GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

MECHANICAL TECHNOLOGY 2025

REVISED ANNUAL TEACHING PLAN

Grade 10 – 11

AUTOMOTIVE

AUTOMOTIVE GRADE 10 – TERM 1

Topic	Content	%	Date completed	Sign
SAFETY (Generic)	Organise and manage activities responsibly and effectively, including self-management and HIV/Aids awareness; Safety precautions taken into account during performance-based activities in order to avoid injuries or incidents. Explain his/her rights, human rights, contributions and responsibilities: Knowledge of basic first aid **Understand the OHS Act** Learners must be fully aware of all the safety precautions when using the following tools: • Hand tools • pedestal drill • Bench grinder **Identify safe and hazardous acts and conditions (e.g. speed of emery wheels etc.)** Refer specifically to the following tools/machines/equipment (refer to Topic 2: • Compressors • Fire extinguisher • Lifts, jacks & trestles. **Practical:** Identify safe and hazardous acts and conditions (e.g. speed of emery wheels, Maximum lift on hydraulic equipment etc.) Apply personal hygiene measures. **Note**: Apply personal hygiene measures. Clean workshop on a weekly basis	2% 5%		

Topic	Content	%	Date completed	Sign
TOOLS (Generic)	**Basic tools and equipment:** • Spanners: ring-, flat- and combination- • Sockets and accessories • Pliers • Hammers • Chisels, hacksaws, • Screwdrivers • Allen keys • Files • Stocks & dies. **Application of measuring and marking-off instruments:** • Steel Rule • Square • Scriber • Tape measure • Combination set • Punches **Practical:** Use the marking-off instruments to mark-off a plate (at least 5mm thick) with 5 holes.	7% 12%		
TOOLS & EQUIPMENT (GENERIC)	Understand the OHS Act Learners must be fully aware of all the safety precautions when using the following tools: • Compressors • Fire extinguisher • Lifts, jacks & trestles **Practical:** Identify safe and hazardous acts and conditions (e.g. speed of emery wheels, maximum lift on hydraulic equipment.	15%		

Topic	Content	%	Date completed	Sign
Engines (Generic)	Operating principles of 2 and 4 stroke internal combustion engines. (Single cylinder spark ignition engines only): • Stroke • Dead centre • Cycle **Practical:** Demonstrate knowledge of the operating principles of the 2 and 4 stroke internal combustion spark ignition engines	20%		
Engines (Specific)	**Identification and function of engine components:** • Pistons, • piston rings, • crankshaft, • connecting rod, • bearings, • gudgeon pin, • camshaft, • valves, • flywheel, • cylinder head, • engine block, • oil pump, • manifolds, • carburettors, etc **Conventional layouts:** • Engine in front with front- and rear-wheel drives • Engine at rear with rear-wheel drive • Advantages and disadvantages of each position	25% 30%		

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AUTOMOTIVE GRADE 10 – TERM 2

Topic	Content	%	Date completed	Sign
JOINING METHODS (Generic)	**Calculations on the size of drills and key dimensions:** • Drill sizes for screw cutting • Width, thickness and length of keys Semi-permanent joining methods: • Bolts • Studs • Locking devices • Nuts • Split pins • Rivets Semi-permanent joining methods: • Keys – Identification, fitting and uses of the following types: ➢ Parallel key ➢ Taper key, ➢ Gib-head key ➢ Woodruff key **Practical:** Use the marking-off plate from Topic "Tools" and drill and tap two (2) holes.	35% 40%		

Topic	Content	%	Date completed	Sign
Forces (Generic)	**Forces:** Different types of forces found in engineering components: • Pulling force (Tensile) • Compressive force • Shearing force **Moments:** Moments found in engineering components (basic calculations). **Definition:** Moment = force x perpendicular distance (Spanner used to tighten a nut or bolt)	33% 40%		

Topic	Content	%	Date completed	Sign
Maintenance (Generic)	**Properties of lubricants:** • Viscosity • Pour point, etc. **Grading of oil according to viscosity: (SAE standards)** • Transmission oil • Engine oil • Differential oil • Cutting fluid • Grease **Friction**: • Characteristics and Application **Define the following types of maintenance:** • Preventive • Predictive • Reliability centred maintenance **Lack of maintenance on equipment** • Excessive wear • Overheating/seizing; and distortion • Failure	46% 50% 55%		

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AUTOMOTIVE GRADE 10 – TERM 3

Topic	Content	%	Date completed	Sign
Terminology (Specific) Drive trains	**Function, construction and operation of the single-plate clutch assembly:** • Flywheel • Diaphragm pressure plate • Clutch Plate • Clutch couplings, etc. • Hydraulic: Master & slave cylinders, pipes • Fault finding **Identify and investigate the various components of the constant mesh manual gearbox and define the construction, function, operation and power flow of:** • Gears • Shafts • Synchronising unit, • Selector mechanism. **Function, construction and operation of drive shafts:** • The Slip Joint • Universal Joint • Constant Velocity Joint • Flexible coupling	62% 68%		

Topic	Content	%	Date completed	Sign
Maintenance (Specific)	**Lubrication Systems:** • Splash feed, Pressure Feed and Full pressure feed **Oil:** • Oil purity, oil dilution, Crankcase ventilation • Oil Filtration systems: Full-flow and by-pass systems **Temperature Control:** • Factors generating heat **Cooling systems:** • Direct air • Indirect air cooling **Components:** • Radiators, • Radiator pressure cap, • Water pumps, • Thermostat, • By-pass system, etc. **Practical:** • Do a visual inspection on a cooling system • Do a pressure test **Check and maintain all fluid levels:** • Water • Oil • Brake fluid	72% 78%		
Systems & Control (Specific)	**Basic carburetion:** • Function of a carburettor • Basic principle of operation, etc. **Air filters**: • Purpose and types. **Hydraulic brake system:** • Master Cylinder (function) • Wheel Cylinders • Disc brake assembly • Brake shoe assembly • Hand brake assembly.	82% 87%		

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AUTOMOTIVE GRADE 10 – TERM 4

Topic	Content	%	Date completed	Sign
Systems & Control (Specific)	**Electricity:** • Electron theory – basic electrical principles: ➢ Electron movement ➢ Electrons and conductors ➢ Pulse with modulation ➢ Digital & analogue signal ➢ Effects of electricity • Characteristics of magnetism • Electromagnets • Ohm's Law • Electrical units and measurements: ➢ Volts ➢ Amps ➢ Ohms • Use of the Multi-meter • Basics series and parallel circuits • Battery – lead acid type	92% 100%		

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AUTOMOTIVE GRADE 11 – TERM 1

Topic	Content	%	Date completed	Sign
Safety (Generic)	**First Aid** **HIV/Aids Awareness** **OHS Act:** **Machine specific safety measures when dealing with:** • Grinding machines • Cutting machