**Certificate Course on Advance Welding Technology**

* Course Id : **MSME/CCAWT**
* Candidate Eligibility : **Inter / ITI passed or its equivalent.**
* No. Of NOS (If QP) : **4**
* NSQF Level : **4**
* Cost Category : **2**
* Course Duration
	+ Theory duration : 1**44**
	+ Practical duration : **336**
	+ OJT duration : **120**

**Trainer Qualification Work Experience**

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| --- | --- |
| **Trainer Qualification** | **Work Experience** |
| * Minimum - Diploma/Degree in Mechanical Engineering
* Certified for Job Role: “Diploma/Degree” with Minimum acceptance score of 60 %
* Recommended that the Trainer is certified for the Job Role: “Diploma/Degree” with Minimum accepted score of 60%.
* Alternatively, must have successfully undergone a CGSC organized TOT workshop on “How to Trainer”.
 | * Minimum 3 to 4 years of industry experience in relevant job role and a Minimum of 3 to 4 years and Training experience in relevant job role.
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**CONTACT DETAILS OF THE BODY SUBMITTING THE QUALIFICATION FILE**

**Name and address of submitting body:**

**Tool Room & Training Centre, Patna**

**(An Extension Centre of Indo-Danish Tool Room, Jamshedpur)**

**Ministry of MSME, Govt. of India**

**Patliputra Industrial Estate**

**Patna-800013**

**(0612) 2270744**

**Name and contact details of individual dealing with the submission**

**Name : Shri. Ashutosh Kumar**

**Position in the organisation : General Manager (I/c)**

**Tel number(s) : (0612) 2270744**

**Mobile : 7260801191**

**E-mail address : trtcpatna14@gmail.com**

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| **Qualification Title**  | **Certificate Course on Advance Welding Technology** |
| **Qualification Code**  | **MSME/CCAWT** |
| **Nature and purpose of the qualification**  | **Nature: A general qualification offered in a formal educational context.****Purpose: To get unemployed people into work.** |
| **Body/bodies which will award the qualification** | **Tool Room & Training Centre, Patna** **(Certificate Awarded by TRTC, Patna)** |
| **Body which will accredit providers to offer courses leading to the qualification** | **Tool Room & Training Centre, Patna** **(Certificate Awarded by TRTC, Patna)** |
| **Body/bodies which will carry out assessment of learners** | **Examination Cell of Tool Room & Training Centre, Patna**  |
| **Occupation(s) to which the qualification gives access** | **Welder**  |
| **Licensing requirements** | **Not Applicable** |
| **Level of the qualification in the NSQF** | **Level 4** |
| **Anticipated volume of training/learning required to complete the qualification** | **600** |
| **Entry requirements and / or recommendations** | **Inter / ITI passed or its equivalent.****Age 15 years to 35 years** |
| **Progression from the qualification** | **Job Progression:****After completion of course and after 3 years of field experience the trainee can work as a Assistant Welder and after 5 years of experience, the person can work as a Welder supervisor.** |
| **Planned arrangements for the Recognition of Prior learning (RPL)** | **Yes** |
| **International comparability where known** | **Existence of any official document suggesting the comparability of the qualification with the qualifications in other countries is not known.** |
| **Date of planned review of the qualification.** | **January 2020** |

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| **Formal structure of the qualification**  |
| **Title of component and identification code** | **Mandatory/ Optional** | **Estimated size (learning hours)** | **Theory hours** | **Practical hours** | **Level** |
| **1. Basic Metal work** | **Mandatory** | **120** | **22** | **98** | **4** |
| **2. GAS Welding** | **Mandatory** | **210** | **92** | **118** | **4** |
| **3. Fabrication of Steel** | **Mandatory** | **150** | **30** | **120** | **4** |
| **4.On Job Training** | **Mandatory** | **120** | **-** | **120** | **4** |
| **Total** | **600** | **144** | **456** |  |

**ASSESSMENT**

**Body/Bodies which will carry out assessment:**

Examination cell - *Tool Room & Training Centre, Patna*

**How will RPL assessment be managed and who will carry it out?**

*YES. Learners who have met the requirements of any Unit Standard that forms part of this qualification may apply for recognition of prior learning to the relevant Education body. The applicant must be assessed against the specific outcomes and with the assessment criteria for the relevant Unit Standards.*

**Describe the overall assessment strategy and specific arrangements which have been put in place to ensure that assessment is always valid, reliable and fair and show that these are in line with the requirements of the NSQF.**

**1. ASSESSMENT GUIDELINE:**

 - Criteria for assessment based on each learning outcomes, will be assigned marks proportional to its importance.

