

TRADE : FITTER AND TURNER

| MODULE | CODE | OBJECTIVES | CRITERIA |
|------------------|-------------|---|---|
| INDUCTION | ID1 | Recall applicable sections of the Manpower Training (Act No 56, 1981), with special reference to discipline and legal responsibilities. | Pass a questionnaire with at least 80%. |
| | ID2 | Recall terms and conditions of apprenticeship as Gazetted 26 July 1991. | Pass a questionnaire with at least 80%. |
| | ID3 | Recall applicable grievance procedures. | Pass a questionnaire with at least 80%. |
| | ID4 | Recall applicable disciplinary procedures. | Pass a questionnaire with at least 80%. |
| | ID5 | Recall company rules and procedures. | Pass a questionnaire with at least 80%. |
| | ID6 | Recall quality assurance procedures. | Correct according to company standards and procedures with a minimum of five (5) questions and 100% pass. |
| SAFETY | SF1 | Recall relevant regulations of the following Acts: (where applicable) <input type="checkbox"/> Occupational Health and Safety Act (Act No 85, 1993). <input type="checkbox"/> Minerals Act and Regulations (Act No 50, 1991). | Pass a questionnaire with at least 80%. |
| | SF2 | Attend a standard industrial safety course accredited by the industry. | Obtain a recognised certificate. |
| | SF3 | Recall safety in welding and gas cutting. | All safety aspects correct according to accredited procedures. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|-----------------------|------|--|--|
| | SF4 | Attend a first aid course. | Obtain a recognised certificate - 1st level. |
| | SF5 | Identify relevant colour markings and symbolic safety signs. | Correct use of SABS 0140 and SABS 1186 publications. |
| HAND TOOLS | HT1 | Identify measuring, checking, forming, cutting, marking and fastening tools and tooling aids. | Correctly identify all the tools and state all their physical characteristics. |
| | HT2 | Use measuring, checking, forming, cutting, marking and fastening tools and tooling aids. | a) <u>Measuring and marking tools</u> - 1,0mm accumulative dimensional tolerance and 2° on angular tolerance. b) <u>Checking tools</u> - 0,5mm dimensional tolerance. c) <u>Forming, cutting and marking tools</u> - correct application. d) All safety aspects adhered to. |
| | HT3 | Maintain measuring, checking, forming, cutting, marking and fastening tools and tooling aids. | Tools in a safe and functional working condition. |
| | HT4 | Use hand tools applicable to the trade. | 1. All safety aspects adhered to. 2. No tools or equipment is damaged. 3. All tools and equipment are clean after use. |
| WORKSHOP TOOLS | WT1 | Use fixed and portable drilling machines. | 1. Correct speeds and feeds to be used. 2. Holes to be within 0,5mm of centre. 3. Correct cutting compounds to be used. |
| | WT2 | Use a fixed and portable grinding machines including replacing, setting, truing and ringing of wheels. | All prescribed safety standards applied. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|------------------------------|------|--|---|
| | WT3 | Use a portable jig-saw. | <ol style="list-style-type: none"> 1. All safety aspects are adhered to. 2. No equipment is damaged. 3. All tools and equipment are clean after use. |
| | WT17 | Operate pneumatic and or electrical power tools. | <ol style="list-style-type: none"> 1. All safety aspects adhered to. 2. No damage to components to equipment. |
| | WT20 | Use hand operated presses. | <ol style="list-style-type: none"> 1. All safety aspects adhered to. 2. No damage to components. |
| | WT21 | Mount grinding stone to pedestal grinder Maximum size: 250mm diameter wheel RPM = 2 000 | <ol style="list-style-type: none"> 1. Ring test 100% correct. 2. No visible damage. 3. Only blotting paper gaskets on each side. 4. Speed of grinder must not exceed wheel speed. 5. Toolrest as close as possible to stone. 6. Tighten nut to hold wheel firmly. |
| | WT22 | Dress a grinding wheel | Wheel must be concentric. |
| MATERIALS | MA1 | Recall the terms, definitions and use of materials pertaining to the trade with special reference to plates, tubes, pipes and hollow sections. | Minimum of 15 questions with at least 80% pass. |
| | MA2 | Recall the physical properties and characteristics of metal. | Minimum of 15 questions with at least 80% pass. |
| | MA3 | Identify ferrous and non-ferrous metals. | Each type of material correctly identified. |
| DRAWINGS AND SKETCHES | DS1 | Recall terms and definitions pertaining to engineering drawings. | A test of minimum 15 questions to be set with 100% pass mark against SABS 044 Part 1 and SABS 0111. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|--------------------|------|--|--|
| | DS2 | Interpret relevant symbols, abbreviations and tolerances. | A test of minimum 20 questions to be set with 100% pass mark against SABS 044, Part 2 and SABS 0111. |
| | DS7 | Make free hand sketches including plan, front and side elevations. | <ol style="list-style-type: none"> To be legible and identifiable. All dimensions recorded to be 100% correct. |
| | DS8 | Compile a material list from engineering drawings. | 100% correct. |
| | DS9 | Identify type of fits from engineering drawings. | 100% correct according to ISO R286. |
| | DS10 | Identify surface textures. | According to comparison scale. |
| MARKING OFF | MT6 | Mark off a seven-holed flange/coupling. | <ol style="list-style-type: none"> No double lines. Punch hole centres 100% correct. All dimensions to be within 0,25mm. According to specific drawings. |
| | MT7 | Mark off a five-holed flange/coupling. | <ol style="list-style-type: none"> No double lines. Punch hole centres 100% correct. All dimensions to be within 0,25mm. According to specific drawings. |
| | MT8 | Mark off a flange consisting of a centre hole. | <ol style="list-style-type: none"> No double lines. Punch hole centres 100% correct. All dimensions to be within 0,25mm. According to specific drawings. |
| | MT9 | Mark off projects for manufacturing using all standard marking-off techniques and tools. | <ol style="list-style-type: none"> No double lines. Punch hole centres 100% correct. All dimension to be within 0,25mm. According to specific drawings. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|--------------------|------|--|---|
| HAND SKILLS | HS2 | Sharpen chisels. | Cutting angle is correct and no mushroom on the chisel head. |
| | HS3 | Sharpen drills. | Angles according to tables and application. |
| | HS4 | Dress screwdrivers. | <ol style="list-style-type: none"> 1. All safety aspects adhered to. 2. Screwdrivers to be functionally correct. |
| | HS5 | Sharpen punches. | <ol style="list-style-type: none"> 1. All safety aspects adhered to. 2. Correct included angles according to application. |
| | HS7 | Sharpen marking-off tools. | Marking edge to make single scribing lines. |
| | HS8 | Manufacture a project using the following techniques and material: filing, sawing, drilling, tapping, reaming. Material: mild steel. | <ol style="list-style-type: none"> 1. All sizes within 0,05mm. 2. All surfaces flat and square. 3. Surface texture down to N9 according to comparison scale. |
| | HS9 | Harden and temper a centre punch. | <ol style="list-style-type: none"> 1. Temperature and colour controlled according to specifications. 2. Temper to be correct for application. |
| | HS10 | Sharpen single point machine cutting tools. | Angles according to tables for different materials. |
| ARC WELDING | AO1 | Identify and set up AC and/or DC welding machines, equipment including starting up and shutting down procedures. | <ol style="list-style-type: none"> 1. Correct according to manufacturers handbook. 2. All safety aspects adhered to. |
| | AO2 | Differentiate between arc welding consumables | Correct to manufacturers specifications. |
| | AO3 | Prepare material for arc welding | <ol style="list-style-type: none"> 1. Correct according to company welding procedures and practises with regard to weld joint preparation, voltage, amperages, and welding consumables. 2. All safety aspects adhered to. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|---------------------------------|------|---|---|
| | AO4 | Tack and arc weld workpieces incidental to the trade using manual metal arc welding techniques. | <ol style="list-style-type: none"> 1. Correct according to company quality control procedures. 2. All safety aspects adhered to. |
| GAS WELDING AND BRAZING | GW10 | Identify and set up oxygen-fuel gas welding equipment including light up, adjustment of gas pressures and shut down procedures. | <ol style="list-style-type: none"> 1. Correct according to manufacturers handbook. 2. All safety aspects adhered to. 3. Selection of correct size nozzles in relationship to material thickness. |
| | GW11 | Differentiate between brazing and gas welding consumables. | Correct according to manufacturers specifications. |
| | GW12 | Prepare material for brazing and gas welding | <ol style="list-style-type: none"> 1. Correct to company brazing and gas welding procedures with regard to joint preparation including brazing and gas welding consumables. 2. All safety aspects adhered to. |
| | GW13 | Braze and gas weld workpieces incidental to the trade. | <ol style="list-style-type: none"> 1. Correct according to company quality control procedures. 2. All safety aspects adhered to. |
| GAS CUTTING AND HEATING | GC1 | Identify and assemble gas cutting and heating equipment, including light up and shut-down procedures. | Correct method and procedure according to safety standard. |
