
CGC/N0409: Prepare for designing of hull and structures of naval ships NOS Version No.: 1.0 NSQF Level: 7	**92:00 Hours**	**116:00 Hours**	**00:00 Hours**	**00:00 Hours**	**208:00 Hours**
Module 2: Basics of naval ship design	40:00 Hours	00:00 Hours	00:00 Hours	00:00 Hours	40:00 Hours
Module 3: Information gathering	16:00 Hours	24:00 Hours	00:00 Hours	00:00 Hours	40:00 Hours
Module 4: Planning and organising	12:00 Hours	44:00 Hours	00:00 Hours	00:00 Hours	56:00 Hours
Module 5: Lines plan and hull stability assessment	24:00 Hours	48:00 Hours	00:00 Hours	00:00 Hours	72:00 Hours
CGC/N0410: Design hull and hull structures of naval ships NOS Version No.: 1.0 NSQF Level: 7	**56:00 Hours**	**204:00 Hours**	**00:00 Hours**	**00:00 Hours**	**260:00 Hours**
Module 6: Designing hull structures	16:00 Hours	40:00 Hours	00:00 Hours	00:00 Hours	56:00 Hours

Module 7: Design verification and modification	24:00 Hours	80:00 Hours	00:00 Hours	00:00 Hours	104:00 Hours
Module 8: 3D Modelling and testing	16:00 Hours	84:00 Hours	00:00 Hours	00:00 Hours	100:00 Hours
CGC/N0411: Design the internal structures for naval ships NOS Version No.: 1.0 NSQF Level: 7	**18:00 Hours**	**96:00 Hours**	**00:00 Hours**	**00:00 Hours**	**114:00 Hours**
Module 9: Internal structures design	18:00 Hours	96:00 Hours	00:00 Hours	00:00 Hours	114:00 Hours
CGC/N0412: Perform post-designing activities for ships and marine systems NOS Version No.: 1.0 NSQF Level: 7	**08:00 Hours**	**32:00 Hours**	**00:00 Hours**	**00:00 Hours**	**40:00 Hours**
Module 10: Post-design activities	08:00 Hours	32:00 Hours	00:00 Hours	00:00 Hours	40:00 Hours
CSC/N1337: Maintain a healthy, safe and secure working environment NOS Version No.: 2.0 NSQF Level: 4	**12:00 Hours**	**22:00 Hours**	**00:00 Hours**	**00:00 Hours**	**34:00 Hours**
Module 11: Healthy, safe and secure environment	08:00 Hours	12:00 Hours	00:00 Hours	00:00 Hours	20:00 Hours
Module 12: Fire safety, first aid and emergencies	04:00 Hours	10:00 Hours	00:00 Hours	00:00 Hours	14:00 Hours
CSC/N1338: Work effectively in a collaborative environment NOS Version No.: 2.0 NSQF Level: 4	**08:00 Hours**	**24:00 Hours**	**00:00 Hours**	**00:00 Hours**	**32:00 Hours**
Module 13: Team effectiveness and respecting diversity	04:00 Hours	12:00 Hours	00:00 Hours	00:00 Hours	16:00 Hours
Module 14: Effective communication and good behaviour	04:00 Hours	12:00 Hours	00:00 Hours	00:00 Hours	16:00 Hours
SGJ/N1703: Adopt sustainable practices at workplace NOS Version No.: 1.0 NSQF Level: 5	**08:00 Hours**	**16:00 Hours**	**00:00 Hours**	**00:00 Hours**	**24:00 Hours**

Module 15: Sustainable practices	08:00 Hours	16:00 Hours	00:00 Hours	00:00 Hours	24:00 Hours
Total Duration	**210:00 Hours**	**510:00 Hours**	**00:00 Hours**	**00:00 Hours**	**720:00 Hours**

Module Details

Module 1: Introduction to the sector and the job role

Bridge Module

Terminal Outcomes:

- Provide an overview of the ship building segment of strategic manufacturing industry.
- List the key responsibilities of a design engineer – hull and structures.

Duration: *08:00*	**Duration**: *00:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the importance of ship building segment of strategic manufacturing industry. • Discuss the scope of employment and career progression in the ship building segment of strategic manufacturing. • List the key responsibilities of a design engineer – hull and structures. • Explain the importance of referring to relevant sources for information pertaining to employment terms, entitlements, job role and responsibilities in an organisation. • Explain the importance of reading and following legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions. • Outline the relevant people that work with a design engineer – hull and structures along with their key responsibilities. • Explain the importance of identifying and following reporting structure, inter-dependent functions, lines and procedures in the work area.	
Classroom Aids:	
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Nil	

Module 2: Basics of naval ship design

Mapped to CSC/N0409, v 1.0

Terminal Outcomes:

- Explain basic concepts of naval ship design.

Duration:*40:00*	**Duration**: *00:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe various types of naval ships and their layout and key characteristics related to hull and structures. • Explain the key steps involved in the ship designing process. • Explain key naval architecture concepts. • State the international system (SI) of measurement relevant to naval ship design. • State the key bassel conventions on the maritime industry. • Discuss the rules and guidelines specified in standards applicable to naval ships. • Discuss classification rules and design norms of different types of ships.	
Classroom Aids:	
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Naval ships for a field visit	

Module 3: Information gathering

Mapped to CSC/N0409, v 1.0

Terminal Outcomes:

- Demonstrate the steps involved in gathering of information required to initiate hull and structures design for naval ships.

Duration: *16:00*	**Duration**: *24:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the information required for design brief of hull and structures for naval vessel and their sources. • Describe how to calculate basic characteristics of the hull by analysing design proposal and specifications. • Explain the importance of reference ship hull and structure design documents and their sources • List the sources for obtaining reference ship hull and structure design documents. • Explain the importance of extracting relevant information on the latest technologies, standards and guidance for compliances and improvements in design from authorised sources. • List authorised sources of information on latest technologies, standards and guidance for compliances and improvements in naval ship design. • Explain the importance of familiarizing with company systems for recording design information and commonly used systems in organisations involved in Naval ship building.	• Demonstrate the steps involved in collating inputs for the design of hull and structures for naval vessels. • Select a reference design from specified statistical data for hull and structures design, which meets the preliminary requirements like type and displacement. • Establish basic characteristics of the hull, such as size and weight to fulfil qualitative requirements by analyzing design proposal and specifications • Identify design constraints for specified naval ship hull and structures design projects. • Identify resources required at various stages of designing based on specifications provided.
Classroom Aids:	
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Computers, printers, access to internet, ERP system, stationary, reference designs for various types of Naval ships, Project requirements, Rules and guidelines specified in Standards, Books, Journals, NPTEL Lectures, Published Papers	

Module 4: Planning and organising

Mapped to CSC/N0409, v 1.0

Terminal Outcomes:

- Demonstrate the steps involved in planning and organising for naval ship design for hull and structures

Duration: *12:00*	**Duration**: *44:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• State the information and level of detail to be included in a design brief. • Describe key project management tools and concepts. • Explain the importance of identifying design constraints. • State some common constraints related to construction in terms of capacity of shipyard. • List some common 2D/3D software and drafting workstations applicable to naval ship design activities. • Explain the need to familiarize with company systems used in their organisation for recording design information. • Describe the activities involved in organising for the availability of equipment, materials and manpower resources at various stages of the designing process.	• Prepare a design brief with all information required for commencement of designing. • Prepare a list of specific tasks required for designing requirements across various ship design stages. • Prepare plan for construction of vessel in dockyard including sequence of shipping in and shipping out. • Produce work measurement records, progress reports and output PERT charts. • Perform feasibility analysis on design plan. • Demonstrate the activities involved in the preparation of the software and drafting workstations for various design activities such as 2D/3D drafting, hull modelling, structural design, stability, computation fluid dynamic / manouvering and FE analysis.
Classroom Aids:	
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Computers, printers, access to internet, ERP system, stationary, Reference designs for various types of Naval ships, Project requirements, Rules and guidelines specified in Standards, Books, Journals, NPTEL Lectures, Published Papers, Software used for naval ship design activities such as 2D Drafting- AutoCAD; 3D Drafting-UGNx, CATIA (for all except hull), Solidworks, Rhino (for only hull modelling); Stability-MAXSURF, NAPA, Aveva Marine; Structural Design-NAPA, Aveva Marine, SM 3D; FE Analysis-ANSYS, Hypermesh, Femap; CFD (Computation Fluid Dynamic / Manouvering) Analysis - Star CCM+, Fluent)	

Module 5: Lines plan and hull stability assessment

Mapped to CSC/N0410, v 1.0

Terminal Outcomes:

- Prepare lines plan and assess stability of the hull

Duration: *24:00*	**Duration**: *48:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain how the principal dimensions of the vessel are determined. • Describe key naval ship design and engineering concepts. • List hull and hull structure features and statistics. • Describe fundamentals of fluid mechanics, structural dynamics, manoeuvring calculations, hydrostatics, hydrodynamics, ship resistance and propulsion, marine mechanics of materials and theory of vibration and their naval architectural calculations. • State the types of design features that should be considered unique or specific to naval ship hull and hull structures design. • Describe the process for developing basic sectional and waterline curves of the hull and structure to establish the centre of gravity, ideal hull form. • Explain the relevance of draft marks, plimsoll marks, load line marks at the final dimension stage.	• Determine principal dimensions of the vessel using design requirements and reference ship data. • Prepare lines plan for the ship's hull and appendages. • Prepare general arrangement plan based on the requirements. • Calculate preliminary weight estimation and centre of gravity as per the requirement of the vessel. • Conduct resistance analysis on the lines plan. • Develop basic sectional and waterline curves of the hull and structure to establish the center of gravity, ideal hull form. • Identify propeller specifications using powering calculations. • Calculate buoyancy, trim and stability. • Make draft marks, plimsoll marks, load line marks at the dimension stage.
Classroom Aids:	
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Computers, printers, access to internet, ERP system, stationary, Software used for naval ship design activities such as 2D Drafting- AutoCAD; Stability-MAXSURF, NAPA, Aveva Marine	

Module 6: Designing hull structures

Mapped to CSC/N0410, v 1.0

Terminal Outcomes:

- Design hull structures for naval ships based on design brief and plan.

Duration: *16:00*	**Duration**: *40:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain how to do a wave load estimation. • Describe midship section structural drawing including scantlings. • State the frame-wise structural drawing process for scantlings required for structural members at each frame. • Explain the concepts applied for integration of various components of hull and structure on drawing board.	• Calculate the wave loads on the hull of a ship. • Design midship section structural drawing including scantlings. • Identify of local load on ship's hull and design hull structure at various locations. • Prepare the frame-wise structural drawings after determining the scantlings required for structural members at each frame. • Integrate various components of hull and structure on drawing board.
• Classroom Aids:	
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Computers, printers, access to internet, ERP system, stationary, Software used for naval ship design activities such as 2D Drafting- AutoCAD; Stability-MAXSURF, NAPA, Aveva Marine; Structural Design-NAPA, Aveva Marine, SM 3D	

Module 7: Design verification and modification

Mapped to CSC/N0410, v 1.0

Terminal Outcomes:

- Perform basic design verification and modifications based on calculations.

Duration: *24:00*	**Duration**: *80:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the concepts involved in strength and stability/buckling analysis. • State the steps involved in the calculation of the steel weight of the ship. • Describe the standard measures to ensure that the steel weight lies within the empirically and statistically obtained limits specific to naval vessels welding processes and their relevant applications. • Describe the welding technology and non-destructive testing methods used in ship building. • Explain the application of corrosion science to ship building and design. • State the importance of driving innovation and research. • List key green initiatives and implementation of approved initiatives in naval ship design. • Describe improved CFD (Computation Fluid Dynamic) procedures and non-linear probabilistic design procedures. • Discuss the application of new lightweight materials.	• Perform ship maneuverability assessment. • Perform strength and stability/buckling analysis and ensure that the structure is within the required factor of safety as recommended by Classification society. • Calculate the steel weight of the ship. • Apply standard measures to ensure that the steel weight lies within the empirically and statistically obtained limits specific to naval vessels. • Analyse to identify suitable grade of material and welding technology. • Modify hull and hull structure design based on analysis.
Classroom Aids:	
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Computers, printers, access to internet, ERP system, stationary, Software used for naval ship design activities such as 2D Drafting- AutoCAD; Stability-MAXSURF, NAPA, Aveva Marine; CFD (Computation Fluid Dynamic / Manouvering) Analysis - Star CCM+, Fluent)	

Module 8: 3D Modelling and testing

Mapped to CSC/N0410, v 1.0

Terminal Outcomes:

- Prepare and test the 3D Model.

Duration: *16:00*	**Duration**: *84:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the software generally used in 3D Modelling and testing of ships and their key features. • Describe the key steps involved in 3D modelling and meshing process for hull and structures of a ship. • Explain the relevance and process of finite element analyses for various conditions. • Explain the relevance and process of evaluating the manoeuvrability and stability of the bare hull. • Explain the relevance and process of measuring the hydrodynamic coefficients for the bare hull.	• Prepare the 3D hull and structural model using software, based on design specifications. • Carry out meshing on the 3D model. • Perform finite element analyses for various conditions on the 3D model. • Evaluate the maneuverability and stability of the bare hull on the 3D model. • Measure the hydrodynamic coefficients for the bare hull. • Carry out accidental load procedures. • Identify changes required in the hull's shape or geometry. • Modify based on testing results till the 3D model clears the tests. • Utilize ship models testing procedures as per standards (ITTC).
Classroom Aids:	
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Computers, printers, access to internet, ERP system, stationary, Software used for naval ship design activities such as 2D Drafting- AutoCAD; 3D Drafting-UGNx, CATIA (for all except hull), Solidworks, Rhino (for only hull modelling); Stability-MAXSURF, NAPA, Aveva Marine; FE Analysis-ANSYS, Hypermesh, Femap; CFD (Computation Fluid Dynamic / Manouvering) Analysis - Star CCM+, Fluent)	