 - The assessment for the theory & practical part is based on knowledge bank of questions created by trainers and approved by Examination cell (TRTC, Patna)

 - For each Individual batch, Examination cell will create unique question papers for theory part as well as practical for each candidate at each examination.

 - To pass the Qualification, every trainee should score a minimum of 40% in each Theory and 50% in each Practical subject.

 - Assessment comprises the following components:

>Job carried out in labs/workshop

>Record book/ daily diary

>Answer sheet of assessment

>Viva –voce

>Progress chart

>Attendance and punctuality

**2. ASSESSORS:**

TRTC Patna faculty teaching the Advanced Programming and Operation with CAD/CAM course, also assesses the students as per guidelines set by Examination cell of TRTC. Faculties are trained from time to time to upgrade their skills on various aspects such as conduction of assessments, teaching methodology etc.

**3. ELIGIBILITY TO APPEAR IN THE EXAM:**

Minimum 70% attendance is compulsory for the students to appear for the assessments.

**4. MARKING SCHEME:**

**Semester-I**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **Method of Assessments** | **Weightage** | **Evaluator** |
| **1** | Practical test | 25 | **Trainer + Moderator (Head of Dept)+ Examiner nominated by Examination cell (TRTC)** |
| **2** | Written test (Trade Theory) | 15 |
| **3** | Basic Metal work | 10 |
| **4** | Welding | 10 |
| **5** | Fabrication of Steel  | 15 |
| **6** | Internal assessment | 25 |
| **Total** | **100** |  |

**5. PASSING MARKS:**

Passing criteria is based on marks obtain in attendance record, term works , assignments, practical’s performance, viva or oral exam, module test, class test, practical exam and final exam

Minimum Marks to pass practical exam – 60%

Minimum Marks to pass theory exam – 40%

Grade Equivalents:-

>85% Ex

>65% & <85% A

>50% & <65% B

>35% & <50% C

<35% D

**6. RESULTS AND CERTIFICATION:**

The assessment results are backed by evidences collected by assessors. Successful trainees are awarded the certificates by TRTC, Patna.

**ASSESSMENT EVIDENCE**

ASSESSMENT EVIDENCE

Assessment evidence comprises the following components document in the form of records:

Job carried out in labs/workshop

Record book/ daily diary

Answer sheet of assessment

Viva –voce

Progress chart

Attendance and punctuality

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| --- | --- |
| **Title of Component** | **Certificate Course on Advance Welding Technology** |
| **Sr.no** | **Outcomes to be assessed** | **Assessment criteria for the outcome** |
| 1 | Follow work ethics and identify necessary  | 1. Competent to understand the requirement and physically fit to carry out the work
2. Ensuring appropriate tools are in working condition and available
3. Prohibiting consumption of alcohol and tobacco in any form, at workplace
4. Behave respectfully with co-workers and use appropriate language for inter-personal communication.
5. Use public conveniences (toilets) only.
 |
| 2 | Perform task with due consideration to safety rules in coordination with team and following government regulations  | 1. Check for all the personal protection equipments before entering into the workplace
2. Conduct appropriate discussions within the team
3. Be aware of the working environment and promptly act during emergencies.
4. Present facts and situations and use appropriate inspection for work and safety.
5. Helping the co-workers at the time of need at workplace
6. Maintaining good working relationship
 |
| 3 | Apply professional knowledge & technical knowledge while performing the task | 1. Understand the importance of Inspection and Quality Control.
2. Displaying skills of Welding
3. Taking decisions at the workplace with due recognition and understanding of government set norms.
 |
| 4 | Should be able to work effectively in team to deliver desired results at workplace | 1. Gather a team
2. Divide work amongst the team members
 |
| 5 | Maintain regularity at the workplace. | 1. Maintaining regularity at the workplace
2. Maintaining decorum of the workplace
3. Open to learning and engaged in discussions
4. Execute the assigned task with in time frame
 |
| 6 | Able to work observing personal health, safety & environmental protocol at Workshop | 1. Know how of safety precautions
2. Know how to give first aid
3. Should know do’s and don’t’s on the work site
4. Should know about personal protection equipment
 |
| **Specific assessable outcome** |
| [**S. no**](http://S.no) | **Assessable outcomes** | **Assessment criteria** |
| 1 | Metal work Capability  | 1. Displaying skills for reading and interpreting information that can be extracted from drawings, specifications, schedule and method statements.
2. Demonstrating skills while cleaning surfaces, measuring, assembling, dismantling, cleaning.
3. Apply safe work practices, follow procedures, report problems and rectify them
4. Minimise damage and maintain clean work place
5. Use appropriate tools and equipments
6. Exercising safe practices while machine handling by wearing gloves.
7. Uses personal protective equipments and access equipment safety to carry out the activity in accordance with legislation and organisational requirement.
 |
| 2 | Welding Capability  | 1. Displaying skills for reading and interpreting information that can be extracted from drawings, specifications, schedule and method statements.
2. Demonstrating skills while cleaning surfaces, measuring, assembling, dismantling, cleaning.
3. Apply safe work practices, follow procedures, report problems and rectify them.
4. Minimise damage and maintain clean work place
5. Use appropriate tools and equipments
6. Exercising safe practices while machine handling by wearing gloves.
7. Uses personal protective equipments and access equipment safety to carry out the activity in accordance with legislation and organisational requirement.
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|  | **Means of assessment** Skill performance is assessed by conductingi) Assignment for each semesterii) Written test for each semesteriii) Final exam after completion of both the semestersiv) Practical exam for each semesterv) Final practical exam after completion of both the semestersvi) Viva / Oral Exam |
|  | **Pass/Fail**Passing criteria is based on marks obtain in attendance record, term works , assignments, practical’s performance, viva or oral exam, module test, practical exam and final exam i) Minimum Marks to pass practical exam – 60%ii)Minimum Marks to pass theory exam – 40% |

**Course Curriculum**

**Syllabus content with time structure**

**For the course of Certificate Course on Advance Welding Technology**

**Duration: 600 hrs.**

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| **Session Name: Basic Metal work** |
| **Practical competencies****(includes demonstration and activity)** | **Underpinning Knowledge** | Duration (in hours) |
| **Demonstration (22 hours)** | **Activity (98 hours)** |  | **Practical** | **Theory** |
| Bench work.Arithmetic’s / Geometrical terminologies and problem solving. |  | **Identify select and use the Measuring tools:**Steel foot rules, Steel tape, Vernier Caliper, Calipers (internal & external), Micrometer, Gauges, Solid steel squares, Protectors.**Identify select and use the Marking tools:** Steel scribers, Divider, Centre Punch, Surface gauge.**Identify select and use the Cutting tools:**Shears, Saws, Chisels, Punches.**Identify select and use the Files and Scrapers:** Single cut file, Cross cut, Rasp cut, Shapes of files, Flat scraper, Triangle scrapers.**Identify select and use the Grinding:** Wheels, Discs, and pencils.**Identify select and use the Drills / Counter****Sinks:** Twist drills, Counter sinks.**Identify select and use the Threading:** Types ofThreads, Tapes and Dies.**Solve the problems 0f Arithmetic’s / Geometrical using Terminologies:** Addition & Subtraction, Multiplication & Division, Metric system, Diameter / Circumference finding., Percentage, Conversion of Inches to Metric to Inches, Lines, Angles, Drawing of Radius, Corner finding from Isometric views, Views finding and matching of views. | 98 | 22 |
|  | Job, tools and personal safety.Practical exercises.Kinds of Welding their principles and use. | **Explain and use the Safety Rules:** Introduction to the safety rules and regulations for tools, work and personal.**Prepare the selected jobs according to the****drawing.**i. Filing Exercise (Channel)ii. Squaring. iii. Marking. iv. Sawing.v. Drilling.vi. Counter Sinking. vii. Threading.viii. Stretching.ix. Sheet Metal Box.**Explain the different Kinds of Welding:** Kinds of welding, their principles and use. |  |  |