| | GC2 | Select nozzles and gas pressures for cutting and heating different materials of various thicknesses. | 100% correct according to manufacturers charts. |
| | GC3 | Hand cut and heat materials incidental to the trade. | Company quality standards on finish and with maximum 2mm deviation from line. |
| BASIC LIFTING TECHNIQUES | BG2 | Recall overhead crane hand signals. | 100% correct according to recognised code of practice. (British Standards) |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|---------------------------------|------|---|---|
| LUBRICATION | LU1 | Identify the following types of lubrication systems; force-feed, splash-feed and gravity -feed. | 100% correct. |
| | LU2 | Identify the following types of lubricants; oil, grease, copper compound, thread cutting compounds. | 100% correct. |
| | LU3 | Diagnose faults in a force feed system. | <ol style="list-style-type: none"> 1. No dirt contamination in system. 2. All blockages detected. 3. All outlets to deliver set amount of grease. 4. All in-line filters clean. |
| | LU4 | Pack bearings with grease. | <ol style="list-style-type: none"> 1. Quantity as per speed specification. 2. Bearings packed prior to start. |
| KEYS AND LOCKING DEVICES | KL1 | Identify the following types of keys - gib-head, parallel, taper, feather, woodruff, and tangential. | 100% correct. |
| | KL2 | Manufacture a gib-head, parallel, taper and feather key. | <ol style="list-style-type: none"> 1. No damage to components. 2. Sizes according to chart size. 3. Taper of key according to components. 4. Surface to bear 80%. |
| | KL3 | Fit a gib-head, parallel, taper, feather key. | Key surface to bear 80%. |
| | KL4 | Install the following locking devices - lock-nuts, dowels, lock-plates, split pins, taper pins and wire method. | All burrs and rough edges, ground smooth. |
| | KL5 | Remove a gib-head, parallel, taper and feather key. | No damage to components. |
| | KL6 | Identify nuts and bolts. | 100% correct. |
| | KL7 | Tighten nuts and bolts. | <ol style="list-style-type: none"> 1. Torque to specified standard. 2. No damage to threads and bolt heads. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|------------------|------|--|--|
| COUPLINGS | CP1 | Identify the following types of couplings - flexible, rigid, slip couplings and universal couplings (carden shaft). | 100% correct. |
| | CP2 | Mount and align the following couplings: 1. Flexible tyre coupling 2. Rigid flange coupling 3. Bibby tyre coupling 4. Internal gear coupling | According to manufacturers specifications. |
| | CP7 | Diagnose faults on the following couplings: fenner flex, rigid, bibby, and internal gear couplings. | All faults diagnosed. |
| BEARINGS | BE1 | Identify plain metal bearing materials such as bronze, white metal, synthetic. | 100% correct. |
| | BE2 | Identify solid, split and guide bearings. | 100% correct. |
| | BE5 | Make oil grooves and wedges. | Size: 5mm wide and within 12 mm from bearing ends. |
| | BE6 | Identify classes of bearings. | Identify 16 out of 20 given bearings correctly. |
| | BE7 | Identify the following ball bearings - deep groove, angular contact, self-alignment and thrust. | 100% correct. |
| | BE8 | Identify the following types of roller bearings - spherical, thrust, taper, cylindrical. | 100% correct. |
| | BE9 | Fit a bearing to a shaft using a hand operated press, sleeve, oil bath and or induction heater. | 1. No damage to components and equipment. 2. Fits according to ISO R286 standard. 3. Correct bearing load application. 4. No shock loads applied to bearing. 5. Maximum heating temperature 110° celsius. 6. Correct speed application. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|---------------|------|--|---|
| | BE10 | Remove a bearing from a shaft using a bearing puller or hand operated press. | No damage to components. |
| | BE11 | Fit a spherical roller bearing and adaptor sleeve to a shaft. | Clearance between outer race and roller within 0,05mm. |
| | BE12 | Remove a spherical roller bearing from an adaptor sleeve and shaft. | No damage to bearing, adaptor sleeve or shaft. |
| | BE13 | Fit and remove a thrust bearing on a shaft (single direction). | 1. No damage to components. 2. Bearing axial loading mounted correct. |
| | BE14 | Fit a roller bearing on a shaft. | Maximum axial ends float 0,04 mm. |
| | BE15 | Recall types of bearing failures and their causes. | Pass a questionnaire with at least 80%. |
| DRIVES | DR1 | Identify the following types of drives - belt, gear, fluid and chain. | 100% correct. |
| | DR2 | Identify A, B and C class V-belts. | 100% correct. |
| | DR3 | Install and align a single belt-drive. | 1. Tension set according to 1mm per 100 mm span length per kilogram force. 2. Align within 0,05mm. |
| | DR4 | Install and align match-set belt drives. | 1. Tension set according to 1mm per 100 mm span length per kilogram force. 2. Align within 0,05mm. |
| | DR6 | Install and align chain drives. | 1. Tension correct according to formula. 2. Align within 0,05mm. |
| | DR7 | Maintain belt drives. | 1. Groove according to standard V-belt gauge. 2. No scorch marks on belts. 3. No axial movement of pulleys. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|-------------------|------|--|--|
| | DR8 | Maintain gear drives. | <ol style="list-style-type: none"> 1. No deformation of involute shape. 2. No broken teeth. 3. No axial movement. 4. Correct tooth depth clearance. |
| | DR9 | Maintain chain drives. | <ol style="list-style-type: none"> 1. No axial movement at sprockets. 2. No deformation of sprocket depth. 3. Maximum chain stretch = 2 x pitches or 2% elongation. |
| | DR10 | Maintain a fluid drive. | <ol style="list-style-type: none"> 1. Filling angle according to set standard chart. 2. No cracks on spiral plate. 3. No oil leaks at seals. 4. Misalignment within specifications. |
| | DR11 | Install jockey on V-belt and chain drive units. | According to manufacturers specification. |
| ASSEMBLIES | AS1 | Dismantle a worm-wheel type reduction gearbox. | <ol style="list-style-type: none"> 1. No damage to components. 2. Matching covers must be marked. |
| | AS2 | Assemble a worm-wheel type gearbox. | <ol style="list-style-type: none"> 1. No damage to components. 2. Alignment: 25% oil lead on worm-wheel bearing teeth. 3. Worm-wheel end float according to specifications. 4. Worm end float according to specifications. |
| | AS3 | Identify the following types of fits on shafts and hole basis - clearance, transition, interference. | All tolerances within ISO standard hole basis system |
| | AS4 | Fit a boss to a shaft with reference to clearance fit. | All tolerances within ISO standard hole basis system |
| | AS5 | Fit a boss to a shaft with reference to transition fit. | All tolerances within ISO standard hole basis system. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|----------------------------|------|---|---|
| | AS6 | Fit a boss to a shaft with reference to interference fit. | <ol style="list-style-type: none"> 1. No damage to components. 2. Only extractor screws to be used. |
| | AS8 | Fit seal and packing to mechanical components. e.g.: pumps, gearboxes, etc. | <ol style="list-style-type: none"> 1. No damage to components. 2. Sealing direction 100% correct. |
| BRAKES AND CLUTCHES | BC1 | Identify the following brake systems: <ul style="list-style-type: none"> <input type="checkbox"/> disc <input type="checkbox"/> thruster <input type="checkbox"/> electro-magnetic | 100% correct. |
| | BC2 | Maintain disc brakes. | <ol style="list-style-type: none"> 1. Minimum brake pad thickness = 1mm. 2. No scored marks on disc braking surface. 3. No air in hydraulic system. 4. No fluid leaks. |
| | BC3 | Maintain thruster brakes - calliper type. | <ol style="list-style-type: none"> 1. Minimum brake pad wear = 1mm above rivet head. 2. No scored marks on brake drum surface. 3. Equal brake shoe air gap according to specification. 4. No fluid leaks on thruster. |
| | BC4 | Maintain electro-magnetic brakes. | <ol style="list-style-type: none"> 1. Air gap set according to specifications. 2. No scored marks on brake drum. 3. Minimum brake pad wear = 1mm above rivet heads. |
| | BC5 | Identify centrifugal and multi-disc clutch systems. | 100% correct. |
| | BC7 | Maintain a multi-disc clutch | <ol style="list-style-type: none"> 1. Air gap set according to specifications. 2. Position adjusting ring lock clips. 3. Maximum wear indication marks must be visible. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|----------------------------------|------|---|--|
| PUMPS | PU1 | Identify the following types of pumps: <input type="checkbox"/> centrifugal <input type="checkbox"/> reciprocating <input type="checkbox"/> gear | 100% correct. |
| | PU2 | Define the terms positive and non positive displacement. | Correct according to specific type of pump. |
| | PU3 | Install gland bush packing. | <ol style="list-style-type: none"> 1. No damage to components. 2. One water drop per 10 seconds for gland lubrication. 3. Distance between gland and bush even measurement. 4. No scorch marks on shaft due to heat. |
| | PU4 | Install a mechanical seal. | <ol style="list-style-type: none"> 1. No damage to seal or components. 2. No dirt contamination in sealing faces. 3. No damage to components. 4. No leaks. |
| | PU5 | Prime centrifugal, reciprocating and gear pumps. | <ol style="list-style-type: none"> 1. All air must be bled out. 2. Direction 100% correct. |
| | PU6 | Diagnose faults on centrifugal, reciprocating and gear pumps. | <ol style="list-style-type: none"> 1. No cavitation allowed. 2. Correct position of foot-valves. 3. Direct proportional head increase to motor amperage. |
| | PU7 | Interpret given flow diagrams and systems. | 100% correct. |
| INSTALLATION OF MACHINERY | IM1 | Install and level gearboxes, motors, machines and pumps. | <ol style="list-style-type: none"> 1. All safety aspects adhered to. 2. No damage to equipment. 3. Level within 0,05mm per 1 000 mm. 4. Correct position of wedges and packing. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|------------|------|---|---|
| HYDRAULICS | HY1 | Interpret symbols and abbreviations. | 100% correct according to ISO 1219 table. |
| | HY2 | Interpret elementary hydraulic circuit diagrams. | 100% correct according to ISO 1219 table. |
| | HY3 | Identify the following hydraulic fluids: <input type="checkbox"/> petroleum based <input type="checkbox"/> emulsion based | 100% correct. |
| | HY4 | Install and maintain the following filters: <input type="checkbox"/> suction <input type="checkbox"/> pressure <input type="checkbox"/> return | <ol style="list-style-type: none"> 1. No fluid leaks. 2. Restriction indicator in specified position. 3. Micron rating specifications. 4. Flow direction 100% correct. |
| | HY5 | Install and maintain hydraulic tubing and fittings. | <ol style="list-style-type: none"> 1. Pipe schedule according to pressure range. 2. No flow restriction due to pipe formations. 3. Colour code according to ISO 0140 Part 3. 4. No fluid leaks at compression fittings. |
| | HY6 | Install and maintain flexible hydraulic hoses and fittings. | <ol style="list-style-type: none"> 1. No fluid leaks at fittings. 2. No twist on bends in pipes. 3. Minimum bend radius must be maintained = 2% - 4% of pipe length allowed for pressure change. 4. No criss-crossing of pipes. |
| | HY7 | Identify the following hydraulic pumps - vane, gear, piston. | 100% correct. |
| | HY8 | Install and maintain hydraulic pumps. | <ol style="list-style-type: none"> 1. No damage to components, equipment and seals. 2. Inlet manifold connected correctly. 3. Outlet manifold connected correctly. 4. No fluid leaks. 5. Correct fluid used. 6. All bolts secured. 7. Alignment according to sealing surfaces. 8. No score marks on sealing surfaces. Pump functions according to specifications. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|-------------------|------|---|--|
| | HY9 | Service procedures of reservoir. | <ol style="list-style-type: none"> 1. No damage to components, equipment and seals. 2. No fluid leaks. 3. Correct fluid used. 4. All bolts secured. 5. No score marks on sealing surfaces. 6. Pump functions according to specifications. |
| | HY10 | Install and maintain directional control, pressure and flow control valves. | <ol style="list-style-type: none"> 1. No fluid leaks. 2. Pressure relieved to fail safe. 3. No damage to equipment. 4. No dirt contamination in components. |
| | HY11 | Install and maintain hydraulic cylinders. | <ol style="list-style-type: none"> 1. No dirt contamination in components and fluids. 2. No fluid leaks. 3. No damage to equipment. 4. No score marks and ridges in barrels. 5. Pressure relieved to fail safe. |
| | HY12 | Identify and install accumulators. | <ol style="list-style-type: none"> 1. No damage to equipment. 2. No gas leaks. 3. No fluid leaks. 4. Ensure complete discharge prior to pre-charge. 5. Adhere to regulations. |
| | HY13 | Diagnose faults in basic hydraulic systems. | <ol style="list-style-type: none"> 1. Adhere to fail safe procedure. 2. No deviation from pre-set pressure. 3. No loss in fluid flow. 4. No cavitation at pump. 5. All pressure valves set to pre-set pressure. 6. No malfunction at directional control valves. 7. All quick-release couplings coupled safely. |
| PNEUMATICS | PN1 | Interpret symbols and abbreviations. | 100% correct according to ISO 1219 standards. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|--------|------|---|---|
| | PN2 | Interpret pneumatic circuit diagrams. | 100% correct according to ISO 1219 standards. |
| | PN3 | Identify compressed air pipelines. | Colour according to SABS 0140 Part 3. |
| | PN4 | Install and maintain compressed air pipelines. | <ol style="list-style-type: none"> 1. Ring main gradient - 2° in direction of air flow. 2. All outlets to be drained correctly. 3. No air leaks. |
| | PN5 | Install and maintain air service units. | <ol style="list-style-type: none"> 1. No air leaks. 2. Inlet and outlet direction 100% correct. 3. No cracks in collector bowls. |
| | PN6 | Install and maintain cylinders. | <ol style="list-style-type: none"> 1. No damage to components. 2. No air leaks. 3. No dirt contamination. 4. No score marks and ridges in barrel. |
| | PN7 | Install and maintain directional control, flow control and pressure valves. | <ol style="list-style-type: none"> 1. No air leaks. 2. Pressure relieved to fail safe. 3. No damage to equipment. 4. No dirt contamination in components. |
