MACHINIST

Competency Standards

National Vocational Certificate Level 2

Version 1 - July 2015

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Competency Module A:Perform Basic Bench Work

Overview: This competency standard identifies the competencies you need to perform basic bench work operations using different tools and equipment, in accordance with approved procedures. You will be expected to perform sawing, filing, threading and reaming using hand tools**.**You will be required to operate the tools and equipment safely by complying the organizational safety policy and approved procedures.
Your underpinning knowledge regarding basic bench work will be sufficient to provide you with the basis for your work.

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
A1. Carry out Sawing	***You must be able to:*** **P1.** Mark the job according to given drawing. **P2.** Select appropriate blade according to job requirement. **P3.** Set the blade in frame of hacksaw as per procedure. **P4.** Ensure the work-piece is clampedfirmly and properly. **P5.** Adapt methods and techniques for sawing that is appropriate to job requirement. **P6.** Follow marked line during sawing to ensure accuracy. **P7.** Observe personal and workplace safety at all times.	***You must know and understand:*** **K1.** Properties of metals. **K2.** Types of Hacksaw blades. **K3.** Procedure of setting blade in hacksaw. **K4.** Interpret basic drawings. **K5.** Methods of measurements. **K6.** Method of marking the work-piece. **K7.** Procedure of clamping the work-piece. **K8.** Methods and techniques of sawing. **K9.** Personal safety precautions.	**T1**. Work bench **T2**. Bench vice **T3**. Tri square **T4**. Scriber **T5**. Hand hack saw with blade **T6**. Steel Rule **T7**. Personal Protective Equipment **T8**. Punching Tools

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
A2. File the work piece according to job requirements	***You must be able to:*** **P1**. Select file according to the operation. **P2**. Ensure the work-piece is clamped firmly and properly. **P3**. Use file according to required dimension grade and shape. **P4**. Adapt methods and techniques for filing that is appropriate to job requirement. **P5**. Ensure surface and size accuracy of work-piece. **P6**. Observe personal and workplace safety at all times.	***You must know and understand:*** **K1**. Types of files **K2**. Use of measuring tools **K3**. Use of marking tools **K4**. Procedure of clamping the work-piece. **K5**.Methods of filing flat, curved edges and even surfaces **K6**. Personal safety precautions.	**T1**. Work bench with vice **T2**. Files **T3**. Scriber **T4**. Steel rule **T5**. Try square **T6**. Personal Protective Equipment
A3. Produce threads on work piece	***You must be able to:*** **P1.** Select tap and die according to job requirement. **P2.** Clamp work-piece in the vice properly. **P3.** Ensure alignment of tap and die. **P4.** Use lubricants during threading for smooth cutting.	***You must know and understand:*** **K1**. Types of taps and dies. **K2**. Use of tap set according to safe process. **K3**. Mm and inches system tap set. **K4**. Importance of using lubricants during threading. **K5**. Copying of design and texture on work	**T1**. Bench and bench vice **T2**. Tapset **T3**. Tap handle **T4**. Lubricant **T5**. Tri square

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
	P5. Eliminate unwanted engraving and slips. **P6.** Ensure the threads are accurate and dimensionally correct. **P7.** Observe personal and workplace safety at all times.	piece. **K6**. Basic drawing concepts. **K7**. Safety precautions.	**T6**. Thread Gauges
A4. Perform Hand Reaming	***You must be able to:*** **P1.** Clamp work-piece in the vice properly. **P2.** Select reamer according to hole size and drawing requirements. **P3.** Set reamer in the handle correctly **P4.** Use lubricants during reaming. **P5.** Ensure proper alignment of the reamer during operations. **P6.** Observe personal and workplace safety at all times.	***You must know and understand:*** **K1**. Selecting reamer according to hole size. **K2**. Types of reamers (straight teeth or helical teeth). **K3**. Method of setting reamer in the handle. **K4**. Importance of using lubricants during reaming. **K5**. Importance of alignment of the reamer during operations. **K6**. Safety precautions.	**T1**. Bench vice **T2**. Hand reamer **T3**. Handle of reamer **T4**. Lubricant **T5**. Plug Gauges

Competency Module B:Perform Drilling Machine Operations

Overview: This competency standard identifies the competencies you need to perform drilling machine operations using different tools and equipment, in accordance with approved procedures. You will be expected to produce holes, counter boring, counter sinking, and reaming using drilling machine..You will be required to operate the tools and equipment safely by complying the organizational safety policy and approved procedures.
Your underpinning knowledge regarding drilling machine operations will be sufficient to provide you with the basis for your work.