Module 9: Internal structures design

Mapped to CSC/N0411, v 1.0

Terminal Outcomes:

- Demonstrate the designing of layout and analysis of internal structures.

Duration: *18:00*	**Duration**: *96:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the common software used in 3D modelling for layout design and their key features. • Describe the key steps and concepts involved in modelling of structure and FE analysis of structures of a ship. • Describe the naval ship design and engineering concepts. • State the hull and hull structure features and statistics. • Explain the relevance and understanding of operations of naval vessels to design the layout of the ship.	• Extract information required for designing internal structures for naval ships from design brief and hull structure design documents. • Design internal structures including decks, bulkheads, tank boundaries • Perform analysis of the internal structures including decks, bulkheads, tank boundaries. • Design the foundations of specific equipment on board naval vessels. • Design the layout of ship's habitable spaces (Habitable spaces: e.g., passenger compartments, galleys, storage rooms, etc.). • Design the layout of tanks, major machinery onboard a ship. • Formulate 3D software designs for support of shipboard hull, including auxiliary equipment, towing, mooring, berthing equipment, hull conditions, etc. • Design the layout of the ship's interiors, including cargo space, deck crane, TMB and anchor. • Identify energy saving area in existing systems/ process. • Verify the design and carry out requisite modifications. • Carry out load tests of load-bearing equipment (Load-bearing equipment: e.g., davit, hoists, etc.)
Classroom Aids:	
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Computers, printers, access to internet, ERP system, stationary, Software used for naval ship design activities such as 2D Drafting- AutoCAD; 3D Drafting-UGNx, CATIA (for all except hull), Solidworks, Rhino (for only hull modelling); Stability-MAXSURF, NAPA, Aveva Marine; Structural Design-NAPA, Aveva Marine, SM 3D; FE Analysis-ANSYS, Hypermesh, Femap; CFD (Computation Fluid Dynamic / Manouvering) Analysis - Star CCM+, Fluent)	

Module 10: Post-design activities

Mapped to CSC/N0412, v 1.0

Terminal Outcomes:

- Perform post-designing activities for ships and marine systems.

Duration: *08:00*	**Duration**: *32:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List various post-design activities that a ship and marine design engineer undertakes. • State the information included in technical and logistics documentation related to recommended design and performance requirements. • Describe various tests performed by the quality team on a ship that could lead to design modifications. • Explain the importance of performing design iterations for further improvement. • Explain the importance of proper maintenance of all design and analysis related records for easy retrieval in future.	• Demonstrate good practices for corresponding with customer and classification society for approval of the designs. • Produce technical reports and procedures, final schematics, statement of technical requirements, logistics documentation, performance requirements and bill of materials for the production team. • Demonstrate good practices for interacting with vendors to approve machinery. • Prepare the protocol for pre-dispatch inspection, installation and commissioning trials. • Review and analyse records of quality team tests, inspections and performance feedback. • Demonstrate the activities involved in maintaining all design and analysis related records for easy retrieval and reference in future.
Classroom Aids:	
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Computers, printers, access to internet, ERP system, stationary, documents and file storage units	

Module 11: Healthy, safe and secure environment

Mapped to CSC/N1337, v 2.0

Terminal Outcomes:

- Demonstrate the common repair work performed on fire protection systems.

Duration: *08:00*	**Duration**: *12:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the responsibilities commonly listed under the organisation's health, safety and security standards. • Explain the importance of working in a healthy, safe and hygienic way. • List common sources of information about health, hygiene and safety at the workplace. • Explain the importance of maintaining the names of all the people responsible for health and safety in a workplace. • State common recommended practices to be followed to ensure protection from infections and transmission to others, such as the use of hand sanitiser and face mask. • Explain the importance and process of checking the work conditions, assessing the potential health and safety risks, and take appropriate measures to mitigate them. • State the precautions to be taken to be taken while working in heights like safety nets, length of rope and other safety practices in marine industry. • Explain the importance and process of selecting and using the appropriate PPE relevant to the task and work conditions. • Describe the recommended techniques to be followed while lifting and moving heavy objects to avoid injury. • Explain the importance of following the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment. • Explain the importance and process of identifying existing and potential hazards at work. • Describe the process of assessing the potential risks and injuries associated with the various hazards. • Explain how to prevent or minimise different types of hazards.	• Demonstrate good practices to ensure protection from infections and transmission to others, such as the use of hand sanitiser and face mask. • Demonstrate how to check the work conditions, assess the potential health and safety risks, and take appropriate measures to mitigate them. • Select and use the appropriate Personal Protective Equipment (PPE) relevant to the task and work conditions. • Apply the recommended techniques while lifting and moving heavy objects to avoid injury. • Identify existing and potential hazards at work. • Assess the potential risks and injuries associated with the identified hazards • Demonstrate how to handle hazardous materials safely and store them in the designated storage. • Ensure marine accommodation related safety aspects, such as, marine accommodation related safety aspects: All emergency lights operational, colour coded and marked with "E"; escape routes unobstructed; exits clearly marked; safety signs and placards posted and clearly readable; life jackets, immersion suits and EEBDs correctly stowed and marked; internal communications equipment tested and operating correctly and muster list signed and properly displayed at appropriate locations. • Ensure machinery spaces related safety aspects, such as, machinery spaces related safety aspects: escape routes, ladders and emergency exits unobstructed and clearly marked; all handrails, guard-rails and safety guards correctly fitted and secured to protect against fall; spare life-jackets

• Describe safety aspects related to marine accommodation, machine spaces and deck area. • Describe how to handle and store hazardous materials safely. • Explain the importance of following the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment. • List the criteria for segregating waste into appropriate categories. • Describe appropriate methods for recycling the recyclable waste. • Describe process of disposing of the non-recyclable waste safely and the applicable regulations. • Explain the importance of coordination with the supervisor or other relevant personnel to prevent or minimise the identified hazards. • Describe the appropriate documentation to be carried out following a health and safety incident at work, and the relevant information to be included. • State the appropriate documentation to be carried out following a health and safety incident at work, and the relevant information to be included. • Explain the importance and process of reviewing the health and safety conditions at work regularly or following an incident. • Explain the importance and process of implementing appropriate changes to improve the health and safety conditions at work. • State steps that can be taken to assist in implementing appropriate changes to improve the health and safety conditions at work.	marked and in good order, emergency equipment accessible and operational; all lights operational, stairways and work areas adequately lit, emergency lighting in E/R checked; safety signs and placards posted and clearly readable; switchboard area clear and free of obstructions and rubber mats in position; all portable fire extinguishers correctly stowed, accessible and inspection dated; all fixed fire-fighting equipment unobstructed and in good condition; high voltage areas clearly marked; protective guards for rotating machinery properly secured in place; steering gear space free from oil, gratings or non-slip surfaces in place; around the steering gear; shielding of high pressure fuel pipes in place, steam pipes properly insulated; self-closing device on sounding pipes and glass level gauges functional and not tied in open position; low clearance limits stripe marked; oil soaked rags and other flammable materials kept in covered non-combustible bins; supplies and materials properly stored; chemicals properly labelled and stored, acids and alkalis segregated, MSDS and PPE available at site and approved First Aid supplies readily available, accessible and clearly marked. • Ensure deck area related safety aspects, such as, deck area related safety aspects: Escape routes and embarking areas marked, unobstructed and no slipping and tripping hazards; "Danger-Enclosed Space" marked outside all such spaces having access; other than via manholes; all deck lights operational and in sound enclosures; all safety and hazard zone identification signs posted and readable, fire plan wallets updated; all lifebuoys correctly stowed, life buoy lights and smoke markers valid and in good condition; lifeboats in good condition; decks and walkways free form oil / grease and is there anti-slip paint at mooring areas; piping systems on deck are properly clamped; watertight doors closing properly with packing in good condition; all weather tight hatches closing properly with packing in good condition; good health of oil pollution clean-up equipment and their storage locations clearly marked; supplies and materials are properly stored and all

	cans in paint store are closed, cargo and bunker samples on tankers are stowed in paint store; provision and easy accessibility of Material Safety Data Sheet (MSDS) • Segregate waste into appropriate categories. • Recycle the recyclable waste appropriately. • Dispose of the non-recyclable waste in an environment-friendly manner, complying with the applicable regulations. • Assess the outcome post implementation of safety procedures. • Demonstrate the how to carry out appropriate documentation following a health and safety incident at work, including all the required information.
Classroom Aids:	
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Personal protective equipment (such as eye protector, hard hats, safety belts, gloves, protective clothing), ladders, hand tools, power tools	

