

Government of Pakistan
National Vocational and Technical Training Commission

Prime Minister's Hunarmand Pakistan Program

"Skills for All"



Course Contents / Lesson Plan

Course Title: Boiler Operator

Duration: 6 Months

Trainer Name	
Course Title	Boiler Operator
Objectives and Expectations	<p>Employable skills and hands-on practice for Boiler Operator</p> <p>This course offers a broad, cross-disciplinary learning experience for students looking to pursue career in Boiler Operator. The needs for Boiler Operator technology has increased in present era keeping with the demands in power generation, process industry, healthcare sector and for HVACR system in commercial buildings. This course will provide participants with an integrated approach to learn about the various aspects of Boilers. The course will introduce the execution of knowledge of boiler, working principle, operation, inspection and maintenance.</p> <p>Boilers are an important asset used for various purposes in different industrial plants. It's one of the main application to produce high-pressure steam for process applications and power generation. Operation and maintenance of Boiler are critical to ensure a safe and efficient plant environment. This course of Boiler Operation, Maintenance & Safety training ensure participants gain a comprehensive understanding of commercial, industrial and utility boiler systems. This course covers the principle of operation of boilers, types and the main components of boilers. It will also focus on the study of correct operation and routine maintenance and safety. Participants will also learn how to improve boiler efficiency, energy cost saving methods and maximize safety</p> <p><u>Main Expectations:</u></p> <p>In short, the course under reference 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.</p> <p>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/after the training.</p> <ol style="list-style-type: none"> 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 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 <u>Job Search & Entrepreneurial Skills</u> 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.

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

	<p>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.</p> <p>The Trainees should be required and supervised to carefully analyze the cases.</p> <p>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.</p> <p>Case studies can be implemented in the following ways: -</p> <ol style="list-style-type: none"> A good quality trade-specific documentary (At least 2-3 documentaries must be arranged by the training institute) Health & Safety case studies (2 cases regarding safety and industrial accidents must be arranged by the training institute) 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
Learning Outcomes of the course	<p>By the end of this course, students will be able to:</p> <ul style="list-style-type: none"> Start up the boiler Operate the boiler Operate boiler pumps Treat feed water of boiler Inspection of combustion Record keeping related to boiler operation Perform inspection of boiler fittings and piping understand safety system of boilers Maintenance of boiler
Course Execution Plan	<p>The total duration of the course: 6 months (26 Weeks)</p> <p>Class hours: 4 hours per day</p> <p>Theory: 20%</p> <p>Practical: 80%</p> <p>Weekly hours: 20 hours per week</p> <p>Total contact hours: 520 hours</p>
Companies offering jobs in the respective trade	<ol style="list-style-type: none"> Power plants Steel manufacturing industry. Construction industry. Fertilizer industry Chemical industry Sugar industry Industrial projects. Hospitals. Railways. Pakistan Ordnance Factory Wah. Heavy Mechanical Complex Taxila. Heavy Forge and Foundry Taxila.

	13. Tractor and Agricultural Equipment Industry. 14. Automobile industry. 15. Local industry. 16. HVACR Boiler operator in Commercial Buildings
Job Opportunities	<p>All over the world there is a high demand in different industries, power plants, manufacturing sectors, railways etc. Boiler Operator handle and maintain heating systems and work with various pieces of equipment, such as boilers or water heating systems</p> <ul style="list-style-type: none"> • Boiler Operator • 1st Class Boiler Attendant • 2nd Class Boiler Attendant • Boiler Course Instructor
No of Students	25
Learning Place	Classroom / Lab
Instructional Resources	<ol style="list-style-type: none"> 1. Boiler Operator's Guide 4th Edition by Anthony L. Kohan McGrawHill Education 2. The Boiler Operator's Handbook by Graham & Trotman National Industrial Fuel Efficiency Service Ltd NIFES 3. Practical Boiler Operation Engineering & Power Plant by Amiya Ranjan Mallick PHI Learning Private Limited, Delhi 4. The basics of boiler Operation & Maintenance by David Sage Mariland Ruppert C. George Segeler William Todd United States Environmental Protection Agency, New York 5. Boiler Operatr's Handbook by Ken Heselton The Fairmont Press Inc, Georgia & Marcel Dekker Inc, New York

MODULES

Scheduled Weeks	Module Title	Learning Units	Remarks
Week 1	Orientation/Course Introduction Knowledge of Boiler Types	<ul style="list-style-type: none"> • Motivational Lecture (<i>For further detail please see Page No: 3 & 4</i>) • Job market • Course Applications • Institute/work ethics <p>Students are introduced to:</p> <ul style="list-style-type: none"> • Shell Boilers • Water Tube Boilers • Sectional Boilers • Magazine Boilers • Fire Tube and Water Tube Boiler • Straight Tube, Bent Tube, Horizontal, Vertical and Inclined Boiler • Waste Heat Recovery Boiler (WHRB) • Package Boiler • Subcritical and Supercritical Boiler • Fuel-fired Boiler 	<p style="text-align: center;">Home Assignment</p> <ul style="list-style-type: none"> • Task 1 • Task 2 <p><i><u>Details may be seen at Annexure-I</u></i></p>
Week 2	Knowledge of Combustion Process	<ul style="list-style-type: none"> • Success stories (<i>For further detail please see Page No: 3& 4</i>) <p>Students are introduced to:</p> <ul style="list-style-type: none"> • Combustion process fundamentals • Excess Air & Flue gases relation • Combustion in practice • Burning oil • Gas burning • Combustion of coal • Flames • Types of flames • Sulfur corrosion 	<ul style="list-style-type: none"> • Task 3 • Task 4 <p><i><u>Details may be seen at Annexure-I</u></i></p>
Week 3	Concepts of Heat Transfer Fundamentals	<p>1) Motivational Lecture(<i>For further detail please see Page No: 3& 4</i>)</p> <p>Students are introduced to:</p> <ul style="list-style-type: none"> • Basics of Thermodynamics • Heat Transfer and Combustion • Latent Heat & Sensible Heat • Steam Properties • Purity of Steam • Mass and Energy Balance • Conduction, Convection, and Radiation 	<ul style="list-style-type: none"> • Task 5 • Task 6 <p><i><u>Details may be seen at Annexure-I</u></i></p>

Week 4	Types of boiler fuels in common use	<ul style="list-style-type: none"> • Success stories (For further detail please see Page No: 3& 4) <p>Students are introduced to learn:</p> <ul style="list-style-type: none"> • Use of fuel • Use of fuel gases (Natural gas CH₄, LPG (Liquefied Petroleum Gas), Propane, Butane, Hydrogen gas, Digester Gas, Landfill Gas • Use of fuel Oil • Flash point of fuel • Coal • Other Solid fuel • Treatment chemicals 	<ul style="list-style-type: none"> • Task 7 <p><u>Details may be seen at Annexure-I</u></p> <div>• Monthly Test 1</div>
Week 5	Knowledge of Boiler Controls	<ul style="list-style-type: none"> • Motivational Lecture (For further detail please see Page No: 3& 4) <p>Students are introduced to learn:</p> <ul style="list-style-type: none"> • Startup Control • Steam flow / air flow • Dual fuel firing • Boiler Control and Protection • Safety Valves • Flame Safeguard • Oxygen Trim • Combustibles trim • Draft Control • Burner Management System • Continuous Blowdown Control • Drum Level Control • Feed water Pressure Control 	<ul style="list-style-type: none"> • Task 8 <p><u>Details may be seen at Annexure-I</u></p>
Week 6	Knowledge of Boiler Piping	<ul style="list-style-type: none"> • Success stories (For further detail please see Page No: 3& 4) <p>Students are introduced to:</p> <ul style="list-style-type: none"> • Boiler Internal piping is known as Boiler Proper Piping (BP) • Boiler External piping (BEP) • Non-Boiler External Piping (NBEP) 	<ul style="list-style-type: none"> • Task 9 • Task 10 <p><u>Details may be seen at Annexure-I</u></p>
Week 7	Knowledge and understanding of Boiler Mountings & Accessories	<ul style="list-style-type: none"> • Motivational Lecture(For further detail please see Page No: 3& 4) <p>Students are introduced to learn:</p> <p><u>Boiler Mountings</u></p> <ul style="list-style-type: none"> • Safety valves • Steam Stop Valves • Vent Valves • Pressure gauge • Water Level Indicator 	<ul style="list-style-type: none"> • Task 11 • Task 12 <p><u>Details may be seen at Annexure-I</u></p>

		<ul style="list-style-type: none"> • Feed Check Valve • Fusible Plug <p><u>Boiler Accessories</u></p> <ul style="list-style-type: none"> • Feed pumps • Injectors • Economizer • Air Preheater • Super heater • Steam Separator • Steam trap 	
Week 8	Boiler Draught, its classification and types	<ul style="list-style-type: none"> • Success stories (For further detail please see Page No: 3& 4) <p>Students are introduced to learn:</p> <ul style="list-style-type: none"> • Boiler Draught • Purpose of Boiler Draught • Measurement of Draught • Classification of Boiler Draught • Types of Boiler Draught (Natural and Artificial/Mechanical) • Advantages and Disadvantages of Natural and Artificial/Mechanical draughts • Types of Artificial / Mechanical Draught (Steam Jet and Mechanical/Fan) • Types of Mechanical or Fan Draught (Induced, Forces, Balanced) 	<ul style="list-style-type: none"> • Task 13 <p><u>Details may be seen at Annexure-I</u></p> <p>Monthly Test 2</p>
Week 9	Startup procedure of the boiler	<ul style="list-style-type: none"> • Motivational Lecture(For further detail please see Page No: 3& 4) <p>Students are introduced to learn:</p> <ul style="list-style-type: none"> • Wear safety kit • Prepare boiler for start up • Feed water to the boiler • Supply fuel to the boiler • Supply compressed air to boiler • Fire the burner (cold start up) • Fire the boiler using given fuel • Change diesel/gas to furnace oil 	<ul style="list-style-type: none"> • Task 14 <p><u>Details may be seen at Annexure-I</u></p>

Week 10	Smooth Operation of Boiler	<ul style="list-style-type: none"> • Success stories (For further detail please see Page No: 3& 4) <p>Students are introduced to:</p> <ul style="list-style-type: none"> • How to locate valves • sequence of opening the valves • pattern of the flame • types of correct indications • colour code of the pipes • boiler operation • steam • steam utilization 	<p>• Task 15</p> <p><u>Details may be seen at Annexure-I</u></p>
Week 11	Treatment of feed water	<ul style="list-style-type: none"> • Motivational Lecture (For further detail please see Page No: 3& 4) <p>Students are introduced to:</p> <ul style="list-style-type: none"> • pH value, hardness of water, • Total Dissolved Solids (TDS) • effects of water with higher / lower pH values • effects of hard water • effects of dissolved gases & TDS • how to control pH value • how to control hardness & TDS • how to control dissolved oxygen / SO₃ • how to test pH value • how to test hardness • directions of opening & closing of valves • how to re-generate the softener • effects of blow down • how & when to blow down. 	<p>• Task 16</p> <p><u>Details may be seen at Annexure-I</u></p>
Week 12	Introduction to Boiler Pumps and their types	<ul style="list-style-type: none"> • Success stories (For further detail please see Page No: 3& 4) <p>Students are introduced to:</p> <ul style="list-style-type: none"> • Pumps • Alignment • Couplings • Reciprocating pumps • Centrifugal Pumps • Turbine pumps • Gear pumps • Screw pumps • Pump control 	<p>• Task 17 • Task 18</p> <p><u>Details may be seen at Annexure-I</u></p>

	Start Preparing your portfolio	<ul style="list-style-type: none"> • Motivational Lecture (For further detail please see Page No: 3& 4) <p>Students are introduced to:</p> <ul style="list-style-type: none"> • the concept of design portfolios • the concept of present design work/projects in a professional manner • websites that provide free portfolio hosting such as Behance and Dribbble • creating a portfolio • how to select work for presenting in your portfolio 	
Week 13	Midterm		
Week 14	Inspect Combustion	<ul style="list-style-type: none"> • Success stories (For further detail please see Page No: 3& 4) <p>Students are introduced to:</p> <ul style="list-style-type: none"> • How to identify a good strainer • how to clean the nozzle tip • viscosity of different • types of fuel oil • requirement for proper combustion of fuels • how to balance oil • spray angles • spray patterns • how to adjust air dampers according to the flue gas condition 	<p>• Home Assignment</p> <p>• Task 19</p> <p><u>Details may be seen at Annexure-I</u></p>
Week 15	Perform Maintenance of Boiler	<ul style="list-style-type: none"> • Motivational Lecture (For further detail please see Page No: 3& 4) <p>Students are introduced to:</p> <ul style="list-style-type: none"> • how to remove & tighten the nuts in steam lines • adjustment of the gap between the ignition electrodes • ignition temperature • how to remove & replace the burner • importance of cleaning of boiler accessories • importance of cleaning of boiler mountings • sealing system of the fire door • how to repair steam leaks • harmfulness of the boiler room disposals 	<p>• Task 20</p> <p><u>Details may be seen at Annexure-I</u></p>

	Introduction to Freelancing	<ul style="list-style-type: none"> • Motivational Lecture (For further detail please see Page No: 3& 4) <p>Students are introduced to:</p> <ul style="list-style-type: none"> • the concept of freelancing • how to become freelance and create a sustainable income • pros and cons of freelancing • the ethical and professional way of becoming a productive freelancer • resources available for freelancing in the field of design • how to join freelancing sites • the process of creating a freelancing profile 	
Week 16	Hazards and Safety of Boilers	<ul style="list-style-type: none"> • Success stories (For further detail please see Page No: 3& 4) <p>Students are introduced to:</p> <ul style="list-style-type: none"> • Boiler room hazards • Boiler log list • Boiler room log list • Normal Operating Water Level (NOWL) • Try cocks • Safety valve function & test • Maximum Allowable Working Pressure (MAWP) • Burner Control system • Flame scanner test • Priming and carryover • Steam valves test • Manhole and Hand hole covers • Steam traps test • Fire safety plan • Chemical safety plan • Lockout / Tag out 	<ul style="list-style-type: none"> • Task 21 <p><u>Details may be seen at Annexure-I</u></p>
Week 17	Boiler Shutdown Procedure	<ul style="list-style-type: none"> • Motivational Lecture (For further detail please see Page No: 3& 4) <p>Students are introduced to:</p> <ul style="list-style-type: none"> • Change the fuel to distillate fuel. • If a separate heating arrangement for heavy oil is present then there's is no need to change over to distillate fuel and the oil is kept on circulation mode. • Stop the boiler automatic cycle. • Close the steam stop valves. • Close the boiler feed water valves. • When the boiler pressure is just 	<ul style="list-style-type: none"> • Task 22 <p><u>Details may be seen at Annexure-I</u></p> <ul style="list-style-type: none"> • Monthly Test 3

		<p>reduced to over atmospheric pressure the vent valve is kept open to prevent vacuum formation inside the boiler.</p> <ul style="list-style-type: none"> • Shut off the fuel to the burner. • If equipped, open the super heater outlet drain valve. • Open all drains. • Shut down the boiler feed system. 	
Week 18	Energy Conservation in Boiler	<ul style="list-style-type: none"> • Success stories (For further detail please see Page No: 3& 4) <p>Students are introduced to:</p> <ul style="list-style-type: none"> • Excess Air Control • Water Quality & tube Cleaning • Arresting Air & Flue Gas Leakage • Proper Combustion • Optimize Blowdown • Heat Recovery from Blowdown • Minimize Boiler Surface Radiation • Operating Condition of Boiler Maximum Continuous Rating (BMCR) • Combustion Air and Feed water Heating • Optimizing Soot Blowing • Maintaining Design Parameter • Heat Recovery from Ash • Proper de-aeration of boiler feed water • Energy Conservation In Boiler Auxiliary Equipment (feed pump, ID, FD and SA Fans) 	<p>•Task 23</p> <p><u>Details may be seen at Annexure-I</u></p>
Week 19	Boiler room cleanup	<ul style="list-style-type: none"> • Motivational Lecture (For further detail please see Page No: 3& 4) <p>Students are introduced to knowledge of:</p> <ul style="list-style-type: none"> • Boiler room doors locking • Oil slick • Gauges easy to read • Tools put away • Clean air intakes • Garbage cleanup • Checking fuel in tank • Checking water in boiler • Heater setting • Cleaning of smoke alarm lens • Atomizing cap cleaning • 	<p>•Task 24</p> <p><u>Details may be seen at Annexure-I</u></p>
Week 20	Keeping Record	<ul style="list-style-type: none"> • Success stories (For further detail please see Page No: 3& 4) <p>Students are introduced to:</p>	<p>•Task 25</p> <p><u>Details may</u></p>

		<ul style="list-style-type: none"> • Basic arithmetic calculations • Knowledge of standard units • How to take & record the readings. • Preparation of data record sheets • Filling the data sheets 	<u>be seen at Annexure-I</u>
Week 21	Employable Project/ Assignment (6 weeks) i.e. 21-26 besides regular classes OR On the job training (2 weeks)	<ul style="list-style-type: none"> • Guidelines to the Trainees for selection of students employable project like final year project (FYP) • Assign Independent project to each Trainee • A project-based on trainee's aptitude and acquired skills. • Designed by keeping in view the emerging trends in the local market as well as across the globe. • The project idea may be based on Entrepreneur. • Leading to successful employment. • The duration of the project will be 6 weeks • Final viva/assessment will be conducted on project assignments. • At the end of the session, the project will be presented in a skills competition • The skill competition will be conducted on zonal, regional, and National levels. • The project will be presented in front of Industrialists for commercialization • The best business idea will be placed in the NAVTTC business incubation center for commercialization. <p style="text-align: center;">OR</p> <p>On the job training for 2 weeks:</p> <ul style="list-style-type: none"> • Aims to provide 2 weeks of industrial training to the Trainees as part of the overall training program • Ideal for the manufacturing trades • As an alternative to the projects that involve expensive equipment • Focuses on increasing Trainee's motivation, productivity, efficiency, and quick learning approach. 	
Week 22	Capstone Project	<p>The capstone project is a unique opportunity to carry out research in order to devise an innovative and unique solution for a real-world problem.</p> <p>The detailed requirements for any capstone project will be determined by the</p>	

		<p>supervising faculty member and can take a wide range of forms, including but not limited:</p> <ul style="list-style-type: none"> • A traditional academic research • A policy paper • An operational plan • A case study • A business plan 	
	<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"> • www.linkedin.com - primarily used for professional networking and career development, and allows job seekers to post their CVs and employers to post jobs • www.careerbuilder.com – mainly has offices in the United States, Canada, Europe, and Asia. In 2008, it had the largest market share among online employment websites in the United States, where it was founded • www.simplyhired.com - is an employment website and mobile application and an online recruitment advertising network based in Sunnyvale, California. The company was launched in 2003. In 2016, Recruit Holdings Co., Ltd., purchased Simply Hired. The company aggregates job listings from thousands of websites and job boards. • www.ziprecruiter.com – an American employment marketplace for job seekers and employers. The company is headquartered in Santa Monica, California with offices in Tempe, AZ; London, UK and Tel Aviv, Israel. • Find the handy 'search' option at the top of your homepage to search for the jobs that best suit 	

		<p>your skills.</p> <ul style="list-style-type: none"> • 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 • Industry 	
Week 23	Freelancing	<ul style="list-style-type: none"> • Create profile on www.freelancer.com • Create gigs • Create profile on www.guru.com • Prepare cover letter • Make proposal for clients • Find project on www.freelancer.com and www.guru.com and apply/bid for them 	<ul style="list-style-type: none"> • Task <p><i><u>Details may be seen at Annexure-I</u></i></p>
Week 24	Professional practice methods & legal side of design	<ul style="list-style-type: none"> • Success stories (For further detail please see Page No: 3& 4) <p>Students are introduced to:</p> <ul style="list-style-type: none"> • the standards that define the expectations of a professional Boiler Operator • the principles of integrity that demonstrate respect for the profession, for colleagues, for clients, for audiences or consumers, and society as a whole • the perspectives of the Boiler Operator profession i.e. understanding the profession, the meanings of environmental responsibility, copyright, and ethics • what legalities are involved in professional Boiler Operation projects • how to build strong professional proposals • copyrights, copyright infringement, 	

		<p>plagiarism, crediting creators, purchasing online products, downloading 'free' content</p> <ul style="list-style-type: none"> the do's and don'ts of how to price their time, effort, and creativity 	
Week 25	Team Management	<p>The candidates are expected to develop following skills to improve their skills, effectiveness, efficiency and to achieve success and goals set by them in real life:</p> <ul style="list-style-type: none"> Allocating Resources Critical Observation Focus Goal Setting Memory Organize Personal Time Management Planning Organizing Prioritization Recalling Scheduling Sense of Urgency Streamlining Stress Management Task Planning Task Tracking Time Awareness Work-Life Balance 	
Week 26	Entrepreneurship and Final Assessment in project	<ul style="list-style-type: none"> Success stories (For further detail please see Page No: 3& 4) Job Market Searching Self-employment Introduction Fundamentals of Business Development Entrepreneurship Startup Funding Business Incubation and Acceleration Business Value Statement Business Model Canvas Sales and Marketing Strategies How to Reach Customers and Engage Stakeholders Power Grid RACI Model, SWOT & PEST Analysis SMART Objectives OKRs Cost Management (OPEX, CAPEX, ROCE, etc.) 	Final Assessment
	Final Assessment		

Tasks For Certificate in Boiler Operator

Task No.	Task	Description	Week
1.	Identify different types of boilers	<ul style="list-style-type: none"> Prepare a report enlisting all types of boilers (as mentioned in Week 1 module) along with their pictures and working principles 	Week 1
2.	Identify main parts of a boiler	<ul style="list-style-type: none"> Enlist all main parts of a boiler and show / labelled them on picture of boilers 	
3.	Write the chemical Reactions of combustion	<ul style="list-style-type: none"> Write the products produced by burning pure Carbon if: <ol style="list-style-type: none"> there is enough supply of air there is a little supply of air 	Week-2
4.	Compare different fuels	<ul style="list-style-type: none"> Enlist the 3 advantages and 3 disadvantages of oil fuel and gas fuel 	
5.	Identify different types of steam	<ul style="list-style-type: none"> Enlist the temperature ranges of the following steams: <ol style="list-style-type: none"> Dry (Super Heated) steam Saturated Steam Wet (Unsaturated) Steam 	Week 3
6.	Heat transfer modes	<ul style="list-style-type: none"> Prepare single page short report on 5 examples each of the following heat transfer modes: <ol style="list-style-type: none"> Conduction Convection Radiation 	
7.	Boiler fuel types	<ul style="list-style-type: none"> Enlist the Energy Content (BTU) of the following fuel quantities: <ol style="list-style-type: none"> Coal – 1 Ton – BTUs ? Crude oil – 1 Barrel – BTUs ? Diesel Fuel – 1 Gallon – BTUs ? Natural Gas – 1 Cubic Feet – BTUs ? Propane LPG – 1 Gallon – BTUs ? Wood (air dried) – 1 pound – BTUs ? Butane Gas – 1 Cubic Feet – BTUs ? 	Week 4

		8. Gasoline – 1 Gallon – BTUs ? 9. Pellets – 1 Ton – BTUs ? 10. Kerosene – 1 Gallon – BTUs ?	
8.	Perform Boiler control with temperature and pressure as parameters	<ul style="list-style-type: none"> Monitor and maintain variables e.g. steam temperature and pressure, in order to control a boiler's burner or air mixture 	Week 5
9.	Internal and External piping of a boiler	<ul style="list-style-type: none"> Differentiate between the uses of internal and external boiler piping. Which standard/code is used to design internal and external piping of boiler? 	Week 6
10	Knowledge of Boiler codes and standards	<ul style="list-style-type: none"> Write short overview of: <ol style="list-style-type: none"> ASME B31.1 ASME BPVC Section I. 	
11	Identification of Boiler accessories and mountings	<ul style="list-style-type: none"> Identify the boiler accessories and mountings as per instructions 	Week 7
12	Operate different valves	<ul style="list-style-type: none"> Explain the following for accessories/mountings: <ol style="list-style-type: none"> Safety valve working principle Fusible plug working principle Economizer working principle Air Preheater working principle 	
13	Knowledge of types of boiler draughts	<ul style="list-style-type: none"> Enlist types of boiler draughts, draw sketches of their process flow and write down the 3 advantages and 3 disadvantages of each type 	Week 8
14	Starting the boiler	<ul style="list-style-type: none"> Start up the boiler after performing the inspection and following the SOPs 	Week 9
15	Perform smooth boiler operation	<ul style="list-style-type: none"> Inspect indicators Blow down mobrey Open steam delivery valves Control water and fuel supplies 	Week 10

		<ul style="list-style-type: none"> • Check the temperature of flue gas • Blow down water gauge glass • Control steam pressure • Shut down boiler 	
16	Perform feed water treatment	<ul style="list-style-type: none"> • Control pH value of feed water • Control hardness of feed water • Control dissolved gases • Control dissolved solids • Blow down boiler 	Week 11
17	Perform coupling and alignment of pump and motor	<ul style="list-style-type: none"> • Perform alignment of given pump shaft with motor shaft 	Week 12
18	Differentiate among different pumps	<ul style="list-style-type: none"> • Write down the working principles of the following pumps: • Reciprocating pumps • Centrifugal Pumps • Gear pumps • Screw pumps 	
19	Perform inspection of combustion	<ul style="list-style-type: none"> • Clean fuel strainers of the boiler • Clean deposits of the nozzle tip • Balance the viscosity of oil • Adjust inlet air damper 	Week 14
20	Perform maintenance of boiler	<ul style="list-style-type: none"> • Regenerate water softener plant • Clean / Replace air filters • Clean / Replace oil filters • Clean / Replace ignition electrodes • Clean diffuser plates • Clean burner • Clean sight glass • Replace sight glass • Clean atomizer • Clean damper unit • Clean burner nozzle • Replace burner nozzle • Clean / Replace photo-cell • Clean fire tubes (wash out) • Clean gauge glass column • Clean chamber of the boiler • Clean carbon deposits in smoke 	Week 15

		<ul style="list-style-type: none"> • box & chimney • Clean steam traps • Maintain stock of material • Repair (minor) leaks of the boiler • Remove disposals • Open the burner 	
21	Perform boiler safety inspection	<ul style="list-style-type: none"> • Fill a boiler safety log form • Write a sample accident report 	Week 16
22	Boiler shutdown procedure	<ul style="list-style-type: none"> • Identify all the key parts in shutting down the boiler • Explain the steps of boiler shutdown procedure 	Week 17
23	Energy conservation in boiler	<ul style="list-style-type: none"> • What are the methods of increasing the efficiency of: <ul style="list-style-type: none"> i) cooling tower ii) pump iii) fan iv) air compressor 	Week 18
24	Boiler room cleanup	<ul style="list-style-type: none"> • Prepare a daily, weekly, monthly and yearly plan for boiler room cleaning (keeping all important tasks to be performed) 	Week 19
25	Perform record keeping	<ul style="list-style-type: none"> • Record log entries • Fill fuel recording table • Fill steam recording table • Fill feed water recording table • Record boiler running chart • Keep other records 	Week 20
26	Build your CV	<p>Download professional CV template from any good site (www.freeresumes.com or www.resumelab.com or www.templates.office.com) or build your resume online at www.jobscan.co/resume-builder or at www.cakeresume.com or www.resumegenius.com</p> <p>Include following details in the resume:</p> <ul style="list-style-type: none"> • Resume title i.e. Boiler Operator 2 Years' Experience • Profile Summary • Personal Information • Educational details • Experience/Portfolio • Professional Courses/Certifications/Trainings • Projects Completed 	Week 21-26

		<ul style="list-style-type: none"> Contact details/profile links Always keep your CV up to date 	
27	Create an account profile on Freelancer.com and Guru	<p>Create an account by following these steps:</p> <p>Step 1: Personal Info</p> <p>Step 2: Professional Info</p> <p>Step 3: Linked Accounts</p> <p>Step 4: Account Security</p>	Week 21-26
28	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"> www.linkedin.com - primarily used for professional networking and career development, and allows job seekers to post their CVs and employers to post jobs www.careerbuilder.com – mainly has offices in the United States, Canada, Europe, and Asia. In 2008, it had the largest market share among online employment websites in the United States, where it was founded www.simplyhired.com - is an employment website and mobile application and an online recruitment advertising network based in Sunnyvale, California. The company was launched in 2003. In 2016, Recruit Holdings Co., Ltd., purchased Simply Hired. The company aggregates job listings from thousands of websites and job boards. www.ziprecruiter.com – an American employment marketplace for job seekers and employers. The company is headquartered in Santa Monica, California with offices in Tempe, AZ; London, UK and Tel Aviv, Israel. Find the handy 'search' option at top of your homepage to search for jobs that best suit 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 	Week 21-26

		<p>appropriate to your search.</p> <ul style="list-style-type: none">• Search for jobs by:<ul style="list-style-type: none">▪ Company▪ Category▪ Location▪ All jobs▪ Agency▪ Industry	
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Motivational Lectures

What is freelancing and how you can make money online – BBC URDU

<https://www.youtube.com/watch?v=9jCJN3Ff0kA>

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 | Pakistani Freelancer

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

21 Yr Old Pakistani Fiverr Millionaire | 25-35 Lakhs a Month Income | Interview

<https://www.youtube.com/watch?v=9WrmYYhr7S0>

Success Story of a 23 Year - Old SEO Expert | How This Business Works | Urdu Hindi Punjabi

<https://www.youtube.com/watch?v=tIQ0CWgszI0>

Failure to Millionaire - How to Make Money Online | Fiverr Superhero Aaliyaan Success Story

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

Stationary Engineer and Boiler Operator Career Video

https://www.youtube.com/watch?v=y_1bmqr1D-4&ab_channel=CareerOneStop

UnityPoint Health - Meriter 5 Miura EX Dual Fuel Boilers

https://www.youtube.com/watch?v=WLcR_PV6ILA&t=69s

<https://miuraboiler.com/category/videos/success-stories/>

SUGGESTIVE FORMAT & 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

communication skills mean	<ul style="list-style-type: none"> • Marker 	
<ul style="list-style-type: none"> • Understand what skills are important for communication skills 		

Schedule	Mentor Should do
Welcome: 5 min	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.
Icebreaker: 10 min	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.
Introduction & Onboarding: 20mins	Provide a brief introduction of the qualification to the class and play the “Onboarding Video or Presentation”. In your introduction cover the following: <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.
Team Activity Planning: 30 minutes	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. <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 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.</p> <p>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>

SUCCESS STORY

S. No	Key Information	Detail/Description
1.	Self & Family background	<p>Ziafat Khan, who was born in an underprivileged area of Punjab province called Dera Ghazi Khan, is an ideal example to be followed by many people. He belongs to a middle class family and hardly managed to bear his school and college expenses.</p> <p>In 2017, Ziafat Khan successfully completed his college and decided to enroll in a skilled based professional course “Boiler Operator” in one of the well know institution of Pakistan namely “Pakistan Navy Engineering College in Karachi (which is also working in collaboration with NAVTTC). He did hard work and managed to learn the skills.</p> <p>Later on, in 2018, he started his journey as Boiler Operator in Fauji Cement Jhang Bhatar and started polishing his skills and improving his knowledge as well. In a very short time of 2 years, he demonstrated his skills and completed advanced diploma of Boiler Operator. The company was very satisfied with his quality of work and commitments. Ziafat Khan received employee of the year award in year 2020. Now Abdullah is earning Rs. 900,000+ in a year.</p> <p>“You don’t need more luck. You need more hardwork and persistence”</p>
2.	How he came on board NAVTTC Training/ or got trained through any other source	Certification in Boiler Operator from Pakistan Navy Engineering College, Karachi (NAVTTC partner institute)
3.	Post-training activities	<p>Ziafat Khan’s area of expertise is in Boiler Operation and Maintenance. In start of his career as freelancer, he successfully managed to create profile on www.freelancer.com and www.guru.com. He applied mostly for projects focused on Provision of Online Trainings to candidates. In start it wasn’t so easy for him to grab clients. In the first few weeks, he didn’t hear back from even a single client, despite bidding for dozens of projects. But after several attempts he succeeded in grabbing a good client who needed</p>

		<p>training services for his employees in Saudi Arabia.</p> <p>“I needed to understand what worked, so I read blogs, participated in forums, and analyzed profiles of successful freelancers. It was an uphill struggle, but I didn’t want to give up,” he explains.</p> <p>Ziafat Khan says he understands why clients would be apprehensive giving projects to untested freelancers. They have hundreds of options to choose from, he explains, and to give a project to someone with no experience requires a strong leap of faith.</p> <p>A slow stream of projects started to come Abdullah’s way. He soon realized that increased use of precise, versatile and training methodologies have assisted industries in achieving their set targets very perfectly.</p> <p>He is working as freelancer and has very good rating on both platforms i.e. www.freelancer.com and www.guru.com. He usually handling 1-2 projects in a week. The example of Ziafat Khan is ideal example for those who are interested to opt Boiler Operator as their field of working in future.</p>
4.	<p>Message to others (under training)</p>	<p>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.</p>

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.