

**National Vocational and Technical Training Commission
(NAVTTTC)**

Competency Standards

for

**Mechanical Manufacturing
Specialized in CNC**

**November 19, 2015
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| Structure of the competency standard table |
| Competency Standards are performance specifications that identify the knowledge and competencies an individual needs to succeed in the workplace. |
| Unit of competency |
| A unit of competency is a statement which points to an outcome that employers will value and is observable and assessable during the work. The competency unit is derived during the process of Occupational Analysis and is called 'Task Statement' in the job analysis table called DACUM Chart or competency map. |
| Overview |
| An overview is a description of the competency standard. It briefly describes the purpose and linkage of the competency units with a job role. |
| Performance Criteria |
| A performance criteria statement sets the standard of performance of a task in a job role. It describes 'how well' a task or competency unit is to be performed. It should be observable and written in a measurable term. It is one of the basic criterions for conducting assessment of the performance of a tradesman |
| Knowledge and understanding |
| Supporting knowledge and understanding statements include the essential knowledge and understanding, covering facts, principles, procedures, processes and methods. These statements cover the basic knowledge and understanding that is required to master a competency unit in an occupation. |
| Tools and machinery |
| All related tools and machinery, required to perform competency tasks are listed under this heading. |
| Consumable |
| The disposable goods that change their shapes or become vanished while performance of certain task. |
| Limitations |
| This competency standard is limited for performance of operations such as bench work, turning, milling, grinding and other mechanical manufacturing operations on Conventional and computerized numeric control (CNC) machines in a hazard less working environment. |

Module A: Maintain Safety

Overview: This Module of competency standard identifies the outcomes require to follow occupational health and safety procedures, effective use of hand and power tools, equipment, machines and carrying out improvements including those to reduce negative environmental impacts in an mechanical work environment.

| Competency Unit | Performance Criteria | Knowledge and Understanding | Tools and equipment |
|---|--|---|--|
| A-1 Maintain work station safety | <p>A competent individual must be able to successfully:</p> <p>P-1 Demonstrate safe occupational habits,</p> <p>P-2 Identify HSE risks around work station,</p> <p>P-3 Perform routine work station cleaning according to standard,</p> <p>P-4 Apply workstation cleanliness procedure as mentioned in HSE documents,</p> <p>P-5 Carry out evacuation according to SOPs,</p> <p>P-6 Perform basic fire-fighting according to SOPs,</p> <p>P-7 Give basic first aid as per SOPs,</p> <p>P-8 Perform tagging on machine as per SOPs.</p> | <p>A competent individual must be able to:</p> <p>K-1 describe importance of work place tidiness,</p> <p>K-2 interpret work station safety documents,</p> <p>K-2 describe reasons behind "SAFETY FIRST" slogan,</p> <p>K-3 enlist typical mechanical manufacturing workshop safety rules,</p> <p>K-4 describe importance of machine tagging,</p> <p>K-5 Interprets HSE codes and symbols.</p> | <p>T-1 First aid box</p> <p>T-2 SOPs</p> <p>T-3 Policy documents</p> <p>T-4 OEM manuals</p> <p>T-2 Brush</p> <p>T-2 Wiper</p> <p>T-4 Scraper</p> <p>T-5 Cotton Rug</p> <p>T-6 Floor Brush</p> <p>T-7 Vacuum Cleaner</p> <p>T-8 Scrap Bin</p> <p>T-9 Dust Pan</p> <p>T-10 Fire Fighting equipment</p> |
| A-2 Dispose of hazardous waste | <p>A competent individual must be able to successfully:</p> <p>P-1 Use safety hazard equipment according to type of hazardous waste disposal,</p> <p>P-2 Handle hazardous waste according to SOPs,</p> <p>P-3 Dispose of Inflammable waste to</p> | <p>A competent individual must be able to:</p> <p>K-1 Describe procedures of risk management,</p> <p>K-2 Interpret material safety data sheet (MSDS)</p> <p>K-3 Determine types of hazards in different workplace context,</p> | <p>T-1 PPE set</p> <p>T-2 Scrape Trolley,</p> <p>T-3 MSDS</p> |

Module B: Perform CNC Milling Operations

Overview: This module of competency standard describes the performance outcomes, skills, knowledge and attitude required to perform job setting -up, run simulation and making parts in safe working environment on CNC milling machine.

| Competency Unit | Performance Criteria | Knowledge and Understanding | Tools and equipment |
|--|---|--|---|
| | <p>A competent individual must be able to successfully:</p> <p>P-1 Collect Material from store as per job requirement</p> <p>P-2 Perform pre operation vertical mill machine cleaning</p> <p>P-3 Home machine for proper references according to work instructions</p> <p>P-4 Operate machine manually for bring table in desired position</p> <p>P-5 Clamp Job according to Job requirement</p> <p>P-6 Perform dialling on job according to operation manual</p> <p>P-7 Evaluate cantering of job value according to SOP</p> <p>P-10 Put desired values in machine control as per job requirement & SOPs</p> | <p>A competent individual must be able to:</p> <p>K-1 Interpret safety precaution mentioned in milling Machine OEM manual</p> <p>K-2 Describe cutting material properties.</p> <p>K-3 Describe Functions of milling machine</p> <p>K-4 Describe Operation of milling machine</p> <p>K-5 Enlist main parts of milling machine</p> <p>K-6 Define measuring method</p> <p>P-8 Tool selection according to the work order</p> <p>K-9 Enlist milling machine Tools</p> <p>K-10 Describe operation of milling machine tools</p> <p>K-11 Interpret mill job drawings.</p> | <p>T-1 CNC Milling machine</p> <p>T-2 Spanner (assorted)</p> <p>T-3 Cutting tools</p> <p>T-4 Machine vice</p> <p>T-5 Steel ruler</p> <p>T-6 Vernier Calliper</p> <p>T-7 Step Clamps Set</p> |
| <p>B-2</p> <p>Run simulation of first part using vertical mill</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Perform initial settings according to operating system manual,</p> <p>P-2 Initiate simulation to verify parameters setting according to Job requirements.</p> | <p>A competent individual must be able to:</p> <p>K-1 Down load milling simulation on computer from storage media,</p> <p>K-2 Run CAM software on computer,</p> <p>K-3 Interpret Manual program.</p> <p>K-4 Understand CAD & CAM</p> | <p>T-1 Computer set equipped with milling simulation</p> <p>T-2 3D CAM software</p> |
| <p>B-3</p> <p>Make part</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Operate milling machine through</p> | <p>A competent individual must be able to:</p> <p>K-1 Describe function of control panel on</p> | <p>T-1 CNC Milling machine</p> <p>T-2 Spanner</p> |

Module C:Perform CNC Turning Operations

Overview:This module describes the performance outcomes, skills, knowledge and attitude required to perform job setting of turning up, run simulation for making parts on CNCturning / machining center in safe work environment.

| Competency Unit | Performance Criteria | Knowledge and Understanding | Tools and equipment |
|---|--|--|--|
| <p>C-1 Perform turning Job setup</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Collect material specification and CAD data according to turning assignment,</p> <p>P-2 Collect material from store as per job requirement,</p> <p>P-3 Assess suitability of material for desire job according to SOP,</p> <p>P-4 Clamp job on CNC lathe according to machine operation manual,</p> <p>P-5 Align Job within allowed tolerance,</p> <p>P-6 Setup tool for required operation</p> | <p>A competent individual must be able to:</p> <p>K-1 Describe Metal characteristics knowledge,</p> <p>K-2 Convert allowed tolerance into size.</p> <p>K-3 Describe mechanical turning process,</p> <p>K-4 Select tools for performing turning operations</p> <p>K-5 Enumerate sequence of job setting up on lathe machine,</p> <p>K-6 Select of coolant according to the job,</p> <p>K-7 Verify machining tool condition,</p> <p>K-8 Enumerate tool setting method,</p> <p>K-9 Describe turning job measurements.</p> | <p>T-1 CNC lathe Machine</p> <p>T-2 Tool and Inserts</p> <p>T-3 Turning Tool</p> <p>T-4 Facing Tool</p> <p>T-5 Parting Tool</p> <p>T-6 Boring Tool</p> <p>T-7 Reaming Tool</p> <p>T-8 Drilling Tool</p> <p>T-9 Centre Tool</p> <p>T-10 Dial Indicator</p> <p>T-11 Vernier Calliper</p> <p>T-12 Micro Meter</p> |
| <p>C-2 Run turning simulation using CNC lathe</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Feed CAM program for simulation verification,</p> <p>P-2 Initiate simulation to verify parameters setting according to job requirements,</p> <p>P-3 Remove errors from assigned values.</p> | <p>A competent individual must be able to:</p> <p>K-1 Download turning simulation on computer from storage media,</p> <p>K-2 Identify errors in assigned values,</p> <p>K-3 Interpret CAM Commands,</p> <p>K-4 Run CAM software,</p> <p>K-5 Interpret Manual turning program.</p> <p>K-6 Understand CAD & CAM</p> | <p>T-1 Computer set equipped with CAD & CAM software and turning simulation</p> <p>T-2 Storage media</p> |

Module D: Perform CNC Grinding Operations

Overview: This competency standard is intended for those who will carry out grinding operations. After completion of this module mechanical manufacturer will be able to perform grinding job setup on CNC grinding machine, simulation and operate grinding machine as per requirement.

| Competency Unit | Performance Criteria | Knowledge and Understanding | Tools and equipment |
|---|---|--|---|
| D-1 Perform grinding Job setup | <p>A competent individual must be able to successfully:</p> <p>P-1 Collect data according to grinding assignment,</p> <p>P-2 Collect material from store as per job requirement,</p> <p>P-3 Perform Wheel balancing of machine According to SOP,</p> <p>P-4 Clamp job on machine according to SOP,</p> <p>P-5 Verify job surface for proper placement,</p> <p>P-6 Perform wheel dressing/crushing,</p> <p>P-7 Assess suitability of material for desire job according to SOP,</p> <p>P-8 Align grinding job within allowed tolerance specified in work instructions</p> <p>P-9 Setup grinding wheel according to surface finish</p> | <p>A competent individual must be able to:</p> <p>K-1 Describe metal grinding techniques,</p> <p>K-2 Describe characteristics of grinding wheel,</p> <p>K-3 Use measuring Instruments for grinding job,</p> <p>K-4 Select appropriate grinding wheel,</p> <p>K-6 Enlist parts of grinding machine with their functions,</p> <p>K-7 Define magnetic Bed strength of clamping,</p> <p>K-8 Calculate cutting Feed & Grinding Wheel RPM,</p> <p>P-9 Enumerates safety precaution recommended for Grinding Machine.</p> | <p>T-1 Grinding machine</p> <p>T-2 Digital calliper</p> <p>T-3 Gauges</p> <p>T-4 Magnetic Vice</p> <p>T-5 Clamping Kit.</p> <p>T-6 Spanner set</p> <p>T-7 Surface finish tester</p> <p>T-8 Micrometre</p> |
| D-2 Run | <p>A competent individual must be able to successfully:</p> | <p>A competent individual must be able to:</p> <p>K-1 Remove Errors from fed program,</p> | <p>T-1 Computer set equipped with CAD & CAM software</p> |

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| <p>grinding simulation</p> | <p>P-1 Down load grinding simulation on computer from storage media correctly, P-2 Load CAM software correctly, P-3 Initiate simulation to verify parameters setting is meeting Job requirements.</p> | <p>K-2 Interpret CAM Commands, K-3 Run CAM software on computer, K-4 Interpret simulation Operating software On Screen Buttons, K-5 Interpret Manual grinding program. K-6 Understand CAD & CAM</p> | <p>and grinding simulation T-2 Storage media</p> |
| <p>D-3 Grind job according to specification s using grinder</p> | <p>A competent individual must be able to successfully: P-1 Operate machine through dry run P-2 Bring to Home Position through control panel, P-3 Operate grinding machine through HMI for making assigned part as prescribed in operation manual , P-4Determine difference between assigned and product tolerance, P-5Intercept grinding operation due to abnormalities.</p> | <p>A competent individual must be able to: K-1 Describe operation of grinding machine, K-2 Identify of abnormalities in grinding Machine performance, K-2 Interpret Grinding machine OEM Manual, P-3 Describe safety gears for grinding operation.</p> | <p>T-1 PPEs T-2Surface Grinding machine T-3Digital calliper T-4 Surface tester</p> |
| <p>D-4 Run production using CNC grinder</p> | <p>A competent individual must be able to successfully: P-1 Prepare sample of grinding job according to work order, P-2 Get approval of quantity production based on OK sample from grinder, P-3 Arrange production material to complete production with in assigned time,</p> | <p>A competent individual must be able to successfully: K-1Describe measuring method for surface finish K-2Interpret process flow chart for grinding operation.</p> | <p>T-1 PPEs T-1Surface Grinding machine T-2 Digital calliper T-2 Surface tester</p> |

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| | P-4 Stack finished products as per SOPs, P-5 Inspect finished products according to pre-set quality standards. | | |
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Module E: Perform wire cut EDM Operations

Overview: This module describes the performance outcomes, skills and knowledge required to develop wire cut Electric Discharge Machine (EDM) Operation skills. It covers, job setting up, running EDM wire cut related simulation, making parts from the machine.

| Competency Unit | Performance Criteria | Knowledge and Understanding | Tools and equipment |
|---|--|---|---|
| E-1 Perform wire cut EDM job setup | A competent individual must be able to successfully: P-1 Perform control panel settings as per work instructions, P-2 Home EDM for predetermined references, P-3 Position EDM table according to job specification, P-4 Load pre quality inspected job according to operational requirements, P-6 Dial job according to specification, P-7 Check EDM wire according to material specification and work instructions P-8 Put values in machine control according to work instructions and machine manual | A competent individual must be able to: K-1 Enlist safe practice precautions for EDM wire cut, K-2 Describe operating Principles of EDM wire cut, K-3 Identify main parts of EDM wire cut, K-4 Give reasons of fluids used in EDM wire cut, K-5 Describes machine referencing procedure, with limit switches, K-6 Describe machine operating, K-7 Describe work order importance, K-8 Describe measure instruments, K-9 Knowledge about wire setting K-10 Understand EDM sinker | T-1 Wire cut EDM T-2 Spanner set T-3 Measuring Instruments T-4 Step Clamps Set T-5 Wire |

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| E-2 Run simulation on wire cut EDM | A competent individual must be able to successfully: P-1 Load CAD Drawing on computer and machine panel from storage media P-2 Perform CAD Data Verification for normal condition on computer / machine panel P-3 Initiate simulation to verify parameters setting is meeting the job requirements | A competent individual must be able to: K-1 Describe operating procedure of Machine panel, K-2 Describes machine reference procedure, K-3 Describe measuring instruments, K-4 Describe about work order, K-5 Describe measure instruments. K-6 Auto CAD & CAD K-7 Basic Engineering Drawing | T-1 Computer set equipped with CAD & CAM software T-2 Data Storage device |

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| <p>E-3 Make part according to job specifications on wire cut EDM</p> | <p>A competent individual must be able to successfully: P-1 Run EDM according to methods prescribed in OEM manual, P-2 Interrupt EDM operation on necessary causes as per prescribed method mentioned in OEM manual,</p> | <p>A competent individual must be able to: K-1 Verify initial job setup on EDM, K-2 describe dimensional specifications, K-3 describe function of control panel on EDM, K-4 Interpret EDM display.</p> | <p>T-1 Wire Cut EDM T-2 Vernier Calliper T-3 Micrometre T-4 Measuring Instruments</p> |
| <p>E-4 Run production wirecut EDM</p> | <p>A competent individual must be able to successfully: P-1 Prepare sample wire cut job according to work order, P-2 Get approval of sample on work order from authority for quantity production on grinder, P-3 Arrange production material to complete production within assigned time, P-4 Stack finished jobs as per SOP, P-5 Inspect finished jobs according to pre-set quality standards.</p> | <p>A competent individual must be able to: K-1 Describe lubricate requirement for wire cut EDM, K-2 Describe operating procedure of wire cut EDM panel, K-3 Required Wire for wire cut EDM, K-4 Measure wire cut EDM job, K-5 Describe function of wire gauge, K-6 Interpret CAD Drawing, K-7 Describe safety precaution for continue operation of wire cut EDM machine, K-8 Describe time management measures to achieve target, K-9 Interpret wire cut process flow chart.</p> | <p>T-1 Wire cut EDM T-4 Measuring Instruments</p> |

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| <p>E-5 Tug out Job from wire cut EDM</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Stop machine operation according to OEM manual,</p> <p>P-2 Turn off machine by applying SOPs.</p> <p>P-3 Un-clamp part from the machine according to SOPs,</p> <p>P-4 Place part on appropriate place according to SOPs,</p> <p>P-5 Perform post work routine cleaning according to work instruction sheet</p> | <p>A competent individual must be able to:</p> <p>K-1 Describe Job Tugging off procedure.</p> <p>K-2 Define cleaning standard</p> | <p>T-1 Wire EDM machine</p> <p>T-2 Spanners set</p> <p>T-3 Cotton rags</p> <p>T-4 Nylon Brush</p> |
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Module F: Perform EDM Sinker Operations

Overview: This module describes the performance outcomes, skills and knowledge required to perform Electric Discharge Machine (EDM) Sinker Operations. It covers, job setting up, running EDMSinker related simulation, making parts from the machine.

| Competency Unit | Performance Criteria | Knowledge and Understanding | Tools and equipment |
|---|---|---|---|
| F-1 Perform EDM Sinker job setup | <p>A competent individual must be able to successfully:</p> <p>P-1 Perform Control panel setting according to work instructions,</p> <p>P-2 Home EDM for predetermined references,</p> <p>P-3 Position EDM table according to job specification,</p> <p>P-4 Mount pre quality inspected electrode on swivel head according to operational requirements,</p> <p>P-5 Clamp job according to job requirement mentioned in SOPs</p> <p>P-6 Dial job according to specification,</p> <p>P-7 Put values in machine control unit based on the guidelines available in SOPs</p> <p>P-8 Move electrode in X & Y axis position for sink position as per work order</p> <p>P-9 Set dielectric flush position</p> | <p>A competent individual must be able to:</p> <p>K-1 Enlist safe practice precautions for EDM Sinker,</p> <p>K-2 Describe operating Principles of EDM Sinker,</p> <p>K-3 Identify main parts of EDM Sinker,</p> <p>K-4 Give reasons of dielectric used in EDM Sinker,</p> <p>K-5 Describes machine referencing procedure, with limit switches,</p> <p>K-6 Describe machine operating,</p> <p>K-7 Describe work order importance,</p> <p>K-8 Describe measure instruments,</p> <p>K-9 Knowledge about electrode</p> <p>K-10 Understand EDM sinker</p> | <p>T-1 EDM Sinker</p> <p>T-2 Spanner set</p> <p>T-3 Measuring Instruments</p> <p>T-4 Step Clamps Set</p> <p>T-5 Electrode</p> |