Module 12: Fire safety, first aid and emergencies

Mapped to CSC/N1337, v 2.0

Terminal Outcomes:

- Describe the various risks and hazards at the workplace and their preventive and corrective measures
- Employ preventive and corrective measures to protect self and others from common workplace hazards and risk

Duration: *04:00*	**Duration**: *10:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• State the different types of fire extinguishers used to extinguish different types of fires. • Explain the process of checking and testing the firefighting and various safety equipment to ensure they are in a usable condition. • State the recommended practices to be followed for a safe rescue during a fire emergency. • State how to request assistance from the fire department to extinguish a serious fire. • State the appropriate practices to be followed during workplace emergencies to ensure safety and minimise loss to organisational property. • Describe entry and exit of vessel and evacuation procedures in case of an emergency. • Describe methods of prevention of fires like proper and safe disposal of inflammable material, maintenance of proper ventilation in enclosed spaces, temperature control in working areas. • State the common health and safety hazards present in a work environment, associated risks, and how to mitigate them. • List safe working practices to be followed while working at various hazardous sites and using electrical equipment. • State the ratings of motors and precautions to taken while dealing with electrical equipment. • Explain the importance of ensuring easy access to firefighting and safety equipment. • List the various causes of fire in different work environments and the recommended precautions to be taken to prevent fire accidents.	• Check and test the firefighting and various safety equipment to ensure they are in usable condition. • Ensure all portable fire extinguishers and stowage locations numbered in place and inspection dated for safety reasons. • Ensure that the fire station is not locked but only sealed. • Demonstrate the steps performed for the repair and replacement of firefighting and safety equipment in co-ordination with the supervisor. • Demonstrate the use the appropriate type of fire extinguisher to extinguish different types of fires safely. • Demonstrate common recommended practices for a safe rescue during a fire emergency. • Demonstrate the recommended procedure to free a person from electrocution. • Check the first aid box to ensure it is updated with the relevant first aid supplies. • Demonstrate the administration of appropriate first aid to the injured personnel. • Demonstrate cardiopulmonary Resuscitation (CPR). • Demonstrate through role play the steps involved in coordination with the emergency services to request medical assistance for seriously injured/ ill personnel requiring professional medical attention or hospitalisation. • Demonstrate the recommended practices to minimise loss to organisational property during an emergency.

• Describe different methods of extinguishing fire. • List different materials used for extinguishing fire, such as sand, water, foam, CO2, dry powder, etc. • State the points to be kept in mind while coordinating with the fire department to request assistance to extinguish a serious fire. • Explain the importance of ensuring the first aid box is updated with the relevant first aid supplies. • State the different types of first aid treatment to be provided for different types of injuries. • List the potential injuries associated with incorrect manual handling. • Describe how to move an injured person safely. • List the various hazards associated with the use of various machinery, tools, implements, equipment and materials. • Describe how to free a person from electrocution safely. • Explain how to administer appropriate first aid to an injured person. • List the indicators to identify a potential victim of cardiac arrest. • State the steps involved in performing Cardiopulmonary Resuscitation (CPR). • Explain the importance of coordinating with the emergency services to request urgent medical assistance for persons requiring professional medical attention or hospitalisation. • State the appropriate preventative and remedial actions to be taken in the case of exposure to toxic materials, such as poisonous chemicals and gases. • State the applicable rescue techniques to be followed during a fire emergency. • Explain the importance of follow the organisational health and safety guidelines during workplace emergencies to ensure own and co-workers' safety. • Explain the importance of placing safety signs and instructions at strategic locations in a workplace and following them. • Explain the importance of ensuring no obstruction and free access to fire exits.	

Classroom Aids:
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook
Tools, Equipment and Other Requirements
Personal protective equipment (such as eye protector, hard hats, safety belts, gloves, protective clothing), fire extinguisher, first aid kit.

Module 13: Team effectiveness and respecting diversity

Mapped to CSC/N1338, v 2.0

Terminal Outcomes:

- Apply effective communication techniques with team and stakeholders.
- Describe approaches to handle queries, concerns and welfare of workers.
- Role play a situation on how to demonstrate behaviours indicating respect for all genders and PwD.

Duration: *04:00*	**Duration**: *12:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the importance of teamwork in organisational and individual success. • Explain the importance of clarifying individual, team and organisational goals and responsibilities. • Explain the existence of organisation's policies and procedures for working with colleagues and dealing with conflict and the need to be familiar with them. • State some common reasons for interpersonal conflict. • Explain the importance of expressing and addressing grievances appropriately and effectively and some good practices with respect to the same. • State some common reasons for interpersonal conflict and ways of managing it effectively. • Explain the importance of resolving individual disagreements with the concerned person. • Explain the importance of following the organisation's policies and procedures to resolve conflicts. • Explain the importance of developing effective working relationships for professional success and some good practices for the same. • Explain the importance of consulting with and assisting others to maximise effectiveness and efficiency in carrying out tasks and solving problems. • List different types of disabilities and some challenges faced by persons with disability (PwD). • State the key laws, acts and provisions defined for PwD by the statutory bodies.	• Demonstrate the ability to take initiative to identify and solve team and work related problems in a positive manner. • Demonstrate the application of initiatives to develop understanding, goodwill and trust with team members. • Recognize when a conflict situation exists. • Demonstrate the ability to take initiative to resolve a conflict situation amicably. • Demonstrate ability to manage discussions to keep verbal, non-verbal and written communication gender, disability, age and culturally sensitive and respectful. • Demonstrate the ability to transact with all people without any personal bias based on gender, disability, caste, religion, colour, sexual orientation or culture and in accordance with their legal rights. • Recognize indicators of harassment and discrimination based on gender, disability, caste, religion, colour, sexual orientation or culture at workplace. • Suggest workplace design and accessibility improvements to make it friendly for persons with disabilities (PwD).

• State government and private schemes and benefits available for PwD. • Explain the importance of gender sensitivity and equality. • Explain stereotyping based on gender, disability and cultural biases, and its impact on others. • Describe gender and its concepts such as gender roles, gender spectrum, gender as an identity. • State common inclusive practices and policies following in gender neutral and PwD sensitive organisations. • State the legislations, grievance redressal mechanisms, and penalties against harassment in the workplace. • Explain the importance of following organisational policy for reporting the indicators of harassment and discrimination. • Explain the importance of ensuring all group processes follow inclusive practices.	
Classroom Aids:	
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Nil	

Module 14: Effective communication and good behaviour

Mapped to CSC/N1338, v 2.0

Terminal Outcomes:

- Apply effective communication techniques with team and stakeholders.
- Describe approaches to handle queries, concerns and welfare of workers.
- Role play a situation on how to demonstrate behaviours indicating respect for all genders and PwD.

Duration: *04:00*	**Duration**: *12:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List various categories of people that one is required to communicate and coordinate with in an organisation. • State the importance of give feedback of work done and reporting problems identified in the field. • Explain the importance of effective communication in the workplace. • Describe the various components of effective communication. • State the key elements of active listening. • Explain the value and importance of active listening and assertive communication. • List the barriers to effective communication. • Explain the importance of tone and pitch in effective communication. • Explain the importance of avoiding casual expletives and unpleasant terms while communicating professional circles. • State how poor communication practices can disturb people, environment and cause problems for the employee, the employer and the customer. • Explain the importance of ethics for professional success. • Explain the importance of discipline for professional success. • State what constitutes disciplined behaviour for a working professional. • Explain the importance of disciplined and responsible behaviour.	• Demonstrate the ability to communicate with other people clearly and effectively. • Use digital and virtual tools for collaboration and communication. • Demonstrate the use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism. • Display workplace etiquettes such as using appropriate titles, terms of respect, polite language and avoiding casual expressions. • Display active listening skills while interacting with others at work. • Demonstrate responsible and disciplined behaviour.
Classroom Aids:	
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Nil	

Module 15: Sustainable practices

Mapped to SGJ/N1703, v 1.0

Terminal Outcomes:

- Conduct material and energy audit of workplace
- Apply material conservation strategies and use of environment friendly materials.
- Apply energy/electricity conservation practices.
- Apply effective waste management/recycling practices.

Duration: *08:00*	**Duration**: *16:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• State the legislative requirements and organisations procedures for waste management and disposal. • Describe some organisational procedures for safe handling of equipment and machine operations. • Explain the importance of following reporting protocol and documentation. • List the parameters and data required for material and energy audit. • List latest methods of energy and material conservation. • List environment friendly materials available to replace conventional materials. • Describe methods of reducing electrical consumptions. • Name renewable energy sources which can be deployed at the workplace. • Describe the steps involved in planning the implementation of energy efficient systems in a phased manner. • Describe methods of optimum utilization of waste and best practices for waste disposal. • Describe methods of treating wastewater and recycling of water.	• Demonstrate how to check for compliance with applicable environmental, waste management and disposal regulations. • Demonstrate how to collect information about usage of different materials including water. • Demonstrate how to collect information on the pattern of electricity and fuel consumption. • Prepare material and energy audit reports. • Analyse material audit report to decipher excessive consumption of material and water. • Identify materials which can be replaced by environment friendly substitutes. • Identify processes where material utilization can be optimised. • Demonstrate how to plan the introduction of revised processes and environment friendly materials in a phased manner. • Demonstrate how to plan and implement ways to conserve and re-use water. • Monitor material and water conservation processes. • Analyse energy/electricity audit report to identify high energy/electricity consumption areas. • Identify processes where energy/electricity utilization can be optimised. • Identify possibilities of using renewable energy and environment friendly fuels. • Ensure electrical equipment and appliances are switched off when not in use. • Identify recyclable, non-recyclable and hazardous waste. • Ensure recyclable, non-recyclable and hazardous waste are segregated as per standard operating procedures.

	• Ensure proper mechanism is followed while collecting and disposing recyclable and nonrecyclable waste. • Ensure proper mechanism is followed while collecting and disposing hazardous waste as per standard operating procedure. • Ensure reuse and recycling of waste wherever applicable. • Ensure proper mechanism is followed for treatment of wastewater in the unit.
Classroom Aids:	
Computer, Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Energy-saving devices, non-recyclable, recyclable and reusable waste	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification *<Select the minimum educational requirements, such as 12th Pass, Graduate or NSQF certified.>*	**Specialization** *<Specify the areas of specialization that are desirable.>*	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
B.E	Naval Architecture	5	Naval ship design	1	Naval ship design	
B.Tech	Naval Architecture	5	Naval ship design	1	Naval ship design	

Trainer Certification	
Domain Certification	**Platform Certification**
"Design Engineer – Hull and Structures" mapped to QP: "CSC/Q0406, v1.0". Minimum accepted score is 80%.	"Trainer", mapped to the Qualification Pack: "MEP/Q2601". Minimum accepted score is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification *<Select the minimum educational requirements, such as 12th Pass, Graduate or NSQF certified.>*	**Specialization** *<Specify the areas of specialization that are desirable.>*	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
B.E	Naval Architecture	**5**	Naval ship design	1	Naval ship design	
B.Tech	Naval Architecture	**5**	Naval ship design	1	Naval ship design	

Assessor Certification	
Domain Certification	**Platform Certification**
"Design Engineer – Hull and Structures" mapped to QP: "CSC/Q0406, v1.0". Minimum accepted score is 80%.	"Assessor", mapped to the Qualification Pack: "MEP/Q2701". Minimum accepted score is 80%.

Assessment Strategy

1. Assessment System Overview:
    - Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email
    - Assessment agencies send the assessment confirmation to VTP/TC looping SSC
    - Assessment agency deploys the ToA certified Assessor for executing the assessment
    - SSC monitors the assessment process & records

2. Testing Environment:
    - Confirm that the centre is available at the same address as mentioned on SDMS or SIP
    - Check the duration of the training.
    - Check the Assessment Start and End time to be as 10 a.m. and 5 p.m.
    - If the batch size is more than 30, then there should be 2 Assessors.
    - Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
    - Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
    - Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
    - Check the availability of the Lab Equipment for the particular Job Role.

3. Assessment Quality Assurance levels / Framework:
    - Question papers created by the Subject Matter Experts (SME)
    - Question papers created by the SME verified by the other subject Matter Experts
    - Questions are mapped with NOS and PC
    - Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
    - Assessor must be ToA certified & trainer must be ToT Certified
    - Assessment agency must follow the assessment guidelines to conduct the assessment

4. Types of evidence or evidence-gathering protocol:
    - Time-stamped & geotagged reporting of the assessor from assessment location
    - Centre photographs with signboards and scheme specific branding
    - Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
    - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos

5. Method of verification or validation:
    - Surprise visit to the assessment location
    - Random audit of the batch
    - Random audit of any candidate

6. Method for assessment documentation, archiving, and access
    - Hard copies of the documents are stored
    - Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage
    - Soft copies of the documents & photographs of the assessment are stored in the Hard Drives

References

Glossary

Term	Description
Declarative Knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning Outcome	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a task. It is the ability to work, or produce a tangible work output by applying cognitive, affective or psychomotor skills.
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do **upon the completion of the training**.
Terminal Outcome	Terminal outcome is a statement of what a learner will know, understand and be able to do **upon the completion of a module.** A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

Term	Description
QP	Qualification Pack
NSQF	National Skills Qualification Framework
NSQC	National Skills Qualification Committee
NOS	National Occupational Standards