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
B1.Produce holes using drilling machine	***You must be able to:*** **P1.** Observe personal and work place safety. **P2.** Set up drilling machine for producing holes according to job requirement. **P3.** Manipulate the machine tool controls safely and correctly in line withoperational procedures. **P4.** Produce components to the required quality and within the specifieddimensional accuracy. **P5.** Carry out quality sampling checks at suitable intervals. **P6.** Shut down the equipment to a safe condition on conclusion of themachining activities.	***You must know and understand:*** **K1.** Safety precautions. **K2.** Procedure of setting up of drilling machine. **K3.** Safe procedure for operating drilling machines. **K4.** Types of drilling machines. **K5.** Selecting and adjusting speed and feed of drilling machine. **K6.** Importance of coolants in drilling operations. **K7.** Methods and techniques of quality checks.	**T1**. Drilling Machines **T2**. Drill chuck with Key **T3**. Machine Vice **T4**. Marking Tools **T5**. Measuring Tools **T6**. Drill Sleeve and Socket **T7**. Personal Protective Equipment

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
B2. Perform counter boring and counter sinking	***You must be able to:*** **P1.** Select relevant tools according to the information given in engineering drawings and job specifications. **P2.** Ensure tooling is correct in terms of size, shape, type, and grade for the work. **P3.** Position the work-piece in the drill in such a way that it is aligned, secured and stable during drilling. **P4.** Adjust speeds and feeds of drill in accordance with the size, type, and hardness of work-piece material, so that the drill performs optimum cutting without damage to work-piece.	***You must know and understand:*** **K1.** Different types of drilling tools and their implications. **K2.** Importance of selecting right drilling tool for the job specifications. **K3.** Methods and techniques for positioning the work-piece in the drill to ensure proper alignment and stability during drilling. **K4.** Using speeds and feeds chart for different types of materials and their hardness. **K5.** Specific safety precautions during boring and sinking operations.	**T1**. Counter drill **T2**. Cutting oil **T3**. Tri square **T4**. Measuring Tools
B3. Perform machine reaming	***You must be able to:*** **P1.** Observe personal and workplace safety. **P2.** Clamp work-piece in the vice properly. **P3.** Select reamer according to hole size and drawing requirements **P4.** Set reamer in the drill chuck according to procedure.	***You must know and understand:*** **K1.** Safety precautions. **K2.** Selecting reamer according to hole size. K3. Types of reamers (straight teeth or helical teeth). K4. Method of setting reamer in the drill chuck. K5. Importance of using lubricants during	**T1**. Drilling Machines **T2**. Drill chuck with Key **T3**. Machine Vice **T4**. Measuring Tools **T5**. Personal Protective Equipment

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
	P5. Use lubricants during reaming for smooth cutting. **P6.** Ensure proper alignment of the reamer during operations.	reaming. K6. Importance of alignment of the reamer during operations.	**T6**. Reamers

Competency Module C:Apply Occupational Health & Safety Procedures at Workplace

Overview: This Competency Standard identified the competencies required to apply occupational health and safety procedures at workplace by a machinist in accordance with the organization's approved guidelines and procedures. You will be expected to identify hazards in workplace, comply health and safety precautions, use of personal protective equipment and practicing safe work habits at workplace at all times. Your underpinning knowledge regarding occupational health and safety procedures will be sufficient to provide you with the basis for your work.

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
C1. Identify hazards in workplace environment	***You must be able to:*** **P1.** Read and interpret work processes and procedures correctly to identify risk of hazards at workplace. **P2.** Recognize engineering processes, tools, equipment and consumable materials that have the potential to cause harm. **P3.** Identify any potential hazards and take appropriate action to minimize the risk.	***You must know and understand:*** **K1.** Health and safety precautions of the company. **K2.** Techniques and methods to controlrisksof identified hazards in the workplace. **K3.** Dealing with hazards to reduce, minimise or avoid accident or injury. **K4.** Safety reporting procedures and documentation.	**T1.** Health and safety manual.
C2. Comply with Occupational Health and Safety Precautions	***You must be able to:*** **P1.** Work safely at all times, complying with health and safety precautions, regulations and other relevant guidelines. **P2.** Identify health and safety hazards in the	***You must know and understand:*** **K1.** Organizational health and safety procedures. **K2.** Health and safety risks that can arise as a result of accidents.	**T1**. Overall combination **T2**. Safety shoes **T3**. Safety gloves

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
	workplace, so that the potential for personal injury, damage to equipment or the workplace is prevented, and corrective action is taken. **P3.** Deal with problems which are within your control, and report those that cannot be resolved to safety officer.	**K3.** Types of hazards that are most likely to cause harm to health and safety.	**T4**. Safety goggles **T5**. Safety helmet **T6**. Ear plugs **T7**. Fire extinguisher **T8**. Smoke alarm **T9**. First aid box
C3. Apply Personal Protective and Safety Equipment (PPE)	***You must be able to:*** **P1.** Select personal protective equipment in terms of type and quantity according to work orders. **P2.** Wear, adjust, and maintain personal protective equipment to ensure correct fit and optimum protection in compliance with company procedures. **P3.** Ensure personal protective equipment is cleaned and stored in proper place.	***You must know and understand:*** **K1.** Importance of using Personal Protective Equipment (PPE) **K2.** Types of PPE. **K3.** Protective clothing and equipment to be worn and where it can be obtained. **K4.** Safely maintaining the PPEs.	**T1**. Overall combination **T2**. Safety shoes **T3**. Safety gloves **T4**. Safety goggles T5. Safety helmet T6. Ear plugs T7. First aid box