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| **Session Name: GAS Welding** |
| **Practical competencies****(includes demonstration and activity)** | **Underpinning Knowledge** | Duration (in hours) |
| **Demonstration (92 hours)** | **Activity (118 hours)** |  | **Practical** | **Theory** |
| Gas welding equipment and accessoriesSoldering andBrazing.Arc weldingProvide knowledge and skill on welding process, tools, equipment, accessories, electricity, welding machines, welding different joints. |  | **Identify and select the Gas welding equipment and accessories:**Gas cylinders and Acetylene generator, Regulators, Hoses with fittings, Goggles, Spark lighter, Gas welding and Cutting Torches with nozzles / tips, Flashback arrestors, Filler rods, Burner pliers, their care and safety rules.**Explain, Identify and select the Soldering****accessories.**I. Soldering Process,II. Types of soldering iron, III. Kinds of solders,IV. Soldering fluxes.**Explain the Basic Electricity terminologies and****Units:**Conductor, Electrical Circuit, Current / Ampere, Voltage, Resistance and Watt.**Explain the Arc welding Electrical terminologies.**I. Alternating current (AC), Direct Current (DC). II. Open Circuit Voltage, Close Circuit (Arc)Voltage.III. Polarity (Straight and Reverse).**Distinguish the Welding Machines, their construction and use:**I. Transformer, II. Generator,III. Rectifier,**Identify and use the proper Tools and****Equipment:**Cables, Electrode holder, Earth clamp, Welding screen / helmet, Chipping hammer, Steel wire brush, Leather apron, Leather gloves.**Identify, select, store the Arc welding****Electrode:**I. Types of Core wire. II. Types of coating.III. Function of coating. IV. Identifying electrode.V. Selecting the correct electrode. VI. Caring and storing electrode. | 118 | 92 |
|  | Welding joints and positions, Welding and cutting techniques, Welding defects and practical skill.Soldering and brazing tools, equipment, Filler metals, Fluxes and Practical exercises.Arc weldingProvide knowledge and skill on welding process, tools, equipment, accessories, electricity, welding machines, welding different joints. | **Identify and Explain the types of welding joints:**Butt joint, Corner joint, Tee joint, Lap Joint, Edge Joint.**Identify and Explain the types of welding positions:**Flat position, Horizontal position, Vertical position, Overhead position.**Explain and select the Welding techniques:**Forehand welding, Backhand welding.**Select and use the Oxy-Acetylene Cutting techniques:**Flame cutting process, freehand cutting, Guide bar cutting, Curve and Circular cutting.**Identify Welding defects (Arc & Gas), causes and select remedies:**Lack of Fusion, Under cut, Blowholes, Porosity, Slag inclusion, Cracks, Their causes and remedies.**Weld the job with Gas welding on practical****exercises:**I. Lightening of flame.II. Adjusting of flames (Carburizing, Neutral andOxidizing).III. Blind weld flat (Puddling procedure). IV. Double flange edge weld.V. Butt joint flat.VI. Corner joint (out side) flat. VII. V - Butt joint flat.VIII. Corner joint outside horizontal. IX. Butt joint horizontal.X. T-joint horizontal.XI. Square butt joint vertical.XII. Square butt joint on pipe flat.XIII. Square butt joint on pipe horizontal. XIV. Square butt joint on pipe fix.**Solder the Joints on various metals.** Lap joint soldering on MS, GI, Cu and brass sheets. Butt joint soldering on MS, GI, Cu and brass sheets.**Explain identify and select the Brazing accessories.**I. Brazing process,II. Types of brazing filler metals, III. Brazing fluxes,IV. Melting Temperature of different metals,V. Melting temperature of brazing filler metals.**Braze the jobs on different metals.**Lap joint brazing on MS sheet. Butt joint brazing on MS sheet.Double lap joint brazing on MS sheet.Brazing Non ferrous metals Cu, Brass, StainlessSteel. Pipe on sheet / plate brazing**Explain the Welding Arc:**I. Method of striking an arc (Tapping / Scratching), II. Maintaining the arc (Long, Standard, Short),III. Running short beads.**Explain the factors for Running continuous****Bead:**I. Correct electrode. II. Arc length.III. Current and amperage. IV. Speed of travel.V. Electrode angle. VI. Crater formation. VII. Maintaining crater. VIII. Breaking the arc. IX. Restarting the arc.**X.** Running continuous bead.**Select the proper Bead forming Motions:**Straight, Crescent, Figure 8, Rotary, Triangle.**Weld the jobs with Arc welding on Practical exercises:**I. Striking the arc MS 200x100x6mm (1piece). II. Running short beads.III. Breaking and restarting the arc. IV. Straight bead weld.V. Depositing metal by weaving motion between straight beads.VI. Square butt joint flat. VII. Lap joint single pass. VIII. T-fillet joint single pass.IX. T-fillet joints multiple pass. X. Out side corner joint.XI. V-butt joint flat.XII. Straight bead in horizontal position.XIII. Lap joint horizontal position single pass. XIV. V-butt joint in horizontal position.XV. Straight bead in vertical down position. XVI. Straight bead in vertical up position. XVII. Lap joint vertical up.XVIII. Butt joint vertical up.XIX. Pipe on plateXX. Pipe weld fix.XXI. Pipe weld horizontal |  |  |