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| <p>F-2 Make part according to job specifications on EDM Sinker</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Run EDM Sinker according to methods prescribed in OEM manual,</p> <p>P-2 Intercept EDM Sinker operation on necessary causes as per prescribed method mentioned in OEM manual,</p> | <p>A competent individual must be able to:</p> <p>K-1 Verify initial job setup on EDM Sinker ,</p> <p>K-2 Describe dimensional specifications,</p> <p>K-3 Describe function of control panel on EDM Sinker,</p> <p>K-4 Interpret EDM Sinker display.</p> | <p>T-1 EDM Sinker</p> <p>T-2 Spanner set</p> <p>T-3 Machine vice</p> <p>T-4 Measuring Instruments</p> <p>T-5 Step Clamps Set</p> <p>T-6 Magnifying glass</p> |
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Module G: Perform Conventional Machining Operations

Overview: This module of competency standard describes the performance outcomes, skills, knowledge and attitude which assist an individual to perform conventional machining operations leading to CNC machining operations. The basic understanding of conventional machining operations will enable an individual to competently work on CNC machine and setting up job on CNC machine. It includes basic demonstration of milling, lathe, drilling & grinding in conventionally safe working environment.

| Competency Unit | Performance Criteria | Knowledge and Understanding | Tools and equipment |
|--|--|--|--|
| G-1 Perform milling operation | <p>A competent individual must be able to successfully:</p> <p>P-1 Select milling tools according to job requirement.</p> <p>P-2. Mount and set the required work-holding devices, work piece and cutting tools.</p> <p>P-3 Set the operating parameters (e.g. speed and feed) of machine tool to achieve the work specification.</p> <p>P-4 Obtain and follow work specifications, drawings or sketches to accomplish the job</p> <p>P-5 Perform milling as per prescribed procedure.</p> <p>P-6 Perform tool sharpening operation according to work instructions</p> | <p>A competent individual must be able to know:</p> <p>K-1 Interpret safety precautions and PPEs</p> <p>K-2 Understand methods and techniques of mounting and setting of work-piece.</p> <p>K-3 Understand methods and techniques of adjusting operating parameters of machine tool.</p> <p>K-4 Demonstrate procedure and calculate speed and feed.</p> <p>K-5 Identify cutting tools.</p> <p>K-6 Interpret work specifications, drawings and sketches.</p> <p>K-7 Interpret techniques to check quality of component produced.</p> <p>K-8 Understand basic machine operations</p> <p>K-9 Use safety precautions and procedures need to be observed during work.</p> <p>K-10 Understand basic Engineering drawing</p> <p>K-11 Understand basic manufacturing processes</p> | <p>T-1 Milling Machine</p> <p>T-2 Milling / Cutting Tools</p> <p>T-3 Vernier Calliper</p> <p>T-4 Personal Protective Equipment</p> <p>T-5 Angular vice</p> <p>T-6 Arbour</p> <p>T-7 Dividing / indexing head</p> <p>T-8 Studs</p> <p>T-9 Rotary table</p> <p>T-10 Tool Sharpener</p> |

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| | | K-12 Describe tool sharpening | |
| G-2 Perform lathe operation | <p>A competent individual must be able to successfully:</p> <p>P-1 Select tools according to job requirement.</p> <p>P2. Mount Work piece in chuck</p> <p>P-3 Mount cutting tool in tool post</p> <p>P-4 Set speed & feed</p> <p>P-5 Perform turning operation according to drawing / instructions.</p> <p>P-6 Perform tool sharpening operation according to work instructions</p> | <p>A competent individual must be able to know:</p> <p>K-1 Understand methods and techniques of mounting and setting of work-piece.</p> <p>K-2 Understand installation methods of cutting tool</p> <p>K-3 Understand adjustment of feed & speed according to material specification</p> <p>K-4 Understand basic material properties</p> <p>K-5 Identify cutting tool</p> <p>K-6 Interpret work specifications, drawings and sketches.</p> <p>K-7 Understand techniques to check quality of component produced.</p> <p>K-8 Understand procedure of shutting down of machine and equipment after closure of activities.</p> <p>K-9 Use safety precautions and procedures need to be observed during work.</p> <p>K-10 Understand basic engineering drawing</p> <p>K-11 Describe tool sharpening</p> | <p>T-1 Lathe Machine</p> <p>T-2 Cutting Tools</p> <p>T-3 Vernier Calliper</p> <p>T-4 Personal Protective Equipment</p> <p>T-5 Tool sharpener</p> |
| G-3 Perform drilling operation | <p>A competent individual must be able to successfully:</p> <p>P1. Select drill bits according to drawing.</p> <p>P2. Mount and set the required work-holding devices, work piece and cutting tools.</p> <p>P3. Adjust the RPM of machine according to the job.</p> | <p>A competent individual must be able to:</p> <p>K1. Identify types of drill bits</p> <p>K2. Define procedure of mounting and setting up of work-holding devices, work piece and cutting tools.</p> <p>K3. Understand method and technique of adjusting RPM of drill machine.</p> <p>K4. Use safe drilling procedures.</p> <p>K7. Use safety precautions and procedures.</p> | <p>T-1 Drill machine & bits</p> <p>T-2 Drill chuck with key</p> <p>T-3 Vernier caliper</p> <p>T-4. Personal Protective Equipment</p> <p>T-5 Marking Tools</p> <p>T-6 Drill Sleeve and Socket</p> |

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| | <p>P4. Perform drilling operation according to the drawing.</p> <p>P5. Check quality of the component produced at different intervals.</p> <p>P6. Observe personal and workplace safety.</p> <p>P7 Perform tool sharpening operation according to work instructions</p> | <p>K-8 Understand basic engineering drawing</p> <p>K-9 Describe tool sharpening</p> | <p>T-7 Scriber</p> <p>T-8 Center punch</p> <p>T-9 Clamping vice</p> <p>T-10 Scale</p> <p>T-11 Tool sharpener</p> |
| <p>G-4 Perform Grinding Machine Operations</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Select appropriate grinding wheel according to material specification</p> <p>P-2 Hold the work piece firmly by placing it on the tool rest.</p> <p>P-3 Use specified coolant as per SOPs</p> <p>P-4 Identify reference points on work piece before grinding.</p> <p>P-5 Adjust depth of cut according to speed of machine table.</p> <p>P-6 Observe safety</p> | <p>A competent individual must be able to:</p> <p>K1. Understand types of different grinding machines.</p> <p>K2. Understand type, size, grade of wheels and abrasive.</p> <p>K3. Define technique of holding work piece</p> <p>K4. Understand importance of using coolant.</p> <p>K5. Use specific safety precautions and guidelines.</p> <p>K6 Understand basic Engineering drawing</p> | <p>T-1 D-type bevel protector</p> <p>T-2. Grinding Machine</p> <p>T-3. Personal Protective Equipment</p> <p>T-4. Coolant</p> <p>T-5. Wheel Dresser</p> <p>T-6 Surface grinder</p> <p>T-7 Cylindrical grinder</p> <p>T-8 Vice for grinding machine</p> |

Module H: Perform routine maintenance on CNC machines

Overview: This module identifies the competencies required to perform maintenance functions by an individual in accordance with the organization's approved guidelines and procedures. The competent worker will be expected to perform routine maintenance of machines and tools as well as general housekeeping. The underpinning knowledge regarding maintenance of tools and machinery will be sufficient to provide the worker with the basis for maintenance work.

| Competency Unit | Performance Criteria | Knowledge and Understanding | Tools and equipment |
|---|--|--|--|
| H-1 Clean CNC machine | <p>A competent individual must be able to successfully:</p> <p>P-1 Turn off the machine</p> <p>P-2 Empty chips trolley according to SOPs,</p> <p>P-3- Remove dust particles from exterior of machine according to SOPs,</p> <p>P-4 Perform exterior-Interior cleaning of machine using cleaning tools recommended in OEM manual.</p> | <p>A competent individual must be able to:</p> <p>K-1 Describe necessary starting activities to perform machining operations on CNC machine,</p> <p>K-2 Describe necessary ending activities to perform machining operations on CNC machine,</p> <p>K-3 Enlist safety measures for CNC machine cleaning,</p> <p>K-4 Follow 5S practices</p> <p>K-5 Enlist material required to perform exterior&Interior cleaning of CNC machine,</p> <p>K-6 Identify chips trolley,</p> | <p>T-1 Cotton Rug</p> <p>T-2 Forklifter</p> <p>T-3 Waste Trolley</p> <p>T-4 Scrape Pan</p> <p>T-5 Gloves</p> <p>T-6 Dust Mask</p> <p>T-7 Floor Brush</p> <p>T-8 Standard cleaning fluids</p> <p>T-9 SOPs</p> |
| H-2 Maintain Hydraulic and lubrication oil level | <p>A competent individual must be able to successfully:</p> <p>P-1 Perform fluid condition test as per OEM Manual,</p> <p>P-2 Remove used fluid as per recommendations of OEM manual of machine</p> | <p>A competent individual must be able to:</p> <p>K-1 Identify to different eye level</p> <p>K-2 Give reasons for maintaining fluid level in machine</p> <p>K-3 Identify machine fluid</p> <p>K-4 Interpret fluid removal method</p> | <p>T-1 Oil can</p> <p>T-2 Funnel</p> <p>T-3 spanners set</p> <p>T-4 Waste cloths</p> <p>T-5 Oil fluids / hydraulic</p> <p>T-6 Operation manual</p> |

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| | P-3 Top up fluid level as per OEM recommendations. | K-5 Interpret fluid top up method K-6 Interpret oil change records | |
| H-3 Change coolant | A competent individual must be able to successfully: P-1 Check working condition of coolant as per SOPs, P-2 Top up the coolant up to level recommended in OEM manual. | A competent individual must be able to: K-1 Identify to different gauge level K-2 Identify coolant K-3 Select recommended fluid for machine K-4 Identify coolant reservoir K-5 Interpret coolant removal method K-6 Interpret coolant top up method | T-1 Mechanical workshop machine T-2 Oil can T-3 Funnel T-4 Spanners set T-5 Waste cloths T-6 OEM Manual |
| H-4 Service coolant tank | A competent individual must be able to successfully: P-1 Perform coolant tank cleaning according to SOPs P-2 Refill recommended coolant in recommended quantity. | A competent individual must be able to: K-1 Follow Company SOP's K-5 Enlist coolant top up method | T-1 SOPs T-2 Spanners set T-3 Specified seals |
| H-5 Replace worn tools | A competent individual must be able to successfully: P-1 Perform visual inspection of tool to decide its operational condition. P-2 Remove worn out tool from machine according to OEM recommendations, P-3 Update tool library with correct indexing. P-4 Replace tool from library | A competent individual must be able to: K-1 Describe Physically discarded tool, K-2 Describe causes of tool wear, K-3 Define disadvantages of using worn tool, K-2 Index tool Library. | T-1 machine equipped with machining tools T-2 Tool Library T-3 Spanners T-4 Allen keys set |

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| <p>H-6 Perform lockout/tag out procedures</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Maintain daily maintenance check list</p> <p>P-2 Lock operating panel</p> <p>P-3 Mount tags on appropriate locations</p> <p>P-4 Remove electrical connections</p> | <p>A competent individual must be able to:</p> <p>K-1 Interpret daily check list,</p> <p>K-2 Interpret tags</p> | <p>T-1 Standard check sheet</p> <p>T-2 Identification tags</p> <p>T-3 Star set</p> |
| <p>H-7 Apply Grease on machine</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Remove expired grease according to SOPs</p> <p>P-2 Apply recommended quality & quantity grease on machine as per OEM manual</p> | <p>A competent individual must be able to:</p> <p>K-1 Give purpose of performing greasing</p> <p>K-2 Describe grease specifications</p> <p>K-2 Differentiate between oil and grease</p> | <p>T-1 PPEs</p> <p>T-2 Specified grease</p> <p>T-3 Grease gun</p> <p>T-1 Maintenance manual</p> |
| <p>H-8 Respond to machine failure</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Stop the machine / Emergency Stop,</p> <p>P-2 Switch off related electrical supply,</p> <p>P-3 Submit Report to concerned authority</p> <p>P-4 Keep maintenance record as per company policy,</p> <p>P-5 Keep all the tools and material in proper place to ensure safe work.</p> | <p>A competent individual must be able to:</p> <p>K-1 Knowledge about Emergency Stop</p> <p>K-2 Understand all panel connection locations</p> <p>K-3 Understand reporting format</p> <p>K-4 Read maintenance schedule</p> <p>K-5. Describe method of keeping record of maintenance schedule.</p> <p>K-6. Understand machine operations</p> <p>K-7 Emergency contact numbers</p> | <p>T-1 Safety equipment</p> <p>T-2 Fire extinguisher</p> <p>T-3 Fire buckets</p> <p>T-4 Alarm switch</p> <p>T-5 Reporting format</p> |