| | PN9 | Testing of set safety valves. | <ol style="list-style-type: none"> 1. No damage to components. 2. Blow-off pressure set at 5% of working pressure. |
| | PN10 | Recall the service procedure for air receivers. | According to the applicable regulations of the Mines and Works Act or the Machinery and Occupational Safety Act, whichever Act is applicable. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|--------------------------|------|--|--|
| | PN12 | Diagnose faults in pneumatic systems. | <ol style="list-style-type: none"> 1. Adhered to fail safe procedures. 2. No loss in air flow. 3. All valves set to pre-set pressure. 4. All quick-release couplings coupled safely. 5. Flow sequence 100% correct. 6. No air leakage. |
| CENTRE LATHE WORK | CL1 | Carry out routine inspection on centre lathe. | <ol style="list-style-type: none"> 1. All safety aspects adhered to. 2. All slides must be oiled and cleaned. 3. Oil levels according to level marks. 4. No excessive slide clearance. 5. Toolpost and chuck spanners to fit properly. |
| | CL2 | Compile a machining procedure. | Procedure to allow workpiece to be completed in a logical manner. |
| | CL3 | Recall the parts of a centre lathe. | 100% correct. |
| | CL4 | Set calibrated dials. | <ol style="list-style-type: none"> 1. Calibration and reading of dials 100% correct. 2. Method of angle setting on compound slide 100% correct. |
| | CL5 | Set up a workpiece in a four-jaw chuck. | <ol style="list-style-type: none"> 1. Correct according to centre lines. 2. Correct according to outside diameter. 3. Correct according to inside diameter. 4. Square to face. 5. Correct according to eccentric lines. |
| | CL6 | Identify types of cutting tools with reference to: (i) High speed toolbits (ii) Throw away bits (inserts tungsten carbide) | 100% correct according to application and angles for different materials. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|--------|------|--------------------------------------|--|
| | CL7 | Turn an external parallel workpiece. | <ol style="list-style-type: none"> 1. All safety aspects adhered to. 2. No damage to components. 3. 100% correct to drawing specifications (ISO standard). 4. No burrs allowed on any surfaces. 5. Maximum surface texture according to N6 on the comparison scale. 6. All tolerances according to ISO R286. 7. Speeds and feeds according to type of materials and tooling. 8. Correct centre height of specific tool and application. 9. Correct cutting compound used where applicable. |
| | CL8 | Turn an internal parallel workpiece. | <ol style="list-style-type: none"> 1. All safety aspects adhered to. 2. No damage to components. 3. 100% correct to drawing specifications (ISO standards). 4. No burrs allowed on any surfaces. 5. Maximum surface texture according to N6 on the comparison scale. 6. All tolerances according to ISO R286. 7. Speeds and feeds according to type of material and tooling. 8. Correct centre height of specific tool and application. 9. Correct drilling procedures used. 10. Correct cutting compound used where applicable. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|--------|------|--|--|
| | CL9 | Turn the following internal and external threads: (i) "V" and acme / trapezoidal (ii) Left hand and right hand (iii) Single and two-start | <ol style="list-style-type: none"> 1. All safety aspects adhered to. 2. No damage to components. 3. 100% correct to drawing specifications (ISO standards). 4. No burrs allowed on any surfaces. 5. Maximum surface texture according to N6 on the comparison scale. 6. All tolerances according to ISO R286. 7. Speeds and feeds according to type of material and tooling. 8. Correct centre height of specific tool and application. 9. Pitch/lead 100% correct. 10. Thread angle 100% correct. 11. Calculations according to formulae. 12. Fits according standard gauges. 13. Compound slide set correctly. 14. Correct cutting compound used where applicable. |
| | CL10 | Turn an external and internal taper using a compound slide. | <ol style="list-style-type: none"> 1. All safety aspects adhered to. 2. No damage to components. 3. 100% correct to drawing specifications (ISO standards). 4. No burrs allowed on any surfaces. 5. Maximum surface texture according to N6 on the comparison scale. 6. All tolerances according to ISO R286. 7. Speeds and feeds according to type of material and tooling. 8. Correct centre height of specific tool and application. 9. Calculation 100% correct. 10. Compound slide set 100% correct. 11. Taper fit on male and female to be correct. 12. Correct cutting compound used where applicable. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|--------|------|---------------------------------------|--|
