

Government of Pakistan

**National Vocational and Technical Training Commission**

**Prime Minister's Hunarmand Pakistan Program**

"Skills for All"



**Course Contents / Lesson Plan**

**Course Title: Advanced Welding**

**Duration: 6 Months**

**Revised Edition**

Trainer Name	
Course Title	<b>Advanced Welding</b>
Objectives and Expectations	<p><b>Employable skills and hands-on practice for Advanced Welding</b></p> <p>This course offers a broad, cross-disciplinary learning experience for students looking to pursue career in Advanced Welding. The needs for superior welding technology have increased in keeping with the demands for a wide variety of performances such as high productivity, high quality, as well as labor and cost savings. This course will provide participants with an integrated approach to learn about the various aspects of welding and allied technologies. The course will introduce various welding processes such as arc welding, laser welding, electron beam welding, friction stir welding, diffusion bonding and brazing. It will discuss welding metallurgy along with the weld-ability of various ferrous and non-ferrous alloys.</p> <p><b><u>Main Expectations:</u></b></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"> <li>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.</li> <li>ii. To materialize the main expectations, a special module on <b><u>Job Search &amp; Entrepreneurial Skills</u></b> has been included in the latter part of this course (5<sup>th</sup> &amp; 6<sup>th</sup> 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.</li> </ol>

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 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.

	<p>Case studies can be implemented in the following ways: -</p> <ol style="list-style-type: none"> <li>i. A good quality trade-specific documentary (At least 2-3 documentaries must be arranged by the training institute)</li> <li>ii. Health &amp; Safety case studies (2 cases regarding safety and industrial accidents must be arranged by the training institute)</li> <li>iii. Field visits (At least one visit to a trade-specific major industry/ site must be arranged by the training institute)</li> </ol>
<b>Entry-level of trainees</b>	Intermediate
<b>Learning Outcomes of the course</b>	<p>By the end of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Be able to recognize the dangers and observe relevant safety precautions while performing / supervising hot work.</li> <li>• Understand the differences and working principles of various welding equipment on board.</li> <li>• Methodologies for evaluating weld-ability</li> <li>• Principles for pre/post weld heat treatment</li> <li>• Principles of destructive &amp; non-destructive testing &amp; inspection of welds</li> <li>• Acquire the knowledge of correct welding rod selection and parameter settings based on the material to be welded.</li> <li>• Project based case studies on welding</li> </ul>
<b>Course Execution Plan</b>	<p>The total duration of the course: <b>6 months (26 Weeks)</b>  Class hours: <b>4 hours per day</b>  Theory: <b>20%</b>  Practical: <b>80%</b>  Weekly hours: <b>20 hours per week</b>  Total contact hours: <b>520 hours</b></p>
<b>Companies offering jobs in the respective trade</b>	<ol style="list-style-type: none"> <li>1. Steel manufacturing industry.</li> <li>2. Construction industry.</li> <li>3. Fertilizer industry</li> <li>4. Chemical industry</li> <li>5. Sugar industry</li> <li>6. Industrial projects.</li> <li>7. Shipyards.</li> <li>8. Railways.</li> <li>9. Pakistan Ordinance Factory Wah.</li> <li>10. Heavy Mechanical Complex Taxila.</li> <li>11. Heavy Forge and Foundry Taxila.</li> <li>12. Tractor and Agricultural Equipment Industry.</li> <li>13. Automobile industry.</li> <li>14. Local industry.</li> <li>15. Local metal fabrication shops.</li> </ol>
<b>Job Opportunities</b>	<p>All over the world there is a high demand in the Welding industry for Welders in various fields Such as: fabricators, pipe welders, multi-welders, constructors. With the help of this course, we will be able to give technical trainings of Advance welding to our youth. There are also opportunities for</p>

	<p>start-up entrepreneurship due to the high demand in the market in following designated jobs;</p> <ul style="list-style-type: none"> <li>• Fitters</li> <li>• Fabricators</li> <li>• Argon welders</li> <li>• CO2 Welders</li> <li>• Multi welders</li> <li>• Structural Contractors</li> <li>• Welding supervisors</li> <li>• Welding inspectors with additional quality inspection training.</li> </ul>
<b>No of Students</b>	25
<b>Learning Place</b>	Classroom / Lab
<b>Instructional Resources</b>	<ol style="list-style-type: none"> <li>1. Modern Welding by Althose Turnquist Bowditch South Holland, Illions The Good Heart-Will Cox (Company) INC</li> <li>2. ARC WELDING (Basic Fundamentals) by JOHN R.WALKER South Holland, Illions The Good Heart-Will Cox (Company) INC</li> <li>3. OXYACETYLENE WELDING (Basic Fundamentals) by RONALD J.BAIRD South Holland, Illions The Good Heart-Will Cox (Company) INC</li> <li>4. MODERN WELDING Althose Turnquist Bowditch South Holland, Illions The Good Heart-Will Cox (Company) INC</li> <li>5. OXYACETYLENE HAND BOOK by LINDE, Linde Company</li> <li>6. WELDING SKILLS by JOSEPH W.GIACHINO Pub. American Technical Publisher</li> <li>7. GAS WELDING AND CUTTING YENSEXER Mosco – Pease Publisher</li> <li>8. Pocket Welding Guide by Hobart Institute of Welding Technology</li> <li>9. Welding Skills by Joseph W.Giachino American Technical Publisher</li> </ol>

## MODULES

Scheduled Weeks	Module Title	Learning Units	Remarks
Week 1	Understand the basic Engineering practice and Introduction	<ul style="list-style-type: none"> <li>• <b>Motivational Lecture</b> (<i>For further detail please see Page No: 3&amp; 4</i>)</li> <li>• <b>Job market</b></li> <li>• <b>Course Applications</b></li> <li>• <b>Institute/work ethics</b></li> <li>• Describe basic welding processes and the welding trade.</li> <li>• Identify and describe personal protective equipment (PPE) related to the welding trade.               <ul style="list-style-type: none"> <li>▪ Identify and describe body, foot, and hand protective gear.</li> <li>▪ Identify and describe ear, eye, face, and head protective gear.</li> </ul> </li> <li>• Identify and describe welding safety practices related to specific hazards or environments.               <ul style="list-style-type: none"> <li>▪ Describe the importance of welding safety and identify factors related to accidents.</li> <li>▪ Describe basic welding safety practices related to the general work area.</li> <li>▪ Describe hot work permits and fire watch requirements.</li> <li>▪ Describe confined spaces and their related safety practices.</li> <li>▪ Identify safety practices related to welding equipment.</li> <li>▪ Identify and describe respiratory hazards, respiratory safety equipment, and ways to ventilate welding work areas.</li> </ul> </li> </ul>	<p style="text-align: center;"><b>Home Assignment</b></p> <ul style="list-style-type: none"> <li>• <b>Task 1</b></li> <li>• <b>Task 2</b></li> <li>• <b>Task 3</b></li> </ul> <p style="text-align: center;"><i><u>Details may be seen at Annexure-I</u></i></p>
Week 2	Apply Oxyfuel Cutting skills	<ul style="list-style-type: none"> <li>• <b>Success stories</b> (<i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>• Oxyfuel cutting and identify related safe work practices.               <ul style="list-style-type: none"> <li>▪ Describe basic oxyfuel cutting.</li> <li>▪ Identify safe work practices related to oxyfuel cutting.</li> </ul> </li> <li>• Identify and describe oxyfuel cutting equipment and consumables.               <ul style="list-style-type: none"> <li>▪ Identify and describe various gases and cylinders used for oxyfuel</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Task 4</b></li> </ul> <p style="text-align: center;"><i><u>Details may be seen at Annexure-I</u></i></p>

		<p>cutting.</p> <ul style="list-style-type: none"> <li>▪ Identify and describe hoses and various types of regulators.</li> <li>▪ Identify and describe cutting torches and tips.</li> <li>▪ Identify and describe other miscellaneous oxyfuel cutting accessories.</li> <li>▪ Identify and describe specialized cutting equipment.</li> </ul> <ul style="list-style-type: none"> <li>• Explain how to setup, light, and shut down oxyfuel equipment. <ul style="list-style-type: none"> <li>▪ Explain how to properly prepare a torch set for operation.</li> <li>▪ Explain how to leak test oxyfuel equipment.</li> <li>▪ Explain how to light the torch and adjust for the proper flame.</li> <li>▪ Explain how to properly shut down oxyfuel cutting equipment.</li> </ul> </li> <li>• Explain how to perform various oxyfuel cutting procedures. <ul style="list-style-type: none"> <li>▪ Identify the appearance of both good and inferior cuts and their causes.</li> <li>▪ Explain how to cut both thick and thin steel.</li> <li>▪ Explain how to bevel, wash, and gouge.</li> <li>▪ Explain how to make straight and bevel cuts with portable oxyfuel cutting machines.</li> </ul> </li> </ul>	
<p><b>Week 3</b></p>	<p><b>Apply Plasma Arc Cutting skills</b></p>	<ul style="list-style-type: none"> <li>• <b>Motivational Lecture</b>( <i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>• Plasma arc cutting processes and identify related safety precautions. <ul style="list-style-type: none"> <li>▪ Describe the plasma arc cutting processes.</li> <li>▪ Identify safety practices related to plasma arc cutting.</li> </ul> </li> <li>• Identify and describe plasma arc cutting equipment. <ul style="list-style-type: none"> <li>▪ Identify and describe plasma arc power units.</li> <li>▪ Identify and describe plasma arc torches and accessories.</li> <li>▪ Identify and describe plasma arc cutting gases and gas control devices.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Task 5</b></li> </ul> <p><i><u>Details may be seen at Annexure-I</u></i></p> <ul style="list-style-type: none"> <li>• <b>Monthly Test 1</b></li> </ul>

		<ul style="list-style-type: none"> <li>Describe how to set up, safely operate, and care for plasma arc cutting equipment. <ul style="list-style-type: none"> <li>Describe how to set up plasma arc cutting equipment and the adjacent work area.</li> <li>Describe how to safely operate plasma arc cutting equipment.</li> <li>Describe how to care for plasma arc cutting equipment.</li> </ul> </li> </ul>	
Week 4	<b>Air-Carbon Cutting and Gouging</b>	<ul style="list-style-type: none"> <li><b>Success stories</b> ( <i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to learn:</p> <ul style="list-style-type: none"> <li>Air-carbon arc cutting and identify the related equipment and consumables. <ul style="list-style-type: none"> <li>Define air-carbon arc cutting.</li> <li>Identify and describe air-carbon arc cutting equipment.</li> <li>Identify and describe various types of electrodes.</li> <li>Identify safety practices related to air-carbon arc cutting.</li> </ul> </li> <li>Describe how to set up, safely operate, and care for air-carbon arc cutting equipment. <ul style="list-style-type: none"> <li>Describe how to prepare the equipment and work area for air-carbon arc cutting.</li> <li>Describe how to wash and gouge metals.</li> <li>Describe how to care for air-carbon arc cutting equipment.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li><b>Task 6</b></li> </ul> <p><u>Details may be seen at Annexure-I</u></p>
Week 5	<b>Preparation of Base Metal</b>	<ul style="list-style-type: none"> <li><b>Motivational Lecture</b>( <i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>Safety practices related to preparing base metals and describe basic cleaning procedures. <ul style="list-style-type: none"> <li>Identify safety practices related to preparing base metals.</li> <li>Describe the basic properties and types of carbon and stainless steel.</li> <li>Describe basic metal cleaning procedures and concerns.</li> </ul> </li> <li>Identify and describe basic weld joint design and types of welds. <ul style="list-style-type: none"> <li>Identify and describe the loads that are routinely placed on weld joints.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li><b>Task 7</b></li> </ul> <p><u>Details may be seen at Annexure-I</u></p>

		<ul style="list-style-type: none"> <li>▪ Identify and describe the various types of weld joints.</li> <li>▪ Describe a welding procedure specification (WPS) and the information it provides.</li> <li>• Describe how to prepare joints for welding. <ul style="list-style-type: none"> <li>▪ Describe how to mechanically prepare joints for welding.</li> <li>▪ Describe how to thermally prepare joints for welding</li> </ul> </li> </ul>	
<p><b>Week 6</b></p>	<p><b>Quality of Welds using Non-Destructive Testing</b></p>	<ul style="list-style-type: none"> <li>• <b>Success stories</b> ( <i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>• The various code organizations that apply to welding and their basic elements. <ul style="list-style-type: none"> <li>▪ Identify the various welding code organizations and their sponsoring organizations.</li> <li>▪ Identify and describe the basic provisions of welding codes.</li> </ul> </li> <li>• Identify and describe weld discontinuities and their causes. <ul style="list-style-type: none"> <li>▪ Identify and describe discontinuities related to porosity and inclusions.</li> <li>▪ Identify and describe discontinuities that result in cracking.</li> <li>▪ Identify and describe discontinuities related to joint penetration, fusion, and undercutting.</li> <li>▪ Identify and describe acceptable and unacceptable weld profiles.</li> </ul> </li> <li>• Describe various non-destructive and destructive weld examination practices. <ul style="list-style-type: none"> <li>▪ Describe basic visual inspection methods including measuring devices and liquid penetrants.</li> <li>▪ Describe magnetic particle and electromagnetic inspection processes.</li> <li>▪ Describe the radiographic and ultrasonic inspection processes.</li> <li>▪ Describe destructive testing processes.</li> </ul> </li> <li>• Weld quality inspection, common welding mistakes and appearance of</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Task 8</b></li> </ul> <p><u><i>Details may be seen at Annexure-I</i></u></p>