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
C4. Practice safe work habits to ensure safety in the workplace	***You must be able to:*** **P1.** Wear required clothing (not loose or torn), confine long hair, and remove jewelry in accordance with company procedures. **P2.** Apply work procedures and approaches that ensure personal safety as well as others safety. **P3.** Demonstrate good housekeeping in the workplace by cleaning up spills or leaks. **P4.** Keep work area clean and clear of obstructions, and storing tools or equipment, so that the potential for accident or injury is prevented. **P5.** Ensure tools or equipment are in place and available in proper place as per company procedures.	***You must know and understand:*** **K1.** Importance of safety at work and its implications. **K2.** Work safety procedures and guidelines. **K3.** Specific company procedures regarding workplace safety. **K4.** Recommended procedure for cleaning and storing of tools and equipment at workplace.	**T1**. Earthing wire **T2**. Fire extinguisher **T3**. Tool box/bins **T4**. Safety covers **T5**. First aid box **T6**. Safety equipment

Competency Module D:Carry Out Maintenance of Tools and Machines

Overview: This Competency Standard identified the competencies required to perform maintenance functions by a machinist in accordance with the organization's approved guidelines and procedures. You will be expected to perform preventive maintenance of machines and tools as well as general housekeeping and maintenance of tools and machines.
Your underpinning knowledge regarding maintenance of tools and machinery will be sufficient to provide you with the basis for your work.

Unit of Competency	Performance Criteria	Knowledge	Tools & Equipment
D1. Perform preventive maintenance of machines and tools	***You must be able to:*** **P1.** Inspect and assess the general condition of an assigned machine on regular basis. **P2.** Recognize maintenance problems and carry out routine maintenance as per given instructions and schedules. **P3.** Report the problems which are beyond the scope of authority. **P4.** Keep record as per company policy to track maintenance history.	***You must know and understand:*** **K1.** Read maintenance schedule **K2.** Method of keeping record of maintenance schedule. **K3.** Understand machine operations **K4.** Identify faulty/damaged/ worn out parts **K5.** Troubleshooting of minor faults **K6.** Understand own scope of authority	**T1**. Wrench **T2**. AllenKey set **T3**. Spanner set **T4**. Hammer **T5**. Chisel **T6**. Bearing puller **T7**. Safety equipment **T8**. Maintenance Box **T9**. Measuring Tools

Unit of Competency	Performance Criteria	Knowledge	Tools & Equipment
D2. Perform general housekeeping and maintenance of machines and tools	***You must be able to:*** **P1.** Clean and maintain all bench-work tools and machines as per housekeeping checklists or instructions given. **P2.** Maintain cleanliness of the workplace. **P3.** Respond appropriately to safety hazards on all bench-work tools and machines. **P4.** Keep all the tools and material in proper place to ensure safe work.	***You must know and understand:*** **K1.** Importance of cleanliness of tools and machines. **K2.** Methods and techniques for cleanliness and maintenance of machines and tools. **K3.** Specific guidelines and checklists to conduct maintenance and housekeeping of machines and tools.	**T1**. Tool racks **T2**. Grease gun **T3**. Oil gun **T4**. Cotton rags/Floor brush **T5**. Tool grinders **T6**. Maintenance Box **T7**. Measuring Tools

Competency Module E: Perform Lathe Machine Operations

Overview: This Competency Standard identified the competencies required to perform lathe machine operations by a machinist in accordance with the organization's approved guidelines and procedures. You will be expected to perform facing, turning drilling/boring, taper turning, knurling and threading operations using lathe machine.

Your underpinning knowledge regarding lathe machine operations will be sufficient to provide you with the basis for your work.

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
E1. Perform facing operations	***You must be able to:*** **P1.** Select facing tools according to job requirement. **P2.** Mount and set the required work-holding devices, work piece and cutting tools. **P3.** Follow the correct specifications for the part or component to be produced. **P4.** Select safe procedures and tools to accomplish the work. **P5.** Adjust the operating parameters (e.g. speed and feed) of machine tool to achieve the work specification. **P6.** Ensure all safety mechanisms are in place.	***You must know and understand:*** **K1**. Safety precautions involved in work. **K2**. Methods and techniques of mounting and setting of work-piece. **K3**. Methods and techniques of adjusting operating parameters of machine tool. **K4**. Procedure of adjusting speed and feed. **K5**. Calculation of speed and feed. **K6**. Use of cutting tools.	**T1.** Lathe Machine **T2.** Cutting Tools **T3.** Measuring Tools **T4.** Personal Protective Equipment
E2. Perform turning operations	***You must be able to:*** **P1.** Obtain and follow work specifications, drawings or sketches to accomplish the	***You must know and understand:*** **K1.** Reading and interpreting work specifications, drawings and sketches.	**T1.** Lathe Machine

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
	work. **P2.** Set up and adjust the machine as per work specifications and procedures. **P3.** Ensure the components produced have the required quality and within the specified dimensional accuracy. **P4.** Shut down the machine and equipment on conclusion of the machining activities.	**K2.** Method and technique of setting up and adjusting the machine. **K3.** Techniques to check quality of component produced. **K4.** Procedure of shutting down of machine and equipment after closure of activities. **K5.** Safety precautions and procedures need to be observed during work.	**T2.** Cutting Tools **T3.** Measuring Tools **T4.** Personal Protective Equipment **T5.** Files
E3. Perform drilling or boring operations	***You must be able to:*** **P1**. Select drill or boring tools according to drawings. **P2**. Mount and set the required work-holding devices, work piece and cutting tools. **P3**. Adjust the RPM of machine according to the cutting speed. **P4**. Perform the boring operation according to the drawing. **P5.** Check quality of the component produced at different intervals. **P6.** Observe personal and workplace safety.	***You must know and understand:*** **K1.** Types of drilling or boring tools and their function. **K2.** Procedure of mounting and setting up of work-holding devices, work pieces and cutting tools. **K3.** Method and technique of adjusting RPM of lathe machine. **K4.** Safe boring procedures. **K5.** Techniques of checking quality of components. **K6.** Calculation of RPM. **K7.** Safety precautions and procedures.	**T1**. Drill **T2**. Drill chuck **T3**. Vernier caliper **T4**. Depth gauge **T5**. Personal Protective Equipment **T6**. Lathe Machine **T7**. Dial indicator