| | CL11 | Turn an external and internal radius. | <ol style="list-style-type: none"> 1. All safety aspects adhered to. 2. No damage to components. 3. 100% correct to drawing specifications (ISO standards). 4. No burrs allowed on any surfaces. 5. Maximum surface texture according to N6 on the comparison scale. 6. All tolerances according to type of material and tooling. 7. Correct centre height of specific tool and application. 8. Form according to radius gauge. 9. Correct cutting compound used where applicable. |
| | CL12 | Turn a workpiece between centres. | <ol style="list-style-type: none"> 1. All safety aspects adhered to. 2. No damage to components. 3. 100% correct to drawing specifications (ISO standards). 4. No burrs allowed on any surfaces. 5. Maximum surface texture according to N6 on the comparison scale. 6. All tolerances according to ISO R286. 7. Speeds and feeds according to type of material and tooling. 8. Correct centre height of specific tool and application. 9. Correct method of clamping with a lathe carrier to be used. 10. Correct cutting compound used where applicable. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|-----------------------------|------|---|--|
| | CL13 | Turn workpieces using fixed and travelling steadies. | <ol style="list-style-type: none"> 1. All safety aspects adhered to. 2. No damage to components. 3. 100% correct to drawing specifications (ISO standard). 4. No burrs allowed on any surfaces. 5. Maximum surface texture according to N6 on the comparison scale. 6. All tolerances according to ISO R286. 7. Speeds and feeds according to type of material and tooling. 8. Correct centre height of specific tool application. 9. Correct cutting compound used where applicable. |
| MILLING MACHINE WORK | MM1 | Carry out routine inspection on milling machine. | <ol style="list-style-type: none"> 1. All safety aspects adhered to. 2. All slides must be oiled and cleaned. 3. Oil levels according to level marks. 4. No excessive slide clearance. |
| | MM2 | Compile a machining procedure. | Procedure to allow workpiece to be completed in logical manner. |
| | MM3 | Recall the parts of a universal milling machine. | 100% correct. |
| | MM4 | Set calibrated dials. | <ol style="list-style-type: none"> 1. Calibration and reading of dials 100% correct. 2. Method on angle settings 100% correct. |
| | MM5 | Set up workpiece in a dividing head using a three-jaw chuck, and between centres. | <ol style="list-style-type: none"> 1. Centres of milling machine in line. 2. No damage to workpiece by carrier and firmly in position. |
| | MM6 | Set up a workpiece on a turntable. | <ol style="list-style-type: none"> 1. No damage to components. 2. Workpieces correctly and securely clamped. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|--------|------|--|---|
| | MM7 | Set up a workpiece in a machine vice. | <ol style="list-style-type: none"> 1. No damage to components. 2. Workpiece correctly set up and secured. 3. Vice correctly set up and secured. 4. Correct to outside surfaces. 5. Correct to inside surfaces. 6. Correct to face surfaces. |
| | MM8 | Use a dividing head for simple and differential indexing. | <ol style="list-style-type: none"> 1. Index calculations 100% correct. 2. Sector arm 100% correct. 3. Index plate selection 100% correct. 4. Gear selection 100% correct. 5. Gear assembly 100% correct. |
| | MM10 | Mount a universal head. | <ol style="list-style-type: none"> 1. Angle setting 100% correct. 2. All clamp-nuts tightened. |
| | MM11 | Identify high speed and tungsten cutting tools with reference to: <ul style="list-style-type: none"> <input type="checkbox"/> Slot drills <input type="checkbox"/> Side and face cutters <input type="checkbox"/> End-mills <input type="checkbox"/> Slit-saws <input type="checkbox"/> Gear cutters <input type="checkbox"/> Ripping cutters <input type="checkbox"/> Face mills <input type="checkbox"/> Fly cutters | Type correct according to application. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|--------|------|------------------------|---|
| | MM12 | Machine a spur gear. | <ol style="list-style-type: none"> 1. Correct tool position for specific tool and application. 2. Speed and feed according to type of material and tooling. 3. All tolerance according to ISO R286 standard. 4. All safety aspects adhered to. 5. No damage to components. 6. 100% correct to drawing specifications (ISO standard). 7. No burrs allowed on any surface. 8. Maximum surface texture down to N6 according to comparison scale. 9. Gear tooth data calculated 100% correct. 10. Cutter position 100% correct. |
| | MM13 | Cut a external keyway. | <ol style="list-style-type: none"> 1. Correct tool position for specific tool and application. 2. Speed and feed according to type of material and tooling. 3. All tolerance according to ISO R286 standard. 4. All safety aspects adhered to. 5. No damage to components. 6. 100% correct to drawing specifications (ISO standard). 7. No burrs allowed on any surface. 8. Maximum surface texture down to N6 according to comparison scale. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|--------|------|--------------------------------------|---|