		<p>good and defective welds.</p> <ul style="list-style-type: none"> <li>• Weld gauges &amp; its uses.</li> <li>• Types of Inspection methods.</li> <li>• Classification of destructive and NDT methods.</li> <li>• Welding codes and standards</li> <li>• Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR).</li> <li>• Describe the welder performance testing process. <ul style="list-style-type: none"> <li>▪ Describe the qualification of welders by position.</li> <li>▪ Describe welder qualification testing to meet American Welding Society (AWS) and American Society of Mechanical Engineers (ASME) requirements.</li> <li>▪ Describe the process for completing a weld test.</li> </ul> </li> </ul>	
<p><b>Week 7</b></p>	<p><b>Shielded Metal Arc Welding (SMAW) Equipment and Setup</b></p>	<ul style="list-style-type: none"> <li>• <b>Motivational Lecture</b>( <i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>• SMAW-related safety practices and explain how electrical characteristics apply to SMAW. <ul style="list-style-type: none"> <li>▪ Define SMAW and identify related safety practices.</li> <li>▪ Explain how various current characteristics apply to SMAW.</li> </ul> </li> <li>• Explain how to set up and start SMAW equipment. <ul style="list-style-type: none"> <li>▪ Explain how to start, stop, and maintain SMAW equipment.</li> </ul> </li> <li>• Describe the SMAW electrode classification system and how to select the proper electrode for the task. <ul style="list-style-type: none"> <li>▪ Describe the AWS filler metal specification system and various electrode characteristics.</li> <li>▪ Describe the characteristics of the four main electrode groups.</li> </ul> </li> <li>• Explain how to select electrodes and describe their proper care and handling. <ul style="list-style-type: none"> <li>▪ Identify various considerations in the selection of the proper electrode.</li> <li>▪ Describe the proper handling and storage of electrodes.</li> </ul> </li> <li>• Explain how to prepare for SMAW</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Task 9</b></li> </ul> <p><u><i>Details may be seen at Annexure-I</i></u></p>

		<p>welding and how to strike an arc.</p> <ul style="list-style-type: none"> <li>▪ Identify safety practices related to SMAW.</li> <li>▪ Explain how to prepare the area and equipment for welding.</li> <li>▪ Explain how to strike an arc and respond to arc blow.</li> </ul> <ul style="list-style-type: none"> <li>• Explain how to successfully complete various types of beads and welds. <ul style="list-style-type: none"> <li>▪ Explain how to properly restart and terminate a weld pass.</li> <li>▪ Describe the technique required to produce stringer beads.</li> <li>▪ Describe the technique required to produce weave and overlapping beads.</li> <li>▪ Describe the techniques required to produce fillet welds in various positions.</li> </ul> </li> </ul>	
<p><b>Week 8</b></p>	<p><b>Groove Welds with Shielded Metal Arc Welding (SMAW)</b></p>	<ul style="list-style-type: none"> <li>• <b>Success stories</b> ( <i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>• Groove Welds with Backing</li> <li>• Various types of groove welds and describe how to prepare for groove welding. <ul style="list-style-type: none"> <li>▪ Identify various types of groove welds and define related terms.</li> <li>▪ Describe how to prepare for groove welding.</li> </ul> </li> <li>• Describe the technique required to produce various groove welds. <ul style="list-style-type: none"> <li>▪ Describe the technique required to produce groove welds in the 1G and 2G positions.</li> <li>▪ Describe the technique required to produce groove welds in the 3G and 4G positions.</li> </ul> </li> <li>• Open-Root Groove Welds – Plate</li> <li>• Describe the technique required to produce various open V-groove welds. <ul style="list-style-type: none"> <li>▪ Describe the technique required to produce open V-groove welds in the 1G and 2G positions.</li> <li>▪ Describe the technique required to produce open V-groove welds in the 3G and 4G welds.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Task 10</b></li> <li>• <b>Task 11</b></li> </ul> <p><i><u>Details may be seen at Annexure-I</u></i></p>

<p><b>Week 9</b></p>	<p><b>Interpret Welding Symbols</b></p>	<ul style="list-style-type: none"> <li>• <b>Motivational Lecture</b>( <i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>• Welding symbols and their structure. <ul style="list-style-type: none"> <li>▪ Describe the structure and placement of welding symbols and identify basic symbols.</li> <li>▪ Identify and interpret size and dimension markings for common types of welds.</li> <li>▪ Identify and interpret various supplemental symbols.</li> <li>▪ Identify and interpret less common welding symbols.</li> </ul> </li> <li>• Describe welding detail drawings and identify basic drawing elements and features. <ul style="list-style-type: none"> <li>▪ Describe the object views used to depict welding details.</li> <li>▪ Identify basic drawing elements related to welding detail drawings.</li> </ul> </li> <li>• Identify and explain how to interpret dimensional information, notes, and a bill of materials. <ul style="list-style-type: none"> <li>▪ Identify and explain how to interpret dimensional information.</li> <li>▪ Identify and explain how to interpret notes and bill of materials.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Task 12</b></li> <li>• <b>Task 13</b></li> </ul> <p><u><i>Details may be seen at Annexure-I</i></u></p>
<p><b>Week 10</b></p>	<p><b>Physical Characteristics and Mechanical Properties of Metal</b></p>	<ul style="list-style-type: none"> <li>• <b>Success stories</b> ( <i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>• The composition and classification systems for a variety of metals. <ul style="list-style-type: none"> <li>▪ Describe the composition and classification system for ferrous metals.</li> <li>▪ Describe the composition and classification system for low-alloy steel.</li> <li>▪ Describe the composition and classification system for common-grade stainless steel.</li> <li>▪ Describe the composition and classification system for specialty-grade stainless steel.</li> <li>▪ Describe the composition and classification system for nonferrous metals.</li> </ul> </li> <li>• Describe the physical and mechanical</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Task 14</b></li> </ul> <p><u><i>Details may be seen at Annexure-I</i></u></p>

		<p>characteristics of metals and explain how to identify base metals.</p> <ul style="list-style-type: none"> <li>▪ Describe the physical characteristics of different metals.</li> <li>▪ Describe the mechanical properties of different metals.</li> <li>▪ Explain how to identify base metals in field conditions.</li> <li>▪ Describe metallurgy-related considerations for welding.</li> </ul> <ul style="list-style-type: none"> <li>• Identify the common structural shapes of metal. <ul style="list-style-type: none"> <li>▪ Identify the most common structural steel shapes.</li> <li>▪ Identify different structural beam shapes.</li> <li>▪ Identify pipe and tubing types.</li> <li>▪ Identify other common metal forms, including rebar.</li> </ul> </li> <li>• Describe the relationship between heat and metal and identify preheating methods. <ul style="list-style-type: none"> <li>▪ Describe the relationship between heat and metal.</li> <li>▪ Identify and describe methods used to preheat metal prior to welding.</li> <li>▪ Identify and describe devices and products used to measure temperature.</li> <li>▪ Describe interpass temperature control.</li> <li>▪ Describe various post heating processes.</li> </ul> </li> </ul>	
<p><b>Week 11</b></p>	<p><b>Gas Metal and Flux Cored Arc Welding (GMAW/FCAW) Equipment and Filler Metals</b></p>	<ul style="list-style-type: none"> <li>• <b>Motivational Lecture</b> (<i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>• GMAW/FCAW processes and related safety practices. <ul style="list-style-type: none"> <li>▪ Describe basic GMAW/FCAW processes.</li> <li>▪ Identify GMAW/FCAW-related safety practices.</li> <li>▪ Describe the various GMAW metal transfer modes.</li> <li>▪ Describe the FCAW metal transfer process.</li> </ul> </li> <li>• Describe GMAW and FCAW equipment and describe how to prepare for welding.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Task 15</b></li> </ul> <p><u><i>Details may be seen at Annexure-I</i></u></p>