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
E4. Perform taper turning operations	***You must be able to:*** **P1.** Mount and set the required work-holding devices, work piece and cutting tools. **P2.** Select and adjust appropriate speeds and feeds of turning machine. **P3.** Produce a component which matches the work specifications using appropriate methods and techniques. **P4.** Check quality of the component produced at different intervals. **P5.** Follow safety precautions to ensure safe work and to avoid any injury.	***You must know and understand:*** **K1.** Kinds of tapers. **K2.** Types of taper turning methods. **K3.** Calculation of tapers. **K4.** Methods and techniques of adjusting speeds and feeds of turning machine. **K5.** Method of checking quality of components produced. **K6.** Specific safety guidelines and precautions.	**T1.** Lathe Machine **T2.** Cutting Tools **T3.** Vernier Caliper **T4.** Personal Protective Equipment **T5.** Files **T6.** Checking gauges
E5. Perform knurling operations	***You must be able to:*** **P1**. Select the knurling tool according to drawing. **P2**. Set the tool and work piece in the machine according to procedure. **P3**. Adapt methods and techniques to produce proper knurling on work piece. **P4.** Select and adjust appropriate speeds and feeds of lathe machine.	***You must know and understand:*** **K1.** Types of knurling tools. **K2.** Types of knurling. **K3.** Procedure of setting tools and work piece in the machine. **K4.** Methods of knurling. **K5.** Procedure of adjusting speeds and feeds of lathe machine.	**T1.** Lathe Machine **T2.** Knurling Tools **T3.** Personal Protective Equipment **T4.** Files

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
	P5. Use coolants during knurling to achieve smooth impression on work piece. **P6.** Observe personal and workplace safety.	**K6.** Importance of using coolants during knurling. **K7.** Safety precautions and guidelines.	
E6. Perform threading operations	***You must be able to:*** **P1.** Select and obtain the appropriate tools and equipment for the threading operations and check they are in usable condition. **P2.** Follow given work specifications for the component to be produced. **P3.** Shape the materials using appropriate methods and techniques. **P4.** Ensure all the required threading operations have been completed to the given specification. **P5.** Check quality of the component produced at different intervals. ***P6.*** Observe personal and workplace safety.	***You must know and understand:*** **K1.** Hazards associated with the hand fitting techniques. **K2.** Use of threading tools. **K3.** Work specifications and instructions. **K4.** Procedure for setting up of machine. **K5.** Methods and techniques for producing different types of threads. **K6.** Calculations of threading. **K7.** Safety precautions involved in threading operations.	**K1.** Lathe Machine **K2.** Threading Tools **K3.** Personal Protective Equipment **K4.** Files **K5.** Thread Pitch Gauge **K6.** Tool Center Gauge **K7.** Vernier Caliper

Competency Module F: Perform Milling Machine Operations

Overview: This competency standard identifies the competencies you need to perform milling operations on aMillingmachine in accordance with approved procedures. You will be expected to perform Face milling, Plain milling, Step milling, Squaring, Gear milling, slotting, Grooving, Drillingand Boring**.**You will be required to operate the milling machine safely by complying the organizational safety policy and approved procedures.
Your underpinning knowledge regarding milling machine operations will be sufficient to provide you with the basis for your work.

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
F1. Produce a square shaped work piece	***You must be able to:*** **P1.** Identify safety hazards related with milling operations and take appropriate steps to avoid any injury or accident. **P2.** Dial the machine vice according to job requirement. **P3.** Select cutters and set machine as per requirements. **P4.** Mount cutters and work piece in the machine. **P5.** Produce a part matching the process plan and the part print specifications. **P6.** Check quality of the component at suitable intervals. **P7.** Shut down the machine at safe position after finishing the work.	***You must know and understand:*** **K1.** List safety hazards related with the milling machine operations. **K2.** Use of dial indicator **K3.** Method of mounting the cutters **K4.** Checking of right angle with the tri-square. **K5.** Explain square milling procedure. **K6.** Safety guidelines and procedures. **K7.** Safety checks for operating milling machine. **K8.** Interpreting information given in the engineering drawings and job specifications. **K9.** How to use different measuring system	**T1**. Milling machine **T2**. Machine Vice **T3**. Tri square **T4**. Vernier Caliper **T5**. Dial indicator with magnet stand **T6**. Milling cutters **T7**. Personal Protective Equipment

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
		and techniques. **K10.** Handling cutting tools and their storage. **K11.** Recognizing faults in milling machine. **K12.** How to identify when cutters need re-sharpening. **K13.** Quality control procedures involved in squaring of work piece.	
F2. Perform spur gear cutting	***You must be able to:*** **P1.** Identify safety hazards related with milling operations and take appropriate steps to avoid any injury or accident. **P2.** Set the gear blank on the mandrel according to job requirement. **P3.** Hold the mandrel between indexing head and foot stock or tail stock. **P4.** Select the cutter according to the circular pitch and number of teeth. **P5.** Mount the cutter on the arbor according to procedure.	***You must know and understand:*** **K1.** Types of different cutters **K2.** Select exact number of cutters **K3.** Calculation of spur gear **K4.** Explain gear cutting procedure **K5.** Method of using tooth vernier **K6.** Method of mounting the cutter on the arbor. **K7.** Quality checks procedures and techniques. **K8.** Safety guidelines and procedures.	**T1**. Milling machine **T2**. Indexing head **T3**. Gear cutter **T4**. Vernier Caliper **T5**. Dial indicator with magnet stand **T6**. Set of module cutters. **T7**. Tooth Vernier

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
	P6. Set the dividing headaccording to requirements. **P7.** Perform the gear cutting according to the given specifications. **P8.** Check quality of the component at suitable intervals. **P9.** Shut down the machine at safe position after finishing the work.		
F3. Perform slotting or grooving on work piece	***You must be able to:*** **P1.** Identify safety hazards related with milling operations and take appropriate steps to avoid any injury or accident. **P2.** Set the work piece in machine vice according to procedure. **P3.** Select the appropriate cutter as per specifications. **P4.** Adjust the milling cutter for slotting and grooving. **P5.** Determine the touching point of the work piece. **P6.** Produce slotting or grooving on the work	***You must know and understand:*** **K1.** Identifying safety hazards associated with milling machine operations. **K2.** Safety guidelines and procedures. **K3.** Method of using of dial indicator **K4.** Method of mounting the cutters **K5.** Checking of right angle with the tri-square. **K6.** Explain the procedure of slotting and grooving. **K7.** Quality checks procedures and techniques.	**T1**. Slotting cutter **T2**. Vernier caliper **T3**. Depth gauge **T4**. End mil cutter

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
	piece to the required quality. **P7.** Check quality of the component at suitable intervals. **P8.** Shut down the machine at safe position after finishing the work. **P9.** Observe personal and workplace safety at all time.	**K8.** Types of slotting and grooving cutters.	
F4. Perform drilling or boring using milling machine	***You must be able to:*** **P1.** Identify safety hazards related with milling operations and take appropriate steps to avoid any injury or accident. **P2.** Select drill or boring tools according to drawings. **P3.** Mount and set the required work-holding devices, work piece and cutting tools. **P4.** Adjust the RPM of machine according to the standard chart. **P5.** Perform the boring operation according to the drawing. **P6.** Check quality of the component produced at different intervals.	***You must know and understand:*** **K1.** Identifying safety hazards associated with milling machine operations. **K2.** Types of drill or boring tools and their function. **K3.** Procedure of mounting and setting up of work-holding devices, work pieces and cutting tools. **K4.** Method and technique of adjusting RPM of milling machine. **K5.** Safe Boring and milling procedures. **K6.** Techniques of checking quality of components.	**T1**. Milling Machine **T2**. Boring unit **T3**. Boring tools **T4**. Depth gauge **T5**. Drill **T6**. Internal Micrometer **T7**. Personal Protective Equipment

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
	P7. Shut down the machine at safe position after finishing the work. **P8.** Observe personal and workplace safety at all time.	**K7.** Calculation of RPM. **K8.** Use of standard RPM chart. **K9.** Safety precautions and procedures.	

Competency Module G:Carry Out Computerized Numerical Control (CNC) Machine Operations

Overview: This competency standard identifies the competencies you need to Computerized Numerical Control (CNC) Machine operations in accordance with approved procedures. You will be expected to set CNC machine to perform milling and turning operations**.**You will be required to operate the milling machine safely by complying the organizational safety policy and approved procedures.
Your underpinning knowledge regarding CNC machine operations will be sufficient to provide you with the basis for your work.

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
G1. Set CNC machine according to job requirements	***You must be able to:*** **P1.** Mount and set the work-piece and cutting tool according to procedures. **P2.** Set up and adjust machine according to parameters to achieve work specification. **P3.** Report uncertainties and deviations to person concerned for timely action. **P4.** Observe safety and workplace precautions to avoid any injuries.	***You must know and understand:*** **K1.** Basic knowledge of CNC machine. **K2.** Machine process standards and functions. **K3.** Methods and techniques of adjusting operating parameters of machine. **K4.** Interpreting work specifications. **K5.** Techniques for checking quality of components produced. **K6.** Basic knowledge of G-Code and M-Code. **K7.** Basic computer operations. **K8.** Procedure for reporting uncertainties and deviations to person concerned for timely action. **K9.** X, Y, and Z axis. **K10.** Safety precautions and guidelines.	**T1**. CNC machine **T2**. CNC Manual