Module: Perform Bench Work

Overview: This competency module identifies the competencies needed to perform basic bench work operations using different tools and equipment in accordance with approved procedures. The competent individual will be expected to perform deburring (filing) marking, sawing tapping and reaming using hand tools. They will be required to operate the tools and equipment safely by complying organizational safety policy and approved procedures.

| Competency Unit | Performance Criteria | Knowledge and Understanding | Tools and equipment |
|---|---|---|--|
| I-1 Perform deburring on metal | <p>A competent individual must be able to successfully:</p> <p>P-1 Collect work piece from store as per job requirement.</p> <p>P-2 Clamp job in vice correctly as defined in SOPs</p> <p>P-3 Perform deburring to get required finishes on the job as per work instructions.</p> | <p>A competent individual must be able to:</p> <p>K-1 Describe purpose of bench vice</p> <p>K-2 Describe correct posture for performing deburring</p> <p>K-3 Describe hand filing methodology</p> <p>K-4 Interpret parts and types of file</p> <p>K-6 Differentiate files according to cutting teeth</p> <p>K-7 Describe file handling rules</p> <p>K-8 Select file according to the operation.</p> | <p>T-1 PPEs</p> <p>T-2 File set</p> <p>T-3 Emery paper</p> <p>T-4 Hand Grinder</p> |

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| <p>I-2 Perform marking on metallic job</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Paste colour on job according to drawing</p> <p>P-2 Rest job on surface plate according specified angle</p> <p>P-3 Set measuring instruments for error less measurements.</p> <p>P-5 Perform Job marking with- in tolerances.</p> | <p>A competent individual must be able to:</p> <p>K-1 define importance of accurate job marking</p> <p>K-2 Interpret appropriate measuring and marking tools</p> <p>K-3 describe job marking steps</p> <p>K-4 describe job setting method</p> <p>K-5 Describe application of height gauge</p> <p>K-6 Interpret drawing for job marking</p> <p>K-7 Understand Basic Engineering drawing</p> <p>K-8 Understand basics of measurement and tolerances</p> | <p>T-1 Height gauge</p> <p>T-2 Surface plate</p> <p>T-3 Color</p> <p>T-4 marker</p> <p>T-5 Tri square</p> <p>T-6 Scriber</p> <p>T-7 Centre punch</p> <p>T-8 Hammer</p> |
| <p>I-3 Perform manual sawing on metal</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Fix Job on vice according to SOPs ,</p> <p>P-2 Perform hacksaw adjustment for required sawing operation,</p> <p>P-3 Perform sawing on job as per marking /drawing,</p> <p>P-4 Select appropriate saw blade according to job requirement,</p> | <p>A competent individual must be able to:</p> <p>K-1 Define importance of accurate job sawing,</p> <p>K-2 Describe job sawing steps,</p> <p>K-3 Interpret drawing for job sawing,</p> <p>K-4 Interpret saw setting method,</p> | <p>T-1Saw/blade</p> <p>T-2 Saw frame</p> <p>T-3 Bench Vice</p> |
| <p>I-4 Perform reaming on metallic job</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Fix Job on vice according to SOPs,</p> <p>P-2 Set reamer in the handle as specified</p> | <p>A competent individual must be able to:</p> <p>K-1 Interpret appropriate reaming tools,</p> <p>K-2 Describe reaming procedure ,</p> | <p>T1. Bench vice</p> <p>T2. Hand reamer</p> <p>T3. Handle of reamer</p> |

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| | <p>in work instructions</p> <p>P-3 Apply lubricants during reaming on appropriate intervals.</p> | <p>K-3 Interpret drawing for reaming job,</p> <p>K-4 Describe types of reamers,</p> <p>K-5 Define importance of using oil/lubricants during reaming,</p> | <p>T4. Oil/Lubricant</p> <p>T5. Plug Gauges</p> |
| <p>I-5</p> <p>Perform manual tapping</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Mount job on vice as per SOPs,</p> <p>P-2 Perform tapping according to job specification,</p> | <p>A competent individual must be able to:</p> <p>K-1 Describe threads standards.</p> <p>K-2 Interpret thread gauge Interpret drawing to determine thread specification</p> <p>K-3 Know mounting procedure</p> | <p>T-1 ANSI thread size charts</p> <p>T-2 Conversion table</p> <p>T-3 Thread gauge</p> <p>T-4 Tap</p> <p>T-5 Tap handle</p> <p>T-6 Vice</p> <p>T-7 Drill</p> <p>T-8 Centre punch</p> <p>T-9 Magnifying glass</p> |
| <p>I-6</p> <p>Perform electric arc welding on job</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Perform welding job setup according to SOPs,</p> <p>P-2 Control welding machine power source correctly,</p> <p>P-3 Fix electrode in welding holder correctly,</p> <p>P-4 Perform welding on job as per required length</p> <p>P-5 Verify welded joint as per welding SOPs.</p> | <p>A competent individual must be able to:</p> <p>K-1 Interpret welding process,</p> <p>K-2 Describe types of electrodes,</p> <p>K-3 Describe safety requirements,</p> <p>K-4 Describe welding plant capacity,</p> <p>K-5 Interpret electrode according to material specifications.</p> | <p>T-1 Welder's PPEs</p> <p>T-2 Welding transformer</p> <p>T-3 Electrodes</p> <p>T-4 Chipping hammer</p> <p>T-5 Wire brush</p> |