| | MM14 | Machine a hexagon. | <ol style="list-style-type: none"> 1. Correct tool position for specific tool and application. 2. Speed and feed according to type of material and tooling. 3. All tolerance according to ISO R286 standard. 4. All safety aspects adhered to. 5. No damage to components. 6. 100% correct to drawing specifications (ISO standard). 7. No burrs allowed on any surface. 8. Maximum surface texture down to N6 according to comparison scale. 9. Parallelism, squareness correct. |
| | MM15 | Machine a cube using a machine vice. | <ol style="list-style-type: none"> 1. Correct tool position for specific tool and application. 2. Speeds and feeds according to type of material and tooling. 3. All tolerances according to ISO R286 standard. 4. All safety aspects adhered to. 5. No damage to components. 6. 100% correct to drawing specifications (ISO standard). 7. No burrs allowed on any surface. 8. Maximum surface texture down to N6 according to comparison scale. 9. Parallelism, squareness correct. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|--------|------|------------------------------------|---|
| | MM16 | Drill equal spaced holes on PCD's. | <ol style="list-style-type: none"> 1. Correct tool position for specific tool and application. 2. Speed and feed according to type of material and tooling. 3. All tolerance according to ISO R286 standard. 4. All safety aspects adhered to. 5. No damage to components. 6. 100% correct to drawing specifications (ISO standard). 7. No burrs allowed on any surface. 8. Maximum surface texture down to N6 according to comparison scale. 9. Cutter correct on PCD. 10. Dividing head calculation 100% correct. |
| | MM17 | Bore a hole. | <ol style="list-style-type: none"> 1. Correct tool position for specific tool and application. 2. Speed and feed according to type of material and tooling. 3. All tolerance according to ISO R286 standard. 4. All safety aspects adhered to. 5. No damage to components. 6. 100% correct to drawing specifications (ISO standard). 7. No burrs allowed on any surface. 8. Maximum surface texture down so N6 according to comparison scale. 9. Boring head set on centre position. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|--------|------|--------------------------------|--|
| | MM18 | Split a bush using a slit-saw. | <ol style="list-style-type: none"> 1. Correct tool position for specific tool and application. 2. Speed and feed according to type of material and tooling. 3. All tolerance according to ISO R286 standard. 4. All safety aspects adhered to. 5. No damage to components. 6. 100% correct to drawing specifications.(ISO standard). 7. No burrs allowed on any surface. 8. Maximum surface texture down to according to comparison scale. 9. Slit saw set on centre of bush. |
| | MM19 | Cut an internal keyway. | <ol style="list-style-type: none"> 1. Correct tool position for specific tool and application. 2. Speed and feed according to type of material and tooling. 3. All tolerance according to ISO R286 standard. 4. All safety aspects adhered to. 5. No damage to components. 6. 100% correct to drawing specifications (ISO standard). 7. No burrs allowed on any surface. 8. Maximum surface texture down to N6 according to comparison scale. 9. Marking-off correct. |

| MODULE | CODE | OBJECTIVES | CRITERIA |
|--|-----------------------|---|---|
| <p>THEORETICAL TRAINING</p> | <p>TT1</p> <p>TT2</p> | <p>A four subject pass is needed to obtain the N course. Mathematics and the relevant trade theory subject is compulsory. A further two relevant subjects must be chosen by the employer, college and apprentice in order to obtain the four subjects required for the course.</p> <p>Mathematics N1 Relevant Trade Theory N1 Plus two relevant subjects N1</p> <p>Mathematics N2 Relevant Trade Theory N2 Plus two relevant subjects N2</p> <p>"If an apprentice should have a qualification higher than that prescribed in the schedule, the person concerned must, before a trade test date will be allocated, produce evidence of attaining the trade theory at the level prescribed in the training schedule."</p> | <p>Obtain a four subject certificate.</p> <p>Obtain a four subject certificate.</p> |
| <p>ON THE JOB EXPERIENCE AND INDEPENDENT WORK</p> | <p>EX1</p> | <p>On the job experience and independent work should cover at least 80% of all practical modules to ensure as wide as possible field of experience and must take place under supervisory control.</p> | <p>All work done to be recorded with respect to performance levels.</p> |