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
G2. Perform Milling Operations Using CNC Machine	***You must be able to:*** P1. Match work piece data with CAD data through software simulation. P2. Execute program on CNC milling to perform milling operations (e.g. surfacing, drilling, slotting, tapping, key ways, step cutting etc.) to achieve work specifications. **P3.** Follow correct specifications for the component to be produced. **P4.** Report uncertainties and deviations to person concerned for timely action. **P5.** Observe safety and workplace precautions to avoid any injuries.	***You must know and understand:*** **K1.** Use of control panel. **K2.** Quality check points with standards. **K3.** Basic knowledge of machine margins and alignments. **K4.** Interpret drawing and work specifications. **K5.** Reporting procedures in case of uncertainties and deviations. **K6.** G-Code and M-Code. **K7.** Safety precautions and guideline **K8.** Use of coordinate system	**T1**. CNC milling machine with all accessories **T2**. Cutting Tools **T3**. Tool Kit **T4**. Gauges **T5**. Measuring Instruments

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
G3. Perform turning operations using CNC machine	***You must be able to:*** **P1**. Match work piece data with CAD data through software simulation. **P2**. Execute program on CNC Lathe to perform turning operations to achieve work specifications. **P3.** Follow correct specifications for the component to be produced. **P4.** Report uncertainties and deviations to person concerned for timely action. **P5.** Observe safety and workplace precautions to avoid any injuries.	***You must know and understand:*** **K1.** Use of control panel. **K2.** Functions of CNC Lathe Machine and range of turning operations which include facing, grooving, tapering, taper turning, step turning, form turning, threading, knurling, drilling, boring, reaming. **K3.** Quality check points with standards. **K4.** Basic knowledge of machine margins and alignments. **K5.** Interpret drawing and work specifications. **K6.** Reporting procedures in case of uncertainties and deviations. **K7.** Use of coordinate systems. **K8.** Interpreting machine check sheet. **K9.** G-Code and M-Code. **K10.** Safety precautions and guidelines.	**T1**. CNC Lathe machine with all accessories **T2**. Cutting Tools **T3**. Tool Kit **T4**. Gauges **T5**. Measuring Instruments

Competency Module H: Perform Grinding Machine Operations

Overview: This competency standard identifies the competencies you need to perform grinding machine operations in accordance with approved procedures. You will be expected to perform different types of grinding which include off-hand, surface, universal cylindrical and tool and cutter grinding**.** You will be required to operate the grinding machine safely by complying the organizational safety policy and approved procedures.
Your underpinning knowledge regarding grinding machine operations will be sufficient to provide you with the basis for your work.

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
H1. Perform off-hand grinding	***You must be able to:*** **P1.** Select the proper size and shape of grinding wheel. **P2.** Hold the work piece firmly against the rotating wheel by placing it on the tool rest. **P3.** Use coolant at intervals to avoid over heating of the job. **P4.** Adopt technique and methods which are safe. **P5.** Produce component according to work operations. **P6.** Observe personal and workplace safety.	***You must know and understand:*** **K1.** Types of different grinding machines. **K2.** Type, size and shape of wheels and abrasive. **K3.** Technique of holding work piece against rotating wheel. **K4.** Importance of using coolant. **K5.** Methods and techniques for off-hand grinding. **K6.** Selecting correct standing position during grinding. **K7.** Specific safety precautions and guidelines.	**T1**. D-type bevel protector **T2**. Grinding Machine **T3**. Personal Protective Equipment **T4**. Coolant **T5**. Wheel Dresser stand **T6**. Dresser
H2. Perform surface grinding	***You must be able to:*** **P1.** Select the suitable size and type of grinding wheel.	***You must know and understand:*** **K1.** Type and size of wheels and abrasive.	**T1**. Surface Grinding Machine

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
	P2. Mount the work piece over the holding devices to ensure proper clamping. **P3.** Dress the wheel with diamond tip if required. **P4.** Identify reference points on work piece before grinding. **P5.** Adjust depth of cut according to speed of machine table. **P6.** Use coolant continuously to avoid over heating of the job. **P7.** Observe personal and workplace safety.	**K2.** Method of dressing of grinding wheel. **K3.** Work holding methods which include: • Magnet Table • Vice • Angle Plate • Machine base **K4.** Importance of using coolant. **K5.** Methods and techniques for surface grinding. **K6.** Selecting right standing position during grinding. **K7.** Specific safety precautions and guidelines.	**T2**. Holding Devices **T3**. Wheel Dresser **T4**. Grinding Wheels **T5**. Wheel Dresser Stand **T6**. Measuring Tools **T7**. Adjustable Wrench T8. Allen Key Set

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
H3. Perform universal cylindrical grinding	***You must be able to:*** **P1.** Select the suitable size and type of grinding wheel. **P2.** Mount work piece according to procedure (e.g. between two centers, chuck, collet, face plate). **P3.** Ensure the grinding wheel is balanced. **P4.** Follow suitable method for universal cylindrical grinding to ensure work specifications. **P5.** Use coolant continuously to avoid overheating of job. **P6.** Observe personal and workplace safety.	***You must know and understand:*** **K1.** Types of grinding. **K2.** Types and sizes of grinding wheels. **K3.** Procedure of mounting of work piece according to requirements which include: • Between Two Centers • Chuck • Collet and • Face Plate **K4.** Importance of balancing the grinding wheel. **K5.** Procedure of universal cylindrical grinding. **K6.** Safety precautions and guidelines specific to cylindrical grinding.	**T1**. Universal Cylindrical Grinding Machine. **T2**. Measuring Instruments **T3**. Grinding Wheels **T4**. Wheel Dresser **T5**. Dog Carrier **T6**. Screw Wrench **T7**. Coolants **T8**. Allen key Set **T9**. Personal Protective Equipment
H4. Perform tool and cutter grinding	***You must be able to:*** **P1.** Select the suitable size, type and shape of grinding wheel. **P2.** Mount work piece onto correct attachment for required procedure. **P3.** Adjust the attachments according to	***You must know and understand:*** **K1.** Types, sizes and shapes of grinding wheels. **K2.** Types of attachments and their use. **K3.** Procedure of mounting of work-piece on to related attachments.	**T1**. Diamond dresser tool **T2**. Grinding attachment **T3**. Universal bevel protector

