

Government of Pakistan

National Vocational and Technical Training Commission

Prime Minister's Hunarmand Pakistan Program

"Skills for All"



Course Contents / Lesson Plan

Course Title: Marine HVACR

Duration: 6 Months

Trainer Name	
Course Title	Marine HVACR
Objectives and Expectations	<p>Objectives of Marine HVACR Course: -</p> <ul style="list-style-type: none"> ✚ To provide students with a comprehensive understanding of the principles and practices of marine HVACR systems ✚ To equip students with the necessary skills to design, troubleshoot, and maintain marine HVACR systems ✚ To enable students to interpret technical drawings and specifications related to marine HVACR systems ✚ To promote a safety-first culture in all aspects of marine HVACR operations ✚ To encourage students to apply critical thinking and problem-solving skills to real-world scenarios in the marine industry <p>Expectations of Marine HVACR Course: -</p> <ul style="list-style-type: none"> ✚ Students are expected to attend all classes and come prepared with the necessary materials and equipment ✚ Students are expected to participate in group activities and discussions in a respectful and professional manner ✚ Students are expected to complete all assignments and assessments to the best of their abilities and on time ✚ Students are expected to follow all safety protocols and procedures when working with marine HVACR systems ✚ Students are expected to maintain a positive and proactive attitude towards learning and professional development. <p><u>Main Expectations:</u></p> <p>Marine HVACR course should be delivered by professional instructors in such a robust hands-on manner that the trainees are comfortably able to employ their skills for earning money through wage/self-employment at its conclusion. This course thus clearly goes beyond the domain of the traditional training practices in vogue and underscores an expectation that a market-centric approach will be adopted as the main driving force while delivering it. The instructors should therefore be experienced enough to be able to identify the training needs for the possible market roles available out there. Moreover, they should also know the strengths and weaknesses of each trainee to prepare them for such market roles during and after the training.</p> <p>i. Specially designed practical tasks to be performed by the trainees have been included in the Annexure-I to this document. The record of all tasks performed individually or in groups must be preserved by the management of the training</p>

Institute clearly labeling name, trade, session, etc. so that these are ready to be physically inspected/verified through monitoring visits from time to time. The weekly distribution of tasks has also been indicated in the weekly lesson plan given in this document.

- ii. To materialize the main expectations, a special module on **Job Search & Entrepreneurial Skills** has been included in the latter part of this course (5th & 6th month) through which, the trainees will be made aware of the Job search techniques in the local as well as international job markets (Gulf countries). Awareness around the visa process and immigration laws of the most favored labor destination countries also form a part of this module. Moreover, the trainees would also be encouraged to venture into self-employment and exposed to the main requirements in this regard. It is also expected that a sense of civic duties/roles and responsibilities will also be inculcated in the trainees to make them responsible citizens of the country.
- iii. A module on **Work Place Ethics** has also been included to highlight the importance of good and positive behavior in the workplace in the line with the best practices elsewhere in the world. An outline of such qualities has been given in the Appendix to this document. Its importance should be conveyed in a format that is attractive and interesting for the trainees such as through PPT slides +short video documentaries. Needless to say that if the training provider puts his heart and soul into these otherwise non-technical components, the image of the Pakistani workforce would undergo a positive transformation in the local as well as international job markets.

To maintain interest and motivation of the trainees throughout the course, modern techniques such as:

- Motivational Lectures
- Success Stories
- Case Studies

These techniques would be employed as an additional training tool wherever possible (these are explained in the subsequent section on Training Methodology).

Lastly, evaluation of the competencies acquired by the trainees will be done objectively at various stages of the training and a proper record of the same will be maintained. Suffice to say that for such evaluations, practical tasks would be designed by the training providers to gauge the problem-solving abilities of the trainees.

(i) **Motivational Lectures**

The proposed methodology for the training under reference employs motivation as a tool. Hence besides the purely technical content, a trainer is required to include elements of motivation in his/her lecture. To inspire the trainees to utilize the training opportunity to the full and strive towards professional excellence. Motivational lectures may also include general topics such as the importance of moral values and civic role & responsibilities as a Pakistani. A motivational lecture should be delivered with enough zeal to produce a deep impact on the trainees. It may comprise of the following:

- Clear Purpose to convey the message to trainees effectively.
- Personal Story to quote as an example to follow.
- Trainees Fit so that the situation is actionable by trainees and not represent a just idealism.
- Ending Points to persuade the trainees on changing themselves.

A good motivational lecture should help drive creativity, curiosity, and spark the desire needed for trainees to want to learn more.

The impact of a successful motivational strategy is amongst others commonly visible

in increased class participation ratios. It increases the trainees' willingness to be engaged on the practical tasks for a longer time without boredom and loss of interest because they can see in their mind's eye where their hard work would take them in short (1-3 years); medium (3 -10 years) and long term (more than 10 years).

As this tool is expected that the training providers would make arrangements for regular well planned motivational lectures as part of a coordinated strategy interspersed throughout the training period as suggested in the weekly lesson plans in this document.

Course-related motivational lectures online link is available in Annexure-II.

(ii) Success Stories

Another effective way of motivating the trainees is using Success Stories. Its inclusion in the weekly lesson plan at regular intervals has been recommended till the end of the training.

A success story may be disseminated orally, through a presentation, or using a video/documentary of someone that has risen to fortune, acclaim, or brilliant achievement. A success story shows how a person achieved his goal through hard work, dedication, and devotion. An inspiring success story contains compelling and significant facts articulated clearly and easily comprehensible words. Moreover, it is helpful if it is assumed that the reader/listener knows nothing of what is being revealed. The optimum impact is created when the story is revealed in the form of:-

- Directly in person (At least 2-3 cases must be arranged by the training institute)
- Through an audio/ videotaped message (2-3 high-quality videos must be arranged by the training institute)

It is expected that the training provider would collect relevant high-quality success stories for inclusion in the training as suggested in the weekly lesson plan given in this document.

The suggestive structure and sequence of a sample success story and its various shapes can be seen in **Annexure III**.

(iii) Case Studies

Where a situation allows, case studies can also be presented to the trainees to widen their understanding of the real-life specific problem/situation and to explore the solutions.

In simple terms, the case study method of teaching uses a real-life case example/a typical case to demonstrate a phenomenon in action and explain theoretical as well as practical aspects of the knowledge related to the same. It is an effective way to help the trainees comprehend in depth both the theoretical and practical aspects of the complex phenomenon in depth with ease. Case teaching can also stimulate the trainees to participate in discussions and thereby boost their confidence. It also makes the classroom atmosphere interesting thus maintaining the trainee interest in training till the end of the course.

Depending on suitability to the trade, the weekly lesson plan in this document may suggest case studies be presented to the trainees. The trainer may adopt a PowerPoint presentation or video format for such case studies whichever is deemed suitable but only those cases must be selected that are relevant and of a learning value.

The Trainees should be required and supervised to carefully analyze the cases.

For this purpose, they must be encouraged to inquire and collect specific information/data, actively participate in the discussions, and intended solutions to the problem/situation.

Case studies can be implemented in the following ways: -

	<ul style="list-style-type: none"> i. A good quality trade-specific documentary (At least 2-3 documentaries must be arranged by the training institute) ii. Health & Safety case studies (2 cases regarding safety and industrial accidents must be arranged by the training institute) iii. Field visits (At least one visit to a trade-specific major industry/ site must be arranged by the training institute)
Entry-level of trainees	Intermediate / Matric Science
Learning Outcomes of the course	<p>The learning outcomes for a 6-month course in Marine HVACR typically include:</p> <ol style="list-style-type: none"> 1. Understanding the fundamental concepts of marine HVACR systems and how they operate in marine environments. 2. Identifying the key components of HVACR systems, their functions, and how they interact with each other. 3. Learning about the different types of marine HVACR systems and their applications on various types of vessels. 4. Understanding the principles of refrigeration and heat transfer and how they apply to marine HVACR systems. 5. Gaining hands-on experience with the assembly, installation, and maintenance of marine HVACR systems. 6. Developing skills in troubleshooting and repairing common issues with marine HVACR systems. 7. Understanding the safety precautions and regulations related to working with marine HVACR systems. 8. Learning about the latest technologies and trends in the field of marine HVACR.
Course Execution Plan	<p>The total duration of the course: 6 months (26 Weeks) Class hours: 4 hours per day Theory: 20% Practical: 80% Weekly hours: 20 hours per week Total contact hours: 260 hours</p>
Companies offering jobs in the respective trade	<p>Students can try searching online job portals such as LinkedIn, Indeed, and Glassdoor for companies that are offering jobs in the field of Marine HVACR. Students can also consider reaching out to recruitment agencies or staffing firms that specialize in the marine industry. Some fields are mentioned here:</p> <ol style="list-style-type: none"> 1. Maintenance service provider firms in HVAC field 2. Textile Industries 3. Maritime Technology Companies 4. NESCOM 5. Marine Shipyard Agencies 6. Installation 7. Services 8. Sales
Job Opportunities	<p>Marine HVACR course is recognized across the world as the leader in HVAC field. Marine HVAC technician thus hold a high rate of employability in various capacities across various industries. Following are some of the roles that are present and or may become available as trends shift and morph to the Marine HVACR:</p>

	<ul style="list-style-type: none"> • Marine Shipyard Technician • Managing (<i>With additional experience</i>) • Supervising (<i>With additional experience</i>) • Independent Contracting (<i>With additional experience</i>) • Social media and marketing specialist in HVAC field
No of Students	25
Learning Place	Classroom / Lab
Instructional Resources	<p>Marine Air Conditioning Systems Fundamentals https://www.youtube.com/watch?v=wo_EqmNGxlg</p> <p>Ships refrigeration full working system https://www.youtube.com/watch?v=UWr2iz93byQ</p> <p>Marine Refrigeration Air Cooling Vs Water Cooling https://www.youtube.com/watch?v=YL_xj_O4h3c</p> <p>Air condition & Provision Refrigeration Troubleshooting, Ship's HVAC https://www.youtube.com/watch?v=w6UdycyGCyI</p> <p>Marine Ship Air Conditioning System. Difference between Ship HVAC & Ashore. https://www.youtube.com/watch?v=AekgfXbQ5Zk</p> <p>Parts of HVAC System https://www.youtube.com/watch?v=Mxvd68qof5c</p> <p>Marine Air Conditioning - Chilled Water System https://www.youtube.com/watch?v=maZV7ETYZLo</p> <p>CTM Marine - CT Self-Contained Marine Air Conditioner Installation https://www.youtube.com/watch?v=p2AeTEcnswI</p> <p>Ship's Refrigeration Full Working System Animated, TEV Functioning, Working of Sensing Bulb https://www.youtube.com/watch?v=GZTkIW-qaqo</p> <p>Heat Exchanger Water Cooling System https://www.youtube.com/watch?v=GREWk6eOL5w</p> <p>Main Engine Exhaust Valve https://www.youtube.com/watch?v=jdmJGF7XXJ8</p> <p>Marine Diesel Engine Turbocharger https://www.youtube.com/watch?v=XbaLOZjHz4I</p>

Scheduled Weeks	Module Title	Days	Learning Units	Home Assignment
Week 1	Introduction to Marine HVACR	Day 1	<p>Understanding the basics of HVACR</p> <ul style="list-style-type: none"> Identifying the different types of HVACR systems used in marine vessels Discussing the challenges of HVACR in the marine environment Exploring the importance of proper maintenance and repair of marine HVACR systems 	<ul style="list-style-type: none"> Task 1 Task 2 Task 3 <p><i>Details may be seen at Annexure-1</i></p>
		Day 2	<ul style="list-style-type: none"> Examining the history and evolution of the maritime industry Identifying the different types of maritime vessels and their uses Discussing the global impact of the maritime industry 	
	Overview of the maritime industry			

	<p>Importance of HVACR in marine vessels</p>	<p>Day 3</p>	<p>Exploring current trends and future developments in the maritime industry Importance of HVACR in Marine Vessels: -</p> <ul style="list-style-type: none"> • Discussing the role of HVACR in ensuring the safety and comfort of crew members and passengers • Identifying the key components of marine HVACR systems • Examining the impact of HVACR on energy efficiency and cost savings • Exploring the latest developments and advancements in marine HVACR technology 	
	<p>Initiate HVAC work</p>	<p>Day 4</p>	<p>This aims to initiate HVAC work</p> <ul style="list-style-type: none"> • A person will be expected to follow Dress code, • Clean up service vehicle, • Job site, and • Perform maintenance of tools, • Test equipment, • Delegation of work to subordinates, • Issue material from store, • Report safety violation. 	

	Fundamentals of HVACR	Day 5	<ul style="list-style-type: none"> • Principles of Heat transfer • Refrigeration cycle • Psychometrics 	
Week 2	Marine HVACR Systems	Day 1	Types of marine HVACR systems	<ul style="list-style-type: none"> • Task 4 • Task 5 • Task 6 • Task 7 • Task 8 <p><i>Details may be seen at <u>Annexure-I</u></i></p>
		Day 2	Components of marine HVACR systems	
		Day 3	Tagging and Identification of components of marine HVACR systems on modules	
		Day 4	Operation of marine HVACR systems	
		Day 5	Revision of overall Marine HVACR system	

Week 3	Design and Installation of Marine HVACR Systems	Day 1	Calculation of heating and cooling loads	<ul style="list-style-type: none"> • Task 9 • Task 10 • Task 11 <p><i><u>Details may be seen at Annexure-I</u></i></p>
		Day 2	Selection of Equipments	
		Day 3	Installation of marine HVACR systems	
		Day 4	Overview of Design and Installation of Marine HVACR Systems	
		Day 5	Assessment of Full module	

Week 4	Ventilation Systems	Day 1	<ul style="list-style-type: none"> i. Explain the concept of refrigeration as the reversed Carnot cycle. ii. Discuss the working principles of a vapour-compression refrigerant cycle. 	<ul style="list-style-type: none"> • Task 12 • Task 13 • Task 14 <p><i><u>Details may be seen at Annexure-I</u></i></p>
		Day 2	<ul style="list-style-type: none"> i. Describe the basic layout of a direct expansion system. ii. State the difference of a cargo refrigeration system and a ship's store or domestic refrigeration plant on board. 	
		Day 3	<ul style="list-style-type: none"> i. Discuss the principle of direct and indirect expansion systems. ii. Required for reefer containers and a fully refrigerated ship 	

		Day 4	<ul style="list-style-type: none"> i. Explain the principles of a cascade system of refrigeration using multiple compression. ii. Describe various types of refrigerated cargoes and preparations and precautions required in handling such cargoes. 	
		Day 5	Evaluate the types of cooling arrangements	
Week 5	Air Conditioning Systems and Compressors	Day 1	<ul style="list-style-type: none"> i-Describe the working principle of an air conditioning system. ii-Discuss the use of psychometric charts in managing the AC system. 	<ul style="list-style-type: none"> • Task 15 • Task 16 • Task 17 • Task 18 <p><i>Details may be seen at <u>Annexure-I</u></i></p>
		Day 2	<ul style="list-style-type: none"> i. State the comfort conditions to be maintained in an AC system. ii. Evaluate the air handling system in an AC plant. 	

		Day 3	<ul style="list-style-type: none"> i. Identify various component parts in a reciprocating reefer compressor. ii. Discuss the important issues with respect to the efficiency of a reefer compressor. 	
		Day 4	State the lube oil system of a reciprocating compressor.	
		Day 5	Describe the functional components of a reefer plant.	
Week 6	Safety and Handling Oil in A/C Systems	Day 1	<ul style="list-style-type: none"> i. Discuss the various safety devices used to protect the operation of a reefer plant. ii. Describe the types of refrigerants used in a reefer system. 	<ul style="list-style-type: none"> • Task 19 • Task 20 • Task 21 • Task 22 • Task 23 • Task 24

		Day 2	<ul style="list-style-type: none"> i. State the current regulations and restrictions for using refrigerants on board. ii. Evaluate the problems related to oil contamination of the reefer systems. 	<u>Details may be -seen at Annexure-I</u>
		Day 3	<ul style="list-style-type: none"> i. Describe the testing of suction and delivery valves for leakage. ii. Analyze the defrosting process of a reefer system. 	
		Day 4	<ul style="list-style-type: none"> i. Discuss how oil contaminates a reefer system and its detrimental effects on plant performance. 	

		Day 5	<p>i. Evaluate the management of oil return in a single and multi-compressor systems.</p> <p>ii. State the effects of oil return to the Suction and to the crankcase of the compressor.</p>	
Week 7	Maintenance and Troubleshooting of Marine HVACR Systems	Day 1	Preventive maintenance	<ul style="list-style-type: none"> • Task 25 • Task 26 • Task 27 • Task 28 <p><i>Details may be seen at <u>Annexure-I</u></i></p>
		Day 2	Preventive maintenance	

		Day 3	Troubleshooting techniques	
		Day 4		
		Day 5		
Week 8	Maintenance and Troubleshooting of Marine HVACR Systems	Day 1	Common problems and their solutions	<ul style="list-style-type: none"> • Task 29 • Task 30 • Task 31 • Task 32 • Task 33 • Task 34 • Task 35 • Task 36 • Task 37 • Task 38 <p><i>Details may be seen at Annexure-I</i></p>
		Day 2		
		Day 3		

		Day 4	Revision of Maintenance and Troubleshooting of Marine HVACR Systems <ul style="list-style-type: none"> • Preventive maintenance • Troubleshooting techniques • Common problems and their solutions 		
		Day 5			
Week 9	Environmental and Safety Considerations	Day 1	Regulations and guidelines for marine HVACR systems	<ul style="list-style-type: none"> • Task 39 • Task 40 • Task 41 • Task 42 • Task 43 <i>Details may be seen at Annexure-I</i>	
		Day 2			
		Day 3			

		Day 4	Safety procedures for working with marine HVACR systems	
		Day 5		
Week 10	Case Studies and Project Work - Completion of a project related to marine HVACR	Day 1	Analysis of case studies related to marine HVACR systems.	<ul style="list-style-type: none"> • Task 44 • Task 45 • Task 46 • Task 47 • Task 48 • Task 49 <p><i><u>Details may be seen at Annexure-I</u></i></p>
		Day 2		
		Day 3		

		Day 4	Completion of a project related to marine HVACR	
		Day 5		

Week 11	Completion of a project related to marine HVACR	Day 1	Completion of a project related to marine HVACR	<ul style="list-style-type: none"> • Task 50 • Task 51 • Task 52 • Task 53 • Task 54 • Task 55 • Task 56 • Task 57 • Task 58 • Task 59 • Task 60 • Task 61 • Task 62 • Task 63 • Task 64 • Task 65 <p><i><u>Details may be seen at Annexure-I</u></i></p>
		Day 2		
		Day 3		
		Day 4		
		Day 5		
Week 12	Entrepreneurship and Final Assessment in project	Day 1	<ul style="list-style-type: none"> i. Success stories (For further detail please see Page No: 3 & 4) ii. Job Market Searching iii. Self-employment iv. Job Market Searching 	<ul style="list-style-type: none"> • Task 66 • Task 67 • Task 68 <p><i><u>Details may be seen at Annexure-I</u></i></p>

		Day 2	<ul style="list-style-type: none"> v. Introduction vi. Fundamentals of Business Development vii. Entrepreneurship viii. Startup Funding 	
		Day 3	<ul style="list-style-type: none"> ix. Business Value Statement x. Business Model Canvas xi. Sales and Marketing Strategies xii. How to Reach Customers and Engage CxOs 	
		Day 4	<ul style="list-style-type: none"> xiii. Stakeholders Power Grid xiv. RACI Model, SWOT Analysis, PEST Analysis xv. SMART Objectives xvi. Stakeholders Power Grid 	
		Day 5	<ul style="list-style-type: none"> xvii. Cost Management (OPEX, CAPEX, ROCE, etc.) xviii. Final Assessment xix. Cost Management (OPEX, CAPEX, ROCE, etc.) xx. Final Assessment 	

MODULES

Task No.	Task	Description	Week
1.	Search Top Pakistani HVACR service providers	Search any five sites(Fiverr, Upwork, Guru, Haier, etc.) and list down the top 5 profiles related to your course	Week 1
2.	Find the career path	Prepare a career path related to your course and also highlight the emerging trends in the local as well as international market	
3.	Work Ethics	Generate a report on Institute work ethics and professionalism related to your course	
4.	Report Writing about HVACR systems	Research and write a comprehensive report on the different types of marine HVACR systems, including their advantages and disadvantages.	Week 2
5.	Creation and labeling of components of marine HVACR system	Create a detailed diagram of a marine HVACR system, labeling each of its components and explaining their functions.	
6.	Operation of HVACR system	Develop a step-by-step guide on how to operate a marine HVACR system, including troubleshooting tips for common issues.	
7.	Case Study of a particular marine HVACR system	Conduct a case study on a particular type of marine HVACR system used in a specific vessel, detailing its performance, maintenance requirements, and cost-effectiveness.	
8.	Proposal and Design of new marine HVACR system	Design and present a proposal for a new marine HVACR system that incorporates the latest advances in technology and energy efficiency. Include a cost-benefit analysis and a comparison with existing systems.	
9.	Calculation plan for the Heating and Cooling Loads	Develop a comprehensive calculation plan for the heating and cooling loads required for a marine HVACR system. This must take into account the size of the vessel, the type of activities taking place on the boat, and the environmental factors that will impact the temperature inside the vessel. Once complete, present this plan to stakeholders for review and approval.	Week 3
10.	Analysis of Equipment for Marine HVACR	Conduct a thorough analysis of available equipment options for a marine HVACR system. Consider factors such as size, efficiency, and cost, with the goal of selecting the best equipment to meet the vessel's unique needs. Once equipment has been selected, put together a detailed plan for installation, including any necessary modifications to the vessel's infrastructure.	

11.	Installation of Marine HVACR	Oversee the installation of the marine HVACR systems, ensuring that all equipment is installed correctly and functioning properly. Monitor the system's performance over time to ensure that it is meeting the vessel's needs and making any necessary adjustments as needed. Finally, provide training to vessel staff on how to properly operate and maintain the system to ensure its longevity.	
12.	Ventilation Systems	Conduct a maintenance check on the ventilation systems in a marine vessel. This task could involve inspecting and cleaning air filters, checking for any damaged or worn components, and ensuring that the ventilation system is functioning correctly.	Week 4
13.		Design and install a new ventilation system for a marine vessel. This task would involve assessing the ventilation needs of the vessel, selecting appropriate components and materials, and installing and testing the system.	
14.		Troubleshoot an existing ventilation system that is not functioning properly. This task could involve identifying the root cause of the problem, repairing or replacing any malfunctioning components, and testing the system to ensure that it is working correctly.	
15.	Air Conditioning Systems and Compressors	Develop a maintenance schedule for the air conditioning systems and compressors on a marine vessel, taking into account the unique challenges of operating in a saltwater environment.	Week 5
16.		Conduct a feasibility study of installing a new air conditioning system on a marine vessel, weighing factors such as space limitations, energy efficiency, and cost	
17.		Troubleshoot a malfunctioning compressor in a marine HVACR system, identifying potential causes and proposing solutions	
18.		Evaluate the environmental impact of different refrigerants used in marine air conditioning systems, taking into account factors such as ozone depletion potential and global warming potential.	
19.	Safety and Handling Oil in A/C Systems	Research and compile a list of various safety devices used to protect the operation of a reefer plant.	Week 6
20.		Create a detailed report on the types of refrigerants used in a reefer system, including their properties and applications	
21.		Investigate and summarize the current regulations and restrictions for using refrigerants on board, including any environmental concerns	

22.		Analyze the problems related to oil contamination of reefer systems, and propose solutions to prevent or mitigate these issues.	
23.		Develop a testing procedure for suction and delivery valves to detect any leakage, and create a report on the results of your testing.	
24.		Evaluate the defrosting process of a reefer system, including its efficiency, safety, and impact on the system's overall performance	
25.	Maintenance and Troubleshooting of Marine HVACR Systems	Clean and maintain air filters	Week 7
26.		Inspect and clean condenser coils.	
27.		Check refrigerant levels and pressures	
28.		Inspect and clean evaporator coils.	
29.	Maintenance and Troubleshooting of Marine HVACR Systems	Inspect and clean drain pans and lines	Week 8
30.		Test and calibrate thermostats	
31.		Inspect and repair electrical connections	
32.		Check and repair refrigerant leaks.	
33.		Lubricate motors and bearings.	
34.		Check and adjust fan belts	
35.		Inspect and clean the blower wheel	
36.		Check and replace faulty components such as capacitors, contactors, and fuses.	
37.	Preventive Maintenance	<p>It is recommended to schedule regular inspections and cleaning of the HVACR system. This includes:</p> <ul style="list-style-type: none"> a) Checking and replacing air filters b) cleaning coils c) inspecting electrical components and d) Testing thermostats. 	

38.	Preventive Maintenance	<p>When troubleshooting, it is important to use techniques such as:</p> <ul style="list-style-type: none"> a) Testing electrical connections b) checking refrigerant levels and pressures c) Visually inspecting components for damage or wear. <p>Common problems with marine HVACR systems includes:</p> <ul style="list-style-type: none"> • Refrigerant leaks • faulty motors or bearings • electrical issues 	
39.	Environmental and Safety Considerations	Review the regulatory requirements and guidelines for marine HVACR systems to ensure compliance with environmental standards and safety regulations.	Week 9
40.		Develop a comprehensive safety plan and procedures for working with marine HVACR systems that includes hazard identification, risk assessment, and safe work practices	
41.		Conduct regular inspections and maintenance of marine HVACR systems to identify and address potential environmental and safety hazards, such as refrigerant leaks or electrical issues.	
42.		Train employees on proper handling of refrigerants and other hazardous materials used in marine HVACR systems, including proper storage, disposal, and emergency response procedures.	
43.		Implement effective communication protocols to ensure that all employees and stakeholders are aware of environmental and safety considerations related to marine HVACR systems, including updates to regulations, safety procedures, and emergency response plans	

44.	Case Studies and Project Work – Completion of a project related to marine HVACR	Research and gather case studies related to marine HVACR systems.	Week10
45.		Develop a framework for analyzing the case studies, such as identifying key stakeholders, outlining the challenges faced, and summarizing the solutions implemented	
46.		Read through each case study, taking notes on important details and observations.	
47.		Analyze each case study using the framework you developed, drawing out key themes and insights.	
48.		Compare and contrast the results of each case study to identify patterns and trends.	
49.		Synthesize your findings into a written report or presentation, including recommendations for improving marine HVACR systems based on the case studies you analyzed.	
50.	Completion of a project related to marine HVACR	Research and gather information about marine HVACR systems and their components.	Week11
51.		Identify the specific requirements and challenges of the marine environment for HVACR systems.	
52.		Conduct a feasibility study to determine the best HVACR system for your project.	
53.		Develop a project plan with a detailed scope of work, timeline, and budget.	
54.		Identify and select suppliers for required equipment and materials.	
55.		Develop detailed design drawings and specifications for the HVACR system.	
56.		Coordinate with other trades and stakeholders involved in the project.	
57.		Ensure compliance with relevant regulations and standards.	
58.		Install and commission the HVACR system.	
59.		Test and verify the performance of the HVACR system.	
60.		Conduct training sessions for marine staff on the proper use and maintenance of the HVACR system.	
61.		Develop a maintenance plan for the HVACR system to ensure optimal performance and longevity.	
62.	Design and installation of an HVAC system for a new ship or retrofitting an existing system	This project would involve assessing the ship's layout and requirements, selecting the appropriate HVAC components, and designing and installing a system that meets the ship's needs.	

63.	Optimization of HVAC system performance	This project would involve analyzing the ship's existing HVAC system to identify areas for improvement. You could then propose and implement changes to optimize the system's performance and energy efficiency.	
64.	Development of HVAC maintenance procedures	This project would involve creating a set of guidelines for maintaining the ship's HVAC system, including regular inspections, cleaning, and repair procedures. This could help to extend the lifespan of the system and prevent breakdowns that could impact the ship's operations.	
65.	Create an account profile on Fiverr (at least two gigs) and Upwork	Create an account by following these steps: Step 1: Personal Info Step 2: Professional Info Step 3: Linked Accounts Step 4: Account Security	Week12

66.	<p>How to search and apply for jobs in at least two labor marketplace countries (KSA, UAE, etc.)</p>	<ul style="list-style-type: none"> • Browse the following website and create an account on each website <ul style="list-style-type: none"> ▪ Bayt.com – The Middle East Leading Job Site ▪ Monster Gulf – The International Job Portal ▪ Gulf Talent – Jobs in Dubai and the Middle East • Find the handy ‘search’ option at the top of your homepage to search for the jobs that best suit your skills. • Select the job type from the first ‘Job Type’ drop-down menu, next, select the location from the second drop-down menu. • Enter any keywords you want to use to find suitable job vacancies. • On the results page you can search for part-time jobs only, full-time jobs only, employers only, or agencies only. Tick the boxes as appropriate to your search. • Search for jobs by: <ul style="list-style-type: none"> ▪ Company ▪ Category ▪ Location ▪ All jobs <p>Agency / Industry</p>	
67.	<p>Build your CV</p>	<p>Download professional CV template from any good site (https://www.coolfreecv.com or relevant)</p> <ul style="list-style-type: none"> • Add Personal Information • Add Educational details • Add Experience/Portfolio <p>Add contact details/profile links</p>	

68.	How to search and apply for jobs in at least two labor marketplace countries (KSA, UAE, etc.)	<ul style="list-style-type: none">• Browse the following website and create an account on each website<ul style="list-style-type: none">▪ Bayt.com – The Middle East Leading Job Site▪ Monster Gulf – The International Job Portal▪ Gulf Talent – Jobs in Dubai and the Middle East• Find the handy ‘search’ option at the top of your homepage to search for the jobs that best suit your skills.• Select the job type from the first ‘Job Type’ drop-down menu, next, select the location from the second drop-down menu.• Enter any keywords you want to use to find suitable job vacancies.• On the results page you can search for part-time jobs only, full-time jobs only, employers only, or agencies only. Tick the boxes as appropriate to your search.• Search for jobs by:<ul style="list-style-type: none">▪ Company▪ Category▪ Location▪ All jobs▪ Agency	
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Motivational Lectures MARINE HVACR

- **Success Story of a Pakistani national Imtiyaz Ahmed HVAC Technician in Dubai**

<https://www.youtube.com/watch?v=nY3bjXQi788>

- **What Is the Role of Good Manners in the Workplace? By Qasim Ali Shah | In Urdu**

<https://www.youtube.com/watch?v=Qi6Xn7yKIIQ>

- **Hisham Sarwar Motivational Story**

https://www.youtube.com/watch?v=CHm_BH7xAXk

- **HVAC Student Jumpstarts Career**

<https://www.youtube.com/watch?v=gDhXC28w5Fc>

- **Failure to Millionaire - How to Make Money Online**

<https://www.youtube.com/watch?v=d1hocXWSpus>

- **I Make \$80K A Year Repairing Air Conditioners | Roger Cuadra a Heating, Ventilation and air conditioning (HVAC) technician in Anaheim, CA.**

<https://www.youtube.com/watch?v=lzXY0QxVSUc>

Annexure-II

SUGGESTIVE FORMAT AND SEQUENCE ORDER OF MOTIVATIONAL LECTURE.

Mentor

Mentors are provided an observation checklist form to evaluate and share their observational feedback on how students within each team engage and collaborate in a learning environment. The checklist is provided at two different points: Once towards the end of the course. The checklists are an opportunity for mentors to share their unique perspective on group dynamics based on various team activities, gameplay sessions, pitch preparation, and other sessions, giving insights on the nature of communication and teamwork taking place and how both learning outcomes and the student experience can be improved in the future.

Session- 1 (Communication):

Please find below an overview of the activities taking place Session plan that will support your delivery and an overview of this session's activity.

Session- 1 OVERVIEW
Aims and Objectives:
<ul style="list-style-type: none"> To introduce the communication skills and how it will work Get to know mentor and team - build rapport and develop a strong sense of a team Provide an introduction to communication skills Team to collaborate on an activity sheet developing their communication, teamwork, and problem-solving Gain an understanding of participants' own communication skills rating at the start of the program

Activity:	Participant Time	Teacher Time	Mentor Time
Intro Attend and contribute to the scheduled.			
Understand good communication skills and how it works.			
Understand what good communication skills mean			
Understand what skills are important for good communication skills			
Key learning outcomes:	Resources:		Enterprise skills developed:
<ul style="list-style-type: none"> Understand the communication skills and how it works. Understand what 	<ul style="list-style-type: none"> Podium Projector Computer Flip Chart 		<ul style="list-style-type: none"> Communication Self Confidence Teamwork

<p>communication skills mean</p> <ul style="list-style-type: none"> • Understand what skills are important for communication skills 	<ul style="list-style-type: none"> • Marker 	
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Schedule	Mentor Should do
<p>Welcome: 5 min</p>	<p>Short welcome and ask the Mentor to introduce him/herself. Provide a brief welcome to the qualification for the class. Note for Instructor: Throughout this session, please monitor the session to ensure nothing inappropriate is being happened.</p>
<p>Icebreaker: 10 min</p>	<p>Start your session by delivering an icebreaker, this will enable you and your team to start to build rapport and create a team presentation for the tasks ahead. The icebreaker below should work well at introductions and encouraging communication, but feel free to use others if you think they are more appropriate. It is important to encourage young people to get to know each other and build strong team links during the first hour; this will help to increase their motivation and communication throughout the sessions.</p>
<p>Introduction & Onboarding: 20mins</p>	<p>Provide a brief introduction of the qualification to the class and play the “Onboarding Video or Presentation”. In your introduction cover the following:</p> <ol style="list-style-type: none"> 1. Explanation of the program and structure. (Kamyab jawan Program) 2. How you will use your communication skills in your professional life. 3. Key contacts and key information – e.g. role of teacher, mentor, and SEED. Policies and procedures (user agreements and “contact us” section). Everyone to go to the Group Rules tab at the top of their screen, read out the rules, and ask everyone to verbally agree. Ensure that the consequences are clear for using the platform outside of hours. (9am-8pm) 4. What is up next for the next 2 weeks ahead so young people know what to expect (see pages 5-7 for an overview of the challenge). Allow young people to ask any questions about the session topic.
<p>Team Activity Planning: 30 minutes</p>	<p>MENTOR: Explain to the whole team that you will now be planning how to collaborate for the first and second collaborative Team Activities that will take place outside of the session. There will not be another session until the next session so this step is required because communicating and making decisions outside of a session requires a different strategy that must be agreed upon so that everyone knows what they are doing for this activity and how.</p> <ul style="list-style-type: none"> • “IDENTIFY ENTREPRENEURS” TEAM ACTIVITY • “BRAINSTORMING SOCIAL PROBLEMS” TEAM ACTIVITY” <p><i>As a team, collaborate on a creative brainstorm on social</i></p>

	<p><i>problems in your community. Vote on the areas you feel most passionate about as a team, then write down what change you would like to see happen.</i></p> <p>Make sure the teams have the opportunity to talk about how they want to work as a team through the activities e.g. when they want to complete the activities, how to communicate, the role of the project manager, etc. Make sure you allocate each young person a specific week that they are the project manager for the weekly activities and make a note of this. Type up notes for their strategy if this is helpful - it can be included underneath the Team Contract.</p>
<p>Session Close: 5 minutes</p>	<p>MENTOR: Close the session with the opportunity for anyone to ask any remaining questions.</p> <p>Instructor: Facilitate the wrap-up of the session. A quick reminder of what is coming up next and when the next session will be.</p>

MOTIVATIONAL LECTURES LINKS.

<u>TOPIC</u>	<u>SPEAKER</u>	<u>LINK</u>
How to Face Problems In Life	Qasim Ali Shah	https://www.youtube.com/watch?v=OrQte08MI90
Just Control Your Emotions	Qasim Ali Shah	https://www.youtube.com/watch?v=JzFs_vJt-w
How to Communicate Effectively	Qasim Ali Shah	https://www.youtube.com/watch?v=PhHAQEGehKc
Your ATTITUDE is Everything	Tony Robbins Les Brown David Goggins Jocko Willink Wayne Dyer Eckart Tolle	https://www.youtube.com/watch?v=5fS3rj6eIFg
Control Your EMOTIONS	Jim Rohn Les Brown TD Jakes Tony Robbins	https://www.youtube.com/watch?v=chn86sH0O5U
Defeat Fear, Build Confidence	Shaykh Atif Ahmed	https://www.youtube.com/watch?v=s10dzfbozd4
Wisdom of the Eagle	Learn Kurooji	https://www.youtube.com/watch?v=bEU7V5rJTtw
The Power of ATTITUDE	Titan Man	https://www.youtube.com/watch?v=r8LJ5X2ejqU
STOP WASTING TIME	Arnold Schwarzenegger	https://www.youtube.com/watch?v=kzSBrJmXqdg
Risk of Success	Denzel Washington	https://www.youtube.com/watch?v=tbnzAVRZ9Xc

SAMPLE SUCCESS STORY

S. No	Key Information	Detail/Description
1.	Self & Family background	Meet John, a student who was passionate about marine technology and wanted to pursue a career in it. After completing high school, John was unsure about which course to choose that would help him achieve his dream career. However, he stumbled upon the Marine HVACR diploma program, which piqued his interest. John was a hardworking and dedicated student who never missed a class. He spent hours studying and practicing his skills, and even took up an internship at a marine HVACR company during his course to gain real-world experience. After completing his diploma, John started applying for jobs in the marine HVACR industry. He received many offers, but he decided to join a reputed marine HVACR company that had a great work culture and had a global presence. In his job, John was responsible for designing, installing, and maintaining HVACR systems for various marine vessels. John's dedication, hard work, and passion for his job made him an invaluable team member at the company. He quickly moved up the ranks and became a senior technical expert in just five years. He was responsible for training new recruits and overseeing projects worth millions of dollars. Today, John is a successful marine HVACR engineer who is highly respected in the industry. He has mentored many young professionals and continues to inspire others to pursue their passion for marine technology.
2.	How he came on board NAVTTC Training/ or got trained through any other source	Certification in Marine HVACR from Govt. Technical Training Institute (NAVTTC partner institute)
4.	Message to others (under training)	Take the training opportunity seriously Impose self-discipline and ensure regularity Make Hard work pays in the end so be always ready for the same.

Note: Success story is a source of motivation for the trainees and can be presented in several ways/forms in a NAVTTC skill development course as under: -

1. To call a passed out successful trainee of the institute. He will narrate his success story to the trainees in his own words and meet trainees as well.
2. To see and listen to a recorded video/clip (5 to 7 minutes) showing a successful trainee Audio-video recording that has to cover the above-mentioned points.*
3. The teacher displays the picture of a successful trainee (name, trade, institute, organization, job, earning, etc) and narrates his/her story in the teacher's own motivational words.

** The online success stories of renowned professional can also be obtained from **Annex-II***

Workplace/Institute Ethics Guide

Work ethic is a standard of conduct and values for job performance. The modern definition of what constitutes good work ethics often varies. Different businesses have different expectations. Work ethic is a belief that hard work and diligence have a moral benefit and an inherent ability, virtue, or value to strengthen character and individual abilities. It is a set of values-centered on the importance of work and manifested by determination or desire to work hard.

The following ten work ethics are defined as essential for student success:

1. Attendance:

Be at work every day possible, plan your absences don't abuse leave time. Be punctual every day.

2. Character:

Honesty is the single most important factor having a direct bearing on the final success of an individual, corporation, or product. Complete assigned tasks correctly and promptly. Look to improve your skills.

3. Team Work:

The ability to get along with others including those you don't necessarily like. The ability to carry your weight and help others who are struggling. Recognize when to speak up with an idea and when to compromise by blend ideas together.

4. Appearance:

Dress for success set your best foot forward, personal hygiene, good manner, remember that the first impression of who you are can last a lifetime

5. Attitude:

Listen to suggestions and be positive, accept responsibility. If you make a mistake, admit it. Values workplace safety rules and precautions for personal and co-worker safety. Avoids unnecessary risks. Willing to learn new processes, systems, and procedures in light of changing responsibilities.

6. Productivity:

Do the work correctly, quality and timelines are prized. Get along with fellows, cooperation is the key to productivity. Help out whenever asked, do extra without being asked. Take pride in your work, do things the best you know-how. Eagerly focuses energy on accomplishing tasks, also referred to as demonstrating ownership. Takes pride in work.

7. Organizational Skills:

Make an effort to improve, learn ways to better yourself. Time management; utilize time and resources to get the most out of both. Take an appropriate approach to social interactions at work. Maintains focus on work responsibilities.

8. Communication:

Written communication, being able to correctly write reports and memos.

Verbal communications, being able to communicate one on one or to a group.

9. Cooperation:

Follow institute rules and regulations, learn and follow expectations. Get along with fellows, cooperation is the key to productivity. Able to welcome and adapt to changing work situations and the application of new or different skills.

10. Respect:

Work hard, work to the best of your ability. Carry out orders, do what's asked the first time. Show respect, accept, and acknowledge an individual's talents and knowledge. Respects diversity in the workplace, including showing due respect for different perspectives, opinions, and suggestions.