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| **Session Name: Fabrication of Steel** |
| **Practical competencies****(includes demonstration and activity)** | **Underpinning Knowledge** | Duration (in hours) |
| **Demonstration (30 hours)** | **Activity (120 hours)** |  | **Practical** | **Theory** |
| Design and Weld the steel |  | **Explain the Actual size and Fabrication size**Actual size of place, Tolerance / Margins of fitting, Actual making size, Type of design, Size of design. | 120 | 30 |
|  | Design and Weld the steel | **Determine the steps of work process in making the articles considering the design.**I. Cutting of metals in size.II. Shaping or bending the pieces III. Placing the pieces in the fixture.IV. Tacking of pieces.V. Welding of pieces. VI. Hinge makingVII. Hinge welding. VIII. Making door bolt. IX. Welding door bolt.X. Grinding and Finishing.**Practical exercises:** (Should be prepared as project in a group of 4-5 trainees).i. Window with safety grill. (Hinges doors / Slidingdoors).ii. Door with solid sheet fitted with Threshold. iii. Door with safety grill and lattice fitted.iv. Railing in different design. |  |  |

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|  **Session Name: On Job Training** |
| **Practical competencies****(includes demonstration and activity)** | **Underpinning Knowledge** | Duration (in hours) |
| **Demonstration (0 hours)** | **Activity (120 hours)** |  | **Practical** | **Theory** |
|  | **On Job Training** | 1. Basic Metal work2. GAS Welding3. Fabrication of Steel | **120** | **0** |

**External assessments**

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| **Comp. NO.** | **ASSESSABLE OUTCOME** | **ASSESSMENT RESULT** |
| **GENERIC** |
| 1 | Follow work ethics and identify necessary materials and tools | 5 |
| 2 | Perform task with due consideration to safety rules in coordination with team and following government regulations  | 5 |
| 3 | Apply professional knowledge & technical knowledge while performing the task | 5 |
| 4 | Should be able to work effectively in team to deliver desired results at workplace | 5 |
| 5 | Maintain regularity at the workplace. | 5 |
| 6 | Able to work observing personal health, safety & environmental protocol at Workshop | 5 |
| SPECIFIC |
| 1 | Basic Metal work | 25 |
| 2 | GAS Welding | 25 |
| 3 | Fabrication of Steel | 20 |
|  | **External Assessment Result** | **100** |

**EXAMINATION**

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| --- | --- | --- | --- | --- |
| **Sl.No.** | **COURSE CODE** | **COURSE NAME** | **Examination Scheme** | **Total Marks** |
| **Theory** | **Practice** |
| **Sessional** | **Semester Exam** | **Sessional** | **Semester Exam** |
| **Max. Marks** | **Min. to Pass** | **Max. Marks** | **Min. to Pass** | **Max. Marks** | **Min. to Pass** | **Max. Marks** | **Min. to Pass** |
| 1. | CCAWT-01 | Basic Metal work-Theory | 10 | 4 | 30 | 12 | - | - | - | - | 40 |
| 2. | CCAWT-02 | Basic Metal work-Practical | - | - | - | - | 20 | 12 | 40 | 24 | 60 |
| 3. | CCAWT-03 | GAS Welding-Theory | 10 | 4 | 30 | 12 | - | - | - | - | 40 |
| 4. | CCAWT-04 | GAS Welding-Practical | - | - | - | - | 20 | 12 | 40 | 24 | 60 |
| 5. | CCAWT-05 | Fabrication of Steel- Theory | 10 | 4 | 30 | 12 | - | - | - | - | 40 |
| 6. | CCAWT-06 | Fabrication of Steel-Practical | - | - | - | - | 20 | 12 | 40 | 24 | 60 |
| 7. | CCAWT -07 | On Job Training | - | - | - | - | 40 | 24 | 60 | 36 | 100 |

**Evidence of level**

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| --- | --- | --- | --- | --- | --- |
| **LEVEL** | **Process required** | **Professional knowledge** | **Professional skill** | **Core skill** | **Responsibility** |
| 4 | Work in familiar, predictable, routine, situation of clear choice. | Factual knowledge of field of knowledge or study. | Recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts. | Language to communicate written or oral, with required clarity, skill to basic arithmetic and algebraic principles, basic understanding of social political and natural environment. | Responsibility for own work and learning. |
| Level-4 | Level-4 | Level-4 | Level-4 | Level-4 |