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
	different types of tools and cutter grinding. **P4.** Follow procedure for sharpening of tools and cutter that is safe and appropriate. **P5.** Observe personal and safety precautions.	**K4.** Different tools and cutter angles. **K5.** Procedure of sharpening of tools and cutters. **K6.** Safety guidelines and precautions.	**T4**. Tool and Cutter Grinding Machine

Competency Module I: Perform Shaper Machine Operations

Overview: This competency standard identifies the competencies you need to perform shaping operations on shapermachine in accordance with approved procedures. You will be expected to perform Facing, Step cutting, Squaring, slotting, V shape cutting with point cutting tool**.**You will be required to operate the shaper machine safely by complying the organizational safety policy and approved procedures.
Your underpinning knowledge regarding shaper machine operations will be sufficient to provide you with the basis for your work.

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
I1. Produce a squared shape work piece	*You must be able to:* **P1**. Identify safety hazards related with shaping operations and take appropriate steps to avoid any injury or accident. **P2**. Dial the machine vice according to job requirement. **P3**. Select point cutting tool and set machine as per requirements. **P4**. Mount cutting tool and work piece in the machine. **P5**. Check quality of the component at suitable intervals. **P6**. Shut down the machine at safe position after finishing the work.	***You must know and understand:*** **K14.** List safety hazards related with the shaper machine operations. **K15.** Use of Dial indicator **K16.** Method of mounting of cutting tool **K17.** Checking of right angle with the tri square. **K18.** Explain square facing procedure. **K19.** Safety guidelines and procedures. **K20.** Safety checks for operating shaper machine. **K21.** Interpreting information given in the engineering drawings and job specifications.	**T1**. Shaper machine **T2**. Machine Vice **T3**. Tri square **T4**. Vernier Caliper **T5**. Dial indicator with magnet stand **T6**. Point cutting tools **T7**. Personal Protective Equipment

Unit of Competency	Performance Criteria	Knowledge and Understanding	Tools & Equipment
I2. Produce V shaped work piece	***You must be able to:*** **P1**. Identify safety hazards related with shaping operations and take appropriate steps to avoid any injury or accident. **P2**. Dial the machine vice according to job requirement. **P3**. Select point cutting tool and set machine according to job requirements. **P4**. Mount cutting tool and work piece in the machine. **P5**. Check quality of the component at suitable intervals. **P6**. Shut down the machine in safe position after finishing the work.	***You must know and understand:*** **K1**. List safety hazards related with the shaper machine operations. **K2**. Use of Dial indicator **K3**. Method of mounting of cutting tool **K4**. Checking of angle with the bevel protector. **K5**. V-Shape cutting procedure. **K6**. Safety guidelines and procedures. **K7**. Safety checks for operating shaper machine. **K8**. Interpreting information given in the engineering drawings and job specifications.	**T1**. Shaper machine **T2**. Machine Vice **T3**. Tri square/bevel protector **T4**. Vernier Caliper **T5**. Dial indicator with magnet stand **T6**. Point cutting tools **T7**. Personal Protective Equipment

LIST OF MACHINERY / EQUIPMENT / TOOLS ETC

(FOR A CLASS OF 25 STUDENTS)

Name of Trade	Mechanical Machinist
Duration of Course	01 – years

Sr. No.	Nomenclature of tools& equipment	Quantity
1.	Universal milling machine	10 Nos.
2.	Milling Attachment (Dividing head, slotting and Universal vertical Head 02 Nos.)	
3.	Lathe machine BL115	06 Nos.
4.	Lathe machine BE165 with one taper turning attachment	10 Nos.
5.	Power Hacksaw	01 Nos.
6.	Pillar type drill machine	01 Nos.
7.	Bench drill machine	02 Nos.
8.	CNC Lathe Machine with Core i7 computer (server)	01 Nos.
9.	CNC Milling Machine with Core i7 computer (server)	01 Nos.
10.	Computer – Core i5	10 Nos.
11.	Computer Table And Chairs	10 Nos.
12.	Surface grinding machine	01 Nos.
13.	Cylindrical grinding machine	01 Nos.
14.	Pedestal grinding machine	02 Nos.
15.	Bench vice with bench	25 Nos.
16.	Steel rule	25 Nos.
17.	Vernier caliper	25 Nos.
18.	Vernier height gauge	02 Nos.
19.	Vee block	04 Nos.
20.	Centre punch	25 Nos.
21.	Scriber	25 Nos.
22.	Divider	25 Nos.
23.	Screw driver set	6 set
24.	Philips	6 set
25.	Taps set m4,m5,m6,m8,m10,m12	4 each size