		<ul style="list-style-type: none"> <li>▪ Identify common GMAW/FCAW welding equipment.</li> <li>▪ Describe power source control considerations.</li> <li>▪ Identify and describe welding cables and terminations.</li> <li>▪ Identify and describe external wire feeders and their controls.</li> <li>▪ Identify and describe GMAW and FCAW guns, contact tips, and nozzles.</li> <li>▪ Identify various shielding gases and their related equipment.</li> <li>▪ Explain how to set up welding equipment for GMAW and FCAW welding.</li> <li>• Identify various GMAW and FCAW filler metals. <ul style="list-style-type: none"> <li>▪ Identify various FMAW filler metals.</li> <li>▪ Identify various FCAW filler metals.</li> </ul> </li> </ul>	
<p><b>Week 12</b></p>	<p><b>Gas Metal Arc Welding (GMAW) process</b></p>	<ul style="list-style-type: none"> <li>• <b>Success stories ( For further detail please see Page No: 3&amp; 4)</b></li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>• GMAW-related safety practices and explain how to set up for welding. <ul style="list-style-type: none"> <li>▪ Describe basic GMAW processes.</li> <li>▪ Identify GMAW-related safety practices.</li> <li>▪ Explain how to safely set up the equipment and work area for welding.</li> </ul> </li> <li>• Describe equipment control and welding procedures for GMAW and explain how to produce basic weld beads. <ul style="list-style-type: none"> <li>▪ Describe equipment control and welding techniques related to GMAW.</li> <li>▪ Explain how to produce basic GMAW weld beads.</li> </ul> </li> <li>• Describe the welding procedures needed to produce proper fillet and V-groove welds using GMAW welding techniques. <ul style="list-style-type: none"> <li>▪ Describe the welding procedures needed to produce proper fillet welds using GMAW welding techniques.</li> <li>▪ Describe the welding procedures needed to produce proper V-</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Task 16</b></li> </ul> <p><u>Details may be seen at Annexure-I</u></p>

		groove welds using GMAW welding techniques.	
<b>Week 13</b>	<b>Midterm</b>		
<b>Week 14</b>	<b>Flux Cored Arc Welding (FCAW) process</b>	<ul style="list-style-type: none"> <li>• <b>Success stories</b> ( <i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>• FCAW-related safety practices and explain how to prepare for welding. <ul style="list-style-type: none"> <li>▪ Describe basic FCAW processes.</li> <li>▪ Identify FCAW-related safety practices.</li> <li>▪ Explain how to safely set up the equipment and work area for welding.</li> </ul> </li> <li>• Describe equipment control and welding procedures for FCAW and explain how to produce basic welding beads. <ul style="list-style-type: none"> <li>▪ Describe equipment control and welding techniques related to FCAW.</li> <li>▪ Explain how to produce basic FCAW weld beads.</li> </ul> </li> <li>• Describe the welding procedures needed to produce proper fillet and V-groove welds using FCAW welding techniques. <ul style="list-style-type: none"> <li>▪ Describe the welding procedures needed to produce proper fillet welds using FCAW welding techniques.</li> <li>▪ Describe the welding procedures needed to produce proper V-groove welds using FCAW welding techniques.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Home Assignment</b></li> <li>• <b>Task 17</b></li> </ul> <p><i><u>Details may be seen at Annexure-I</u></i></p>
<b>Week 15</b>	<b>Gas Tungsten Arc Welding (GTAW) Equipment and Filler Metals</b>	<ul style="list-style-type: none"> <li>• <b>Motivational Lecture</b> ( <i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>• GTAW-related safety practices and describe the electrical characteristics that affect GTAW. <ul style="list-style-type: none"> <li>▪ Identify GTAW-related safety practices.</li> <li>▪ Describe the electrical characteristics that affect GTAW.</li> </ul> </li> <li>• Identify and describe GTAW equipment and consumables. <ul style="list-style-type: none"> <li>▪ Identify and describe GTAW</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Task 18</b></li> </ul> <p><i><u>Details may be seen at Annexure-I</u></i></p>

		<ul style="list-style-type: none"> <li>welding machines.</li> <li>▪ Identify and describe GTAW torches.</li> <li>▪ Identify and describe GTAW torch nozzles and electrodes.</li> <li>▪ Identify and describe GTAW shielding gases.</li> <li>▪ Identify and describe GTAW filler metals.</li> <li>• Explain how to set up for GTAW welding. <ul style="list-style-type: none"> <li>▪ Explain how to select and position the welding machine.</li> <li>▪ Explain how to connect and set up the shielding gas flow rate.</li> <li>▪ Explain how to select and prepare the tungsten electrode.</li> <li>▪ Explain how to select and install the nozzle along with the tungsten electrode.</li> </ul> </li> </ul>	
Week 16	<b>Gas Tungsten Arc Welding (GTAW) process</b>	<ul style="list-style-type: none"> <li>• <b>Success stories</b> ( <i>For further detail please see Page No: 3&amp; 4</i>)</li> <li>Students are introduced to:</li> <li>• GTAW-related safety practices and explain how to set up for welding. <ul style="list-style-type: none"> <li>▪ Identify GTAW-related safety practices.</li> <li>▪ Explain how to safely set up the equipment and work area for welding.</li> </ul> </li> <li>• Describe welding techniques for GTAW and explain how to produce basic weld beads. <ul style="list-style-type: none"> <li>▪ Describe welding techniques related to GTAW.</li> <li>▪ Explain how to produce basic GTAW weld beads.</li> </ul> </li> <li>• Describe the welding techniques needed to produce proper fillet and open V-groove welds using GTAW welding techniques. <ul style="list-style-type: none"> <li>▪ Describe the welding techniques needed to produce proper fillet welds using GTAW.</li> </ul> </li> <li>• Describe the welding techniques needed to produce proper open V-groove welds using GTAW.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Task 19</b></li> <li><u><i>Details may be seen at Annexure-I</i></u></li> </ul>
Week 17	<b>Resistance welding (RW) process</b>	<ul style="list-style-type: none"> <li>• <b>Motivational Lecture</b> ( <i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Task 20</b></li> <li><u><i>Details may</i></u></li> </ul>