Module J: Perform Administrative Operations

Overview: This module identifies the competencies required to perform basic administrative operations in accordance with approved procedures. Competent individual will be expected to prioritize job schedule, provide process improvement feedback, ensuring quality inspection and Keep inventory. The underpinning knowledge will be sufficient to provide the basis for administrative operations.

| Competency Unit | Performance Criteria | Knowledge and Understanding | Tools and equipment |
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| J-1 Prioritize job schedule | <p>A competent individual must be able to successfully:</p> <p>P-1 Interpret production plan,</p> <p>P-2 Create daily schedule according to priority of production plan.</p> <p>P-3 Comprehend material priorities for hindrance less production,</p> <p>P-4 Develop list of required tools for hindrance less production ,</p> <p>P-5 Calculate time required for production</p> <p>P-6 Determine sequence of activities,</p> <p>P-7 Report delays to superior in prescribed manners.</p> | <p>A competent individual must be able to:</p> <p>K-1 Interpret production plan,</p> <p>K-2 Describe measure to meet time lines,</p> <p>K-3 Describe optimization of own time/activities,</p> <p>K-4 Describe manufacturing process</p> | <p>T-1 Computer set</p> <p>T-2 Stationary (assorted)</p> <p>T-3 Stop watch</p> <p>T-4 Job Card</p> <p>T-5 Standard format in hard and soft copy</p> |
| J-2 Provide process improvement feedback | <p>A competent individual must be able to successfully:</p> <p>P-1 Observe areas for process improvement correctly,</p> | <p>A competent individual must be able to:</p> <p>K-1 Interpret manufacturing process flow diagram/chart,</p> | <p>T-1 Board</p> <p>T-2 Markers</p> <p>T-3 Sticky notes</p> |

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| | <p>P-2 Evaluate individual activities critically,</p> <p>P-3 Evaluate process flow critically,</p> <p>P-4 Maintain flow process chart</p> <p>P-5 Meet supervisor to discuss about process improvement</p> | <p>K-2 Define concepts of integrated manufacturing ,</p> <p>K-3 Describe benefits of integrated manufacturing</p> <p>K-4 Understand & implement Kaizen and 5S methodology</p> | <p>T-4 Stationary items</p> <p>T-5 Flow chart</p> |
| <p>J-3 Keep material inventory</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Verify consumables availability through inventory and maintain check sheet</p> <p>P-2 Verify availability of desired tools through stock inventory,</p> <p>P-3 Report stock condition consumption according to job,</p> <p>P-4 Request for material on prescribed indent format,</p> <p>P-5 Carryout consumed items disposal.</p> | <p>A competent individual must be able to:</p> <p>K-1 Interpret indent book,</p> <p>K-2 Interpret check sheet,</p> <p>K-3 Describe record keeping methods.</p> | <p>T-1 Computer set with printer</p> <p>T-2 Pen</p> <p>T-3 File Racks</p> <p>T-4 Indent book</p> <p>T-5 Check sheet</p> <p>T-6 Bin Cards</p> |
| <p>J-4 Document in-process inspection</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Maintain check sheet</p> <p>P-2 Apply out comes of process inspection</p> <p>P-3 Keep record and suggest improvement if any</p> | <p>A competent individual must be able to:</p> <p>K-1 Describe necessity of in process inspection documentation,</p> <p>K-2 Describe method of in-process documentation,</p> <p>K-3 Understand quality and</p> | <p>T-1 Go - No Go gauges</p> <p>T-2 Stationary</p> <p>T-3 Process check sheets/ flow charts</p> |

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| | | process inspection check points | |
| J-5 Back-up technical data | <p>A competent individual must be able to successfully:</p> <p>P-1 Generate CAD data file back-up in specified location</p> <p>P-2 Generate CAM data file back-up in specified location</p> <p>P-3 Generate numeric control data file back-up in specified location</p> | <p>A competent individual must be able to:</p> <p>K-1 Understand different safe storage medium</p> <p>K-2 Describe process of PC storage</p> <p>K-3 Understanding of frequency of back-up and master medium of storage</p> | <p>T-1 Computer</p> <p>T-2 DVD</p> <p>T-3 Storage Hard drives</p> |

Module K: Develop Professionalism

Overview: This module identifies the competencies required to develop professionalism in an individual in accordance with requirement of profession. A competent individual will be expected to participate in training institute level mechanical manufacturer trainings, on Job training, perform communication with others, upgrade professional skills and work in a team. This underpinning knowledge regarding development of professionalism will be sufficient to provide the basis for quality working.

| Competency Unit | Performance Criteria | Knowledge and Understanding | Tools and equipment |
|--|---|--|---|
| K-1 Participate in mechanical manufacturer training | <p>A competent individual must be able to successfully:</p> <p>P-1 Develop CNC training needs according to recent industrial demands.</p> <p>P-2 Get enrol in mechanical manufacturer training course</p> <p>P3. Follow training providing organizational policies for professional development</p> <p>P-4 Perform training task mentioned in TLM</p> <p>P-5 Follow instructions of training providers</p> <p>P-6 Demonstrate good team work skills where applicable</p> <p>P-7 Adopt dress code as per training providing organization regulations.</p> <p>P-8 Show comfort and tolerance.</p> <p>P-9 Get training qualification avoidances from authority</p> | <p>A competent individual must be able to:</p> <p>K-1 Keep in touch with mechanical training providers</p> <p>K-2 Apply workshop mathematical skills during training.</p> <p>K-3 Apply technical English skills during training,</p> <p>K-4 Describe the importance of being a good team player,</p> <p>K-5 Identify TLM/curriculum.</p> | <p>T-1 -Mechanical manufacturing training workshop tools and equipment</p> <p>T-2 Training provider's prospectus</p> <p>T-3 TLM</p> |