26.	Tap handle set	4 set
27.	Screw pitch gauge 60º	4 set
28.	Screw pitch gauge 55º	4 set
29.	Radius gauge 1-7,7.5-14mm	4 Nos.
30.	Combination set	4 Nos.
31.	Allen key set	4 set
32.	Double ended open spanner set 6-32mm	4 set
33.	Ring spanner set 6-32mm	4 set
34.	Ball peen hammer 500 gm	25 Nos.
35.	Cross peen hammer 500 gm	25 Nos.
36.	Marking hammer 250 gm	6 Nos.
37.	Number punch set	4 set
38.	Letter punch set	4 set
39.	Flat file 300 x1	25 Nos.
40.	Flat file 300x2	25 Nos.
41.	Flat file 250x2	25 Nos.
42.	Flat file 250x3	25 Nos.
43.	Flat file 150x1	25 Nos.
44.	Flat file 150x2	25 Nos.
45.	Half round file 200x2	25 Nos.
46.	Half round file 200x1	25 Nos.
47.	Round file 200x1	25 Nos.
48.	Round file 200x2	25 Nos.
49.	Round file 150x2	25 Nos.
50.	Round file 150x1	25 Nos.
51.	Needle file set	25 Nos.
52.	Key file set	25 Nos.
53.	File brush	25 Nos.
54.	Flat chisel	25 Nos.
55.	Cross cut chisel	25 Nos.
56.	Grooving chisel	25 Nos.
57.	Hand reamer 4,6,8,k10, 12, 57	6 sets

58.	Die M5, M6, M8, M10, M12	6 sets
59.	Dies handles	6 sets
60.	Drills 3.0, 3.8, 4, 4.2,4. 8,5.0,5.5,6.0,6.5,7. 0,7.5,8.0,8.2,8.5,9. 0,9.5,10.0,10.2,10.5, 5.0,12mm	10 sets
61.	Drill set 1 to 10 mm with difference 0.1 mm	12 set
62.	Centre drill 2.5, 3.0 mm	12 set
63.	H.S.S tool bits 8x8x160 mm	200 Nos.
64.	H.S.S tool bits 12x12x200mm	200 Nos.
65.	H.S.S tool bits 16x16x200 mm	200 Nos.
66.	Morse taper gauge set (plug + ring) MT-2, MT-3, MT-4	One each.
67.	Oil cane	12 Nos.
68.	Tool centre gauge	6 Nos.
69.	Hand vice	8 Nos.
70.	Adjustable wrench 12”	6 Nos.
71.	Try angle file 200x2	25 Nos.
72.	Try angle file 200x1	25 Nos.
73.	Counter sink 18; x60º, 12.5x60º	08 sets
74.	Counter bore M 4, M 6, M 10, M 12	06 sets
75.	Twist drill grinding gauge	06 Nos.
76.	Safety goggle	25 Nos.
77.	Diamond dresser with holder	04 Nos.
78.	Acme thread gauge	06 Nos.
79.	Drill drift	06 Nos.
80.	Combination pliers	06 Nos.
81.	Tool box	25 Nos.
82.	Surface plate	3 Nos.
83.	Plain milling cutter φ 100 ⌀50x27	08 Nos.
84.	Plain milling cutter φ 63x50x22 mm	08 Nos.
85.	Plain milling cuter φ 63x25x27 mm	08 Nos.
86.	Side and face cutter φ 80x8x27 mm	08 Nos.
87.	Side φ 80x12x27 and face cutter φ 80x14x27 mm	08 Nos.
88.	Side and face cutter φ 80x18x27	08 Nos.

89.	End mill cutter φ 4 mm two lipped	12 Nos.
90.	End mill cutter φ 5 mm two lipped	12 Nos.
91.	End mill cutter φ 6 mm two lipped	12 Nos.
92.	End mill cutter φ 8 mm two lip/four lip	12 Nos.
93.	End mill cutter φ10 mm	12 Nos.
94.	End mill cutter φ12 mm	12 Nos.
95.	End mill cutter φ14 mm	12 Nos.
96.	End mill cutter φ16 mm	12 Nos.
97.	End mill cutter φ18 mm	12 Nos.
98.	Involute gear milling cutter module 1.0 mm	03 sets
99.	Involute gear milling cutter module 1.5 mm	03 sets
100.	Involute gear milling cutter module 1.75 mm	03 sets
101.	Involute gear milling cutter module 2.0 mm	03 sets
102.	Convex cutter R6x80 mm	03 Nos.
103.	Convex cutter R8x80 mm	03 Nos.
104.	Convex cutter R12x80 mm	03 Nos.
105.	Micro meter 25 mm	04 Nos.
106.	Micro meter 25-50mm	04 Nos.
107.	Micro meter 50-75mm	04 Nos.
108.	Inside micro meter 5-55 mm	04 Nos.
109.	Dial Vernier calipers	04 Nos.
110.	Dial indicator with magnetic stand	04 Nos.
111.	Digital venire calipers 160mm	04 Nos.
112.	Digital micro meter 0-25 mm	04 Nos.
113.	Digital micro meter 25-50 mm	04 Nos.
114.	Safety goggles	25 Nos.
115.	Safety helmet	25 Nos.
116.	Ear plugs	25 Nos.
117.	Fire extinguisher	25 Nos.
118.	Smoke alarm	2 Nos.
119.	First aid box	2 Nos.

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