		<p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>Principles, Process capabilities and limitations, applications, Classifications, welding techniques, power source, Electrode tip selection, surface preparation, welding parameters, developments, defects, causes and remedy</li> </ul>	<i>be seen at Annexure-I</i>
<b>Week 18</b>	<b>Special Welding and Cutting Processes</b>	<ul style="list-style-type: none"> <li><b>Success stories</b> (<i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to: Principles&amp; applications of</p> <ul style="list-style-type: none"> <li>Friction welding</li> <li>Friction stir welding</li> <li>Electro gas welding</li> <li>Electro slag welding</li> <li>Narrow gap welding</li> <li>Laser welding</li> <li>Ultrasonic welding</li> <li>Under water welding</li> <li>Electron beam welding</li> <li>Laser cutting</li> </ul>	<ul style="list-style-type: none"> <li><b>Task 21</b></li> <li><b>Task 22</b></li> <li><b>Task 23</b></li> </ul> <p><i>Details may be seen at Annexure-I</i></p> <ul style="list-style-type: none"> <li><b>Monthly Test 5</b></li> </ul>
<b>Week 19</b>	<b>Demonstrate welding joints using Welding Robotics</b>	<ul style="list-style-type: none"> <li><b>Motivational Lecture</b> (<i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>The concept and types of welding mechanization &amp; automation.</li> <li>Major categorization of mechanization: <ul style="list-style-type: none"> <li>Partially mechanized welding,</li> <li>Fully mechanized welding and Automatic welding.</li> </ul> </li> <li>Moving head system, Moving work systems, Industrial welding robots: Anatomy, Programming and operation.</li> <li>Orbital welding</li> </ul>	<ul style="list-style-type: none"> <li><b>Task 24</b></li> </ul> <p><i>Details may be seen at Annexure-I</i></p>
<b>Week 20</b>	<b>Testing of Materials and Heat Treatment</b>	<ul style="list-style-type: none"> <li><b>Success stories</b> (<i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>Metals &amp; alloys, Classification of steels, alloying elements</li> <li>Hardness test: Brinell hardness test, Vickers hardness test, Rockwell hardness test.</li> <li>Heat treatment methods,-Annealing, Normalizing, Hardening &amp; tempering and surface hardening methods.</li> </ul>	<ul style="list-style-type: none"> <li><b>Task 25</b></li> </ul> <p><i>Details may be seen at Annexure-I</i></p>

		<p>Stress relieving</p> <ul style="list-style-type: none"> <li>• Temperature measurements.</li> <li>• Mechanical Testing of Metals: Tensile test, Bend test, Weld tensile test: All weld metal test, Transverse weld test, Longitudinal butt weld test</li> <li>• Impact test,</li> <li>• Metallographic examination: Macro examination, Micro examination.</li> <li>• Pressure testing</li> <li>• Ferrite testing</li> <li>• Positive metal identification (PMI)</li> </ul>	
<b>Week 21</b>	<p><b>Employable Project/ Assignment (6 weeks)</b> i.e. 21-26 besides regular classes. <b>OR</b> <b>On the job training ( 2 weeks)</b></p>	<ul style="list-style-type: none"> <li>• Guidelines to the Trainees for selection of students employable project like final year project (FYP)</li> <li>• Assign Independent project to each Trainee</li> <li>• A project-based on trainee's aptitude and acquired skills.</li> <li>• Designed by keeping in view the emerging trends in the local market as well as across the globe.</li> <li>• The project idea may be based on Entrepreneur.</li> <li>• Leading to successful employment.</li> <li>• The duration of the project will be 6 weeks</li> <li>• Final viva/assessment will be conducted on project assignments.</li> <li>• At the end of the session, the project will be presented in a skills competition</li> <li>• The skill competition will be conducted on zonal, regional, and National levels.</li> <li>• The project will be presented in front of Industrialists for commercialization</li> <li>• The best business idea will be placed in the NAVTTC business incubation center for commercialization.</li> </ul> <p style="text-align: center;"><b>OR</b></p> <p><b>On the job training for 2 weeks:</b></p> <ul style="list-style-type: none"> <li>• Aims to provide 2 weeks of industrial training to the Trainees as part of the overall training program</li> <li>• Ideal for the manufacturing trades</li> <li>• As an alternative to the projects that involve expensive equipment</li> <li>• Focuses on increasing Trainee's motivation, productivity, efficiency, and quick learning approach.</li> </ul>	<b>Monthly Test 6</b>
<b>Week 22</b>	<b>Capstone Project</b>	Students are provided with details	

		<p>regarding a capstone project that they are required to complete to showcase their learning. The project should ideally consist of the following deliverables:</p> <ol style="list-style-type: none"> <li>1. Design brief/description outlining their project</li> <li>2. Research collected during the project</li> <li>3. Rough sketches, either hand-drawn or digitally created that showcase their design process</li> <li>4. Professionally presented a main body of artwork at the end of the course</li> </ol> <p>Notes for the Trainer/Teacher:</p> <ul style="list-style-type: none"> <li>• Each student must receive a separate/independent project based on their strengths and interests. This will reinforce their motivation and determine their aptitude towards specific design fields.</li> <li>• Each project should be designed keeping future design trends as well as current market demands in mind</li> <li>• The duration for the completion of the project is 4 weeks</li> </ul> <p>It's important to reiterate the value of these projects as each student will later be able to showcase their creative effort in the real world market, giving them leverage over others for better employment.</p> <p>Ideas for projects may be generated via different sites such as:  <a href="https://1000projects.org/">https://1000projects.org/</a>  <a href="https://www.freestudentprojects.com/">https://www.freestudentprojects.com/</a></p>	
<p><b>Week 23</b></p>	<p><b>Introduction to Freelancing</b></p>	<ul style="list-style-type: none"> <li>• <b>Motivational Lecture</b> (<i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>• the concept of freelancing</li> <li>• how to become freelance and create a sustainable income</li> <li>• pros and cons of freelancing</li> <li>• the ethical and professional way of becoming a productive freelancer</li> <li>• resources available for freelancing in the field of design</li> <li>• how to join freelancing sites</li> <li>• the process of creating a freelancing</li> </ul>	

		profile	
<b>Week 24</b>	<b>Professional practice methods &amp; legal side of design</b>	<ul style="list-style-type: none"> <li>• <b>Success stories</b> ( <i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>• the standards that define the expectations of a professional welder</li> <li>• the principles of integrity that demonstrate respect for the profession, for colleagues, for clients, for audiences or consumers, and society as a whole</li> <li>• the perspectives of the welding profession i.e. understanding the profession, the meanings of environmental responsibility, copyright, and ethics</li> <li>• what legalities are involved in professional welding projects</li> <li>• how to build strong professional proposals</li> <li>• copyrights, copyright infringement, plagiarism, crediting creators, purchasing online products, downloading 'free' content</li> <li>• the do's and don'ts of how to price their time, effort, and creativity</li> </ul>	
<b>Week 25</b>	<b>Preparing your portfolio</b>	<ul style="list-style-type: none"> <li>• <b>Motivational Lecture</b>( <i>For further detail please see Page No: 3&amp; 4</i>)</li> </ul> <p>Students are introduced to:</p> <ul style="list-style-type: none"> <li>• the concept of design portfolios</li> <li>• the concept of present design work/projects in a professional manner</li> <li>• websites that provide free portfolio hosting such as Behance and Dribbble</li> <li>• creating a portfolio</li> <li>• how to select work for presenting in your portfolio</li> </ul>	<b>Final Assessment</b>
<b>Week 26</b>	<b>Entrepreneurship and Final Assessment in project</b>	<ul style="list-style-type: none"> <li>• <b>Success stories</b> ( <i>For further detail please see Page No: 3&amp; 4</i>)</li> <li>• Job Market Searching</li> <li>• Self-employment</li> <li>• Introduction</li> <li>• Fundamentals of Business Development</li> <li>• Entrepreneurship</li> <li>• Startup Funding</li> <li>• Business Incubation and Acceleration</li> <li>• Business Value Statement</li> <li>• Business Model Canvas</li> </ul>	