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| <p>K-2 Participate in On Job Training</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Demonstrate manufacturing skills industrial production units,</p> <p>P-2 Promote Kaizen of manufacturing industry,</p> <p>P-3 Implement 5's on Job place,</p> <p>P-4 Maintain skill matrix according to organizational policies,</p> <p>P-5 Follow 4 Level Standards according to organizational policies,</p> <p>P-6 Develop time management plan,</p> <p>P-7 Provide logistic support for workshop machinery according to Job requirement.</p> | <p>A competent individual must be able to:</p> <p>K-1 Describe importance of Industrial Kaizen,</p> <p>K-2 Identify shop KPIs,</p> <p>K-3 Time and motion knowledge for target setting,</p> <p>K-4 Awareness of Takt time,</p> <p>K-5 Describe Housekeeping through check sheet.</p> | <p>T-1 Tool and equipment available on job place</p> <p>T-2 Kaizen suggestion format</p> <p>T-3 Skill matrix format</p> <p>T-4 5's check sheet</p> <p>T-5 Simple PDCA tool</p> |
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| <p>-3 Develop communication skills</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Perform verbal communication with:</p> <ul style="list-style-type: none"> ✓ Colleagues ✓ Clients ✓ Venders ✓ Supervisors ✓ Employee ✓ Juniors <p>P-2 Perform written communication with:</p> <ul style="list-style-type: none"> ✓ Colleagues ✓ Clients ✓ Venders ✓ Supervisors ✓ Employee ✓ Juniors <p>P-3 Maintain communication log / record</p> | <p>A competent individual must be able to:</p> <p>K-1 Identify factors required to communicate effectively and precisely within organisation.</p> <p>K-2 Justify the appropriate use of electronic and relative media as per need</p> <p>K-3 Describe types of communications</p> <p>K-4 Enlist record keeping methods</p> <p>K-5 Determine communication styles</p> | <p>T-1 Pen</p> <p>T-2 Computer, equipped with internet and printer.</p> <p>T-3 Magazines, books, codes and standards, 5S methodology</p> |
| <p>K-4 Participate in workshops and seminars</p> | <p>A competent individual must be able to successfully:</p> <p>P-1 Adopt upcoming market trends in Machinist trade by attending workshop and seminar,</p> <p>P-2 Participate in Skill test for professional development with consecration,</p> <p>P-3 Participate in skill up gradation courses with</p> | <p>A competent individual must be able to:</p> <p>K-1 Describe the benefits of latest machining techniques and developments,</p> <p>K-2 Identify the need of skill sets by getting involved in seminars,</p> <p>K-3 Identify internet browsing/search engine,</p> <p>K-4 Describe browsing techniques to find appropriate</p> | <p>T-1 Computer with internet</p> <p>T-2 Telephone</p> <p>T-3 Journals</p> <p>T-4 Books</p> <p>T-5 Magazines</p> <p>T-6 Survey templates</p> <p>T-7 Research papers</p> |

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| | <p>consecration,</p> <p>P-4 Participate in professional seminars with consecration to acquire first hand industrial knowledge,</p> <p>P-5 Perform industrial visits on schedule,</p> <p>P-6 Consult senior experts to get advised,</p> <p>P-7 Participate in skill competitions for targeted win,</p> <p>P-8 watch videos/documentaries related with mechanical manufacturing trade,</p> <p>P-9 perform internet browsing related with mechanical manufacturing trade,</p> <p>P-10 Conduct related surveys with concerned people to acquire first hand industrial knowledge,</p> <p>P-11 Review research papers related with mechanical manufacturing trade.</p> | <p>web site,</p> <p>P-5 Read books/magazines related with mechanical manufacturing trade.</p> | |
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List of Machines

| | | | |
|----|---------------------------|----|-----------------------------------|
| 1 | Power Saw | 11 | Electric Arc welding complete set |
| 2 | CNC Machining Center | 12 | Wire cut EDM |
| 3 | CNC Turning Centre | 13 | Lifting equipment |
| 4 | Computer set | 14 | Pedestal grinder |
| 5 | Surface Grinder | 15 | Tool & cutter grinder |
| 6 | Hardness testing machine | 16 | EDM Sinker |
| 7 | Hand Grinder | 17 | |
| 8 | Lathe Machine | | |
| 9 | Universal Milling machine | | |
| 10 | Drilling Machine | | |
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List of Tools & Equipment

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| 1 | V Blocks | 21 | Tri-Square |
| 2 | Parallels blocks | 22 | Surface plate |

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| 3 | Allen key set | 23 | Dial indicator |
| 4 | Bevel protector | 24 | Thread gauge |
| 5 | Angular plate | 25 | Tool box |
| 6 | Callipers (inside / outside) | 26 | Feeler Gauges |
| 7 | Chucks (universal, four jaws) | 27 | Files set |
| 8 | Step Clamps | 28 | Dial stand |
| 9 | Cleaning equipment (including sandblasters) | 29 | Hand tools common (e.g., screw driver) |
| 10 | Compasses | 30 | Height gauge |
| 11 | Grease gun | 31 | Magnet able blocks |
| 12 | Depth Gauge | 32 | Torque wrench with sockets |
| 13 | Depth micrometre Dial indicator | 33 | Radius gages |
| 14 | Honing tool | 34 | Saw (& wet saw), Band saw Scale |
| 15 | Cutting tools | 35 | Scientific calculator |
| 16 | Grease gun | 36 | Scriber |
| 17 | Hammer | 37 | DVD & Master Storage medium |
| 18 | Magnetic stand | 38 | CAD Software |
| 19 | Vice (Bench) | 39 | CAM Software |
| 20 | Sine bar | 40 | MS Office |

List of consumables

| Sr. No. | Description | Qty. | Sr. No | Description | Qty. |
|---------|--|------|--------|----------------------------------|------|
| 1. | Saw dust | | 15 | Cotton waste /cotton rags | |
| 2. | Duster | | 16 | Sprit | |
| 3. | Emery paper | | 17 | Thinner | |
| 4. | Flat iron | | 18 | Disposal polyethin bags | |
| 5. | Round bar | | 19 | Rust cleaner | |
| 6. | Grease (assorted) | | 20 | First aid box articles/medicines | |
| 7. | Stationary | | 21 | Floor Brush | |
| 8. | Marking ink | | 22 | Latex gloves | |
| 9. | Machine oil | | 23 | Face/nose mask | |
| 10. | Coolant fluid | | 24 | Ear plug | |
| 11. | Kerosene oil | | 25 | Emery paste | |
| 12. | Hand wash /soap | | 26 | Welding rod | |
| 13. | Cutting tool | | 27 | PPEs | |
| 14. | EDM wire Brass / tungsten / Molybdenum | | 28 | Fire Extinguisher | |