		<ul style="list-style-type: none"><li>• Sales and Marketing Strategies</li><li>• How to Reach Customers and Engage</li><li>• Stakeholders Power Grid</li><li>• RACI Model, SWOT Analysis, PEST Analysis</li><li>• SMART Objectives</li><li>• OKRs</li><li>• Cost Management (OPEX, CAPEX, ROCE, etc.)</li><li>• Final Assessment</li></ul>	
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## Tasks For Certificate in Advanced Welding

Task No.	Task	Description	Week
1.	Find the career path	<ul style="list-style-type: none"> <li>Prepare a career path related to your course and also highlight the emerging trends in the local as well as international market</li> </ul>	Week 1
2.	Work Ethics	<ul style="list-style-type: none"> <li>Generate a report on Institute work ethics and professionalism related to your course</li> </ul>	
3.	Identify hazards in workshop	<ul style="list-style-type: none"> <li>Prepare a report of at least 10 safety practices and welding workshop related hazards</li> </ul>	
4.	Prepare Oxyfuel Equipment for cutting	<ul style="list-style-type: none"> <li>Set up oxyfuel cutting equipment.</li> <li>Light and adjust an oxyfuel torch.</li> <li>Shut down oxyfuel cutting equipment.</li> <li>Disassemble oxyfuel cutting equipment.</li> <li>Change empty gas cylinders.</li> <li>Marking and straight line cutting of MS plate 10 mm thick by gas cutting.</li> <li>Beveling of MS plates 10 mm thick by gas cutting.</li> <li>Various profile shape cutting like a Square, triangle, hexagon etc.</li> </ul>	Week-2
5.	Perform cutting operation with Plasma Arc Equipment	<ul style="list-style-type: none"> <li>Set up plasma arc cutting equipment.</li> <li>Set the amperage and gas pressures or flow rates for the type and thickness of metal to be cut using plasma arc equipment.</li> <li>Square-cut metal using plasma arc equipment.</li> <li>Bevel-cut metal using plasma arc equipment.</li> <li>Pierce and cut slots in metal using plasma arc equipment.</li> <li>Dismantle and store the equipment.</li> </ul>	Week 3
6.	Carry out Air-Carbon cutting and gouging	<ul style="list-style-type: none"> <li>Select and install air-carbon arc cutting electrodes.</li> <li>Prepare the work area and air-carbon arc cutting equipment for safe operation.</li> <li>Use air-carbon arc cutting equipment for washing.</li> <li>Use air-carbon arc cutting equipment for gouging.</li> <li>Perform storage and housekeeping activities for air-carbon arc cutting equipment.</li> </ul>	Week 4
7.	Prepare Base Metal	<ul style="list-style-type: none"> <li>Mechanically or hand-grind a bevel on the edge of a ¼" to ¾" thick mild steel plate (6 to 20 mm metric plate) at 22 ½ degrees.</li> <li>Thermally bevel the edge of a ¼"- to ¾"-thick</li> </ul>	Week 5

		mild steel plate (6 to 20 mm metric plate) at 22 ½ degrees.	
8.	<b>Carry out Inspection of Weld Quality</b>	<ul style="list-style-type: none"> <li>• Perform a visual inspection (VT) on a fillet and/or groove weld and complete an inspection report.</li> <li>• Inspection of welds by using weld gauges.</li> <li>• Plan &amp; Perform Dye penetrant test on the given specimen using Red dye.</li> <li>• Plan &amp; Perform Magnetic Particle test on the given specimen using permanent magnet.</li> <li>• Plan Ultrasonic Test using normal probe for detecting the defects in the given sample and perform.</li> </ul>	<b>Week 6</b>
9.	<b>Perform welding operation with SMAW welding equipment</b>	<ul style="list-style-type: none"> <li>• Set up welding equipment.</li> <li>• Strike an arc.</li> <li>• Make stringer, weave, and overlapping beads using E6010 and E7018 electrodes.</li> <li>• Make corner welds on an angle iron section end welded to a plate coupon.</li> <li>• Make fillet welds using E6010 and E7018 electrodes in the specific positions: Flat (1F), Horizontal (2F), Vertical (3F), Overhead (4F)</li> </ul>	<b>Week 7</b>
10.	<b>Use SMAW to make Groove Welds with Backing</b>	<ul style="list-style-type: none"> <li>• Safely set up arc welding equipment for making groove welds.</li> <li>• Make flat welds with backing on V-groove joints using E7018 electrodes.</li> <li>• Make horizontal welds with backing on V-groove joints using E7018 electrodes.</li> <li>• Make vertical welds with backing on V-groove joints using E7018 electrodes.</li> <li>• Make overhead welds with backing on V-groove joints using E7018 electrodes.</li> </ul>	<b>Week 8</b>
11.	<b>Carry out Open-Root Groove Welds with SMAW</b>	<ul style="list-style-type: none"> <li>• Make open V-groove welds with E6010 and E7018 electrodes in the following positions: Flat (1G) position, Horizontal (2G) position, Vertical (3G) position, Overhead (4G) position.</li> </ul>	
12.	<b>Interpret welding symbols</b>	<ul style="list-style-type: none"> <li>• Identify welding symbols on an instructor-provided drawing.</li> </ul>	<b>Week 9</b>
13.	<b>Sketch welding drawing</b>	<ul style="list-style-type: none"> <li>• Draw a welding drawing based on an instructor-provided image or object.</li> </ul>	
14.	<b>Pre heat base metal</b>	<ul style="list-style-type: none"> <li>• Preheat base metal to 350F (177C) and verify preheat using a temperature-indicating device.</li> </ul>	<b>Week 10</b>
15.	<b>Perform welding operation with GMAW/FCAW welding equipment</b>	<ul style="list-style-type: none"> <li>• Setting up of GMAW/FCAW welding machine &amp; accessories and striking an arc for both processes.</li> <li>• Depositing straight line beads on M.S Plate by GMAW &amp; FCAW.</li> </ul>	<b>Week 11</b>

		<ul style="list-style-type: none"> <li>Fillet weld – “T” joint on MS plate 10mm thick in flat position by GMAW (Dip transfer) &amp; FCAW.</li> <li>Fillet weld – “T” joint on M.S. sheet 3mm thick in flat position by GMAW (Dip transfer) &amp; FCAW.</li> </ul>	
16.	<b>Make multiple welds using GMAW</b>	<ul style="list-style-type: none"> <li>Fillet weld – “T” joint on MS plate 10mm thick in Horizontal position by Dip transfer.</li> <li>Fillet weld – “T” joint on MS sheet 3mm thick in Horizontal position by Dip transfer.</li> <li>Fillet weld – “T” joint on MS plate 10mm thick in vertical position by Dip transfer.</li> <li>Fillet weld – corner joint on MS sheet 3mm thick in vertical position by Dip transfer.</li> <li>Fillet weld – “T” joint on MS sheet 3mm thick in overhead position by Dip transfer.</li> </ul>	<b>Week 12</b>
17.	<b>Make multiple welds using FCAW</b>	<ul style="list-style-type: none"> <li>Make multiple-pass FCAW-G/GM (gas-shielded) and/or FCAW-S (self-shielded) fillet welds on carbon steel plate coupons in all four 1F through 4F positions.</li> <li>Make multiple-pass FCAW-G/GM (gas-shielded) and/or FCAW-S (self-shielded) V-groove welds on carbon steel plate coupons in all four 1G through 4G positions, with or without backing.</li> </ul>	<b>Week 14</b>
18.	<b>Set up GTAW welding equipment</b>	<ul style="list-style-type: none"> <li>Select a GTAW shielding gas.</li> <li>Select a GTAW filler metal.</li> <li>Connect the shielding gas and set the flow rate.</li> <li>Select and prepare the tungsten electrode.</li> <li>Break down and reassemble a GTAW torch</li> </ul>	<b>Week 15</b>
19.	<b>Carry out multiple welds using GTAW</b>	<ul style="list-style-type: none"> <li>Depositing bead on Aluminium /SS sheet 2 mm thick in flat position.</li> <li>Square butt joint on Aluminium /SS sheet 1.6mm thick in flat position.</li> <li>Fillet weld – “T” joint on Aluminium/SS sheet 1.6 mm thick in flat position.</li> <li>Depositing bead on SS sheet 2 mm thick in flat position.</li> <li>Perform multiple-pass fillet welds on carbon steel plate coupons in all four 1F through 4F positions, using GTAW equipment and carbon steel filler metal.</li> <li>Perform multiple-pass open V-groove welds on carbon steel plate coupons in all four 1G through 4G positions, using GTAW equipment and carbon steel filler metal.</li> </ul>	<b>Week 16</b>
20.	<b>Apply skills on Resistance Welding Process (Spot &amp;</b>	<ul style="list-style-type: none"> <li>Perform Spot welding of 1, 1.5, 2 mm thick M.S. Sheet by varying the parameters respectively.</li> <li>Set seam welding parameters for 0.5mm M.S</li> </ul>	<b>Week 17</b>

	Seam)	<p>sheet seam welding.</p> <ul style="list-style-type: none"> <li>• Operate Stud welding gun to weld studs.</li> <li>• Operate Flash butt welding to weld metals.</li> </ul>	
21.	<b>Demonstrate Friction welding to do weld joints</b>	<p><b>Friction Welding</b></p> <ul style="list-style-type: none"> <li>• Prepare samples for Friction welding.</li> <li>• Set the welding parameter for Friction welding.</li> <li>• Operate Friction welding machine.</li> <li>• Inspect the weld for defects.</li> </ul>	<b>Week 18</b>
22.	<b>Demonstrate Ultrasonic welding to do weld joints</b>	<ul style="list-style-type: none"> <li>• Prepare samples for Ultrasonic welding.</li> <li>• Set the welding parameter for Ultrasonic welding.</li> <li>• Operate Ultrasonic welding machine.</li> <li>• Inspect the weld for defects.</li> </ul>	
23.	<b>Cut &amp; check metals using laser cutting system.</b>	<p><b>Laser Cutting</b></p> <ul style="list-style-type: none"> <li>• Set samples for Laser cutting.</li> <li>• Set the parameter for Laser cutting.</li> <li>• Operate Laser cutting machine.</li> <li>• Inspect the weld surface.</li> </ul>	
24.	<b>Apply Skills on Robot Welding</b>	<ul style="list-style-type: none"> <li>• Check of Robot cell components and axis.</li> <li>• Move robot in World coordinate system.</li> <li>• Move robot in axis coordinate system.</li> <li>• Perform Robot program to move in linear path.</li> <li>• Perform Robot program to move in circular path.</li> <li>• Create point to point program.</li> <li>• Cut M.S. Plate to required size as per drawing.</li> <li>• Clean the edges.</li> <li>• Fit on the welding manipulator.</li> <li>• Set welding parameters and Gas flow rates.</li> <li>• Execute Robot welding program.</li> </ul>	<b>Week 19</b>
25.	<b>Perform Hardness Test</b>	<ul style="list-style-type: none"> <li>• Measure the Rockwell hardness, Brinell, Vickers and Micro hardness on heat treated components.</li> </ul>	<b>Week 20</b>
26.	<b>Carryout Heat Treatment of Metals</b>	<ul style="list-style-type: none"> <li>• Perform annealing, normalizing, tempering, hardening, stress relieving and surface hardening processes.</li> <li>• Demonstrate pre heating and post heat treatment on welds.</li> </ul>	
27.	<b>Perform Mechanical Testing of Metals</b>	<ul style="list-style-type: none"> <li>• Operate Universal Testing Machine to measure stress, strain, elongation, modulus of given metals &amp; Carry out bend tests on UTM.</li> <li>• Plan &amp; measure the impact energy of given material by impact testing.</li> </ul>	
28.	<b>Build your CV</b>	<p>Download professional CV template from any good site (<a href="https://www.coolfreecv.com">https://www.coolfreecv.com</a> or relevant)</p> <ul style="list-style-type: none"> <li>• Add Personal Information</li> <li>• Add Educational details</li> <li>• Add Experience/Portfolio</li> </ul>	<b>Week 21-26</b>

		<ul style="list-style-type: none"> <li>• Add contact details/profile links</li> </ul>	
29.	<b>Create an account profile on Fiverr (at least two gigs) and Up-work</b>	<p>Create an account by following these steps:</p> <p><b>Step 1:</b> Personal Info</p> <p><b>Step 2:</b> Professional Info</p> <p><b>Step 3:</b> Linked Accounts</p> <p><b>Step 4:</b> Account Security</p>	<b>Week 21-26</b>
30.	<b>How to search and apply for jobs in at least two labor marketplace countries (KSA, UAE, etc.)</b>	<ul style="list-style-type: none"> <li>• Browse the following website and create an account on each website <ul style="list-style-type: none"> <li>▪ Bayt.com – The Middle East Leading Job Site</li> <li>▪ Monster Gulf – The International Job Portal</li> <li>▪ Gulf Talent – Jobs in Dubai and the Middle East</li> </ul> </li> <li>• Find the handy ‘search’ option at the top of your homepage to search for the jobs that best suit your skills.</li> <li>• Select the job type from the first ‘Job Type’ drop-down menu, next, select the location from the second drop-down menu.</li> <li>• Enter any keywords you want to use to find suitable job vacancies.</li> <li>• 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.</li> <li>• Search for jobs by: <ul style="list-style-type: none"> <li>▪ Company</li> <li>▪ Category</li> <li>▪ Location</li> <li>▪ All jobs</li> <li>▪ Agency</li> <li>▪ Industry</li> </ul> </li> </ul>	<b>Week 21-26</b>

## **Advanced Welding**

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**What is freelancing and how you can make money online - BBCURDU**

**<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](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=tIQ0CWgszl0>**

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

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

**How To Propel Your Career- Women in Welding**

**[https://www.youtube.com/watch?v=S\\_LuVnW-UdQ](https://www.youtube.com/watch?v=S_LuVnW-UdQ)**

**Underwater Welder | I AM WOMAN | Lifetime**

**<https://www.youtube.com/watch?v=LZiIXOkE-rc>**

## 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"> <li>To introduce the communication skills and how it will work</li> <li>Get to know mentor and team - build rapport and develop a strong sense of a team</li> <li>Provide an introduction to communication skills</li> <li>Team to collaborate on an activity sheet developing their communication, teamwork, and problem-solving</li> <li>Gain an understanding of participants' own communication skills rating at the start of the program</li> </ul>

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			
<b>Key learning outcomes:</b>	<b>Resources:</b>		<b>Enterprise skills developed:</b>
<ul style="list-style-type: none"> <li>Understand the</li> </ul>	<ul style="list-style-type: none"> <li>Podium</li> </ul>		<ul style="list-style-type: none"> <li>Communication</li> </ul>

<p>communication skills and how it works.</p> <ul style="list-style-type: none"> <li>• Understand what communication skills mean</li> <li>• Understand what skills are important for communication skills</li> </ul>	<ul style="list-style-type: none"> <li>• Projector</li> <li>• Computer</li> <li>• Flip Chart</li> <li>• Marker</li> </ul>	<ul style="list-style-type: none"> <li>• Self Confidence</li> <li>• Teamwork</li> </ul>
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Schedule	Mentor Should do
<p><b>Welcome:</b> 5 min</p>	<p>Short welcome and ask the <b>Mentor</b> to introduce him/herself.</p> <p>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><b>Icebreaker:</b> 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.</p> <p>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><b>Introduction &amp; Onboarding:</b> 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"> <li>1. Explanation of the program and structure. (Kamyab jawan Program)</li> <li>2. How you will use your communication skills in your professional life.</li> <li>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)</li> <li>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.</li> </ol>
<p><b>Team Activity Planning:</b> 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</p>

	<p>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"> <li>• “IDENTIFY ENTREPRENEURS” TEAM ACTIVITY</li> <li>• “BRAINSTORMING SOCIAL PROBLEMS” TEAM ACTIVITY”</li> </ul> <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><b>Session Close:</b> <b>5 minutes</b></p>	<p><b>MENTOR:</b> Close the session with the opportunity for anyone to ask any remaining questions.</p> <p><b>Instructor:</b> 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	<a href="https://www.youtube.com/watch?v=OrQte08MI90">https://www.youtube.com/watch?v=OrQte08MI90</a>
Just Control Your Emotions	Qasim Ali Shah	<a href="https://www.youtube.com/watch?v=JzFs_yJt-w">https://www.youtube.com/watch?v=JzFs_yJt-w</a>
How to Communicate Effectively	Qasim Ali Shah	<a href="https://www.youtube.com/watch?v=PhHAQEGehKc">https://www.youtube.com/watch?v=PhHAQEGehKc</a>
Your ATTITUDE is Everything	Tony Robbins Les Brown David Goggins Jocko Willink Wayne Dyer Eckart Tolle	<a href="https://www.youtube.com/watch?v=5fS3rj6eIFg">https://www.youtube.com/watch?v=5fS3rj6eIFg</a>
Control Your EMOTIONS	Jim Rohn Les Brown TD Jakes Tony Robbins	<a href="https://www.youtube.com/watch?v=chn86sH0O5U">https://www.youtube.com/watch?v=chn86sH0O5U</a>
Defeat Fear, Build Confidence	Shaykh Atif Ahmed	<a href="https://www.youtube.com/watch?v=s10dzfbozd4">https://www.youtube.com/watch?v=s10dzfbozd4</a>
Wisdom of the Eagle	Learn Kurooji	<a href="https://www.youtube.com/watch?v=bEU7V5rJTtw">https://www.youtube.com/watch?v=bEU7V5rJTtw</a>
The Power of ATTITUDE	Titan Man	<a href="https://www.youtube.com/watch?v=r8LJ5X2ejqU">https://www.youtube.com/watch?v=r8LJ5X2ejqU</a>
STOP WASTING TIME	Arnold Schwarzenegger	<a href="https://www.youtube.com/watch?v=kzSBrJmXqdg">https://www.youtube.com/watch?v=kzSBrJmXqdg</a>
Risk of Success	Denzel Washington	<a href="https://www.youtube.com/watch?v=tbnzAVRZ9Xc">https://www.youtube.com/watch?v=tbnzAVRZ9Xc</a>

SUCCESS STORY

S. No	Key Information	Detail/Description
1.	<b>Self &amp; Family background</b>	<p><b>Danyal Saleem</b>, who lives in Mirpur (AJK), is an example of how hard work and perseverance can reap rich rewards when bidding for projects online. The graphic designer works exclusively on an online freelancing platform and has earned, on average, <b>US\$20,000</b> per month for the past several months. But this isn't a story of overnight success – Danyal has had to work hard to differentiate himself and stay true to his goal.</p> <p>It was a full year later, in May 2017, when Danyal finally decided to jump in. He signed up for one of the numerous sites that connect designers or coders with people or companies that have small projects, like designing a logo or building a website. He had already started a small business to help pay for his college education, so he was nervous and apprehensive about the decision. “I gave myself two or three months at most. If I didn't succeed, then I would go back to running the business as it was showing potential,” he says.</p> <p><b>If at first, you don't succeed, try try again</b></p>
2.	<b>How he came on board NAVTTC Training/ or got trained through any other source</b>	Certification in graphic designing from STEPS(NAVTTTC partner institute)
3.	<b>Post-training activities</b>	<p><b>Danyal's</b> area of expertise is in <b>graphic design</b>. In his first month using Fiverr, he pitched mostly for projects centered around logo designing. But it wasn't so simple. In the first few weeks, he didn't hear back from even a single client, despite pitching for dozens of projects.</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>Danyal says he understands why clients would be apprehensive giving projects to untested freelancers. They have hundreds of options to choose from, he</p>

		<p>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 Danyal's way. Within a few months, he was landing an average of a hundred projects every month, with a large number of repeat clients. He also expanded the range of his professional services, branching out from logo design to business cards, banners, Facebook cover pages, letterheads, and stationery.</p> <p>But he's had to face his fair share of challenges too. The shoddy state of internet infrastructure in his city, Mirpur, threatened to derail his freelancing career. "Sometimes I haven't had connectivity for two days straight," he explains. "That's unthinkable for someone who makes his livelihood on the internet."</p>
4.	<b>Message to others (under training)</b>	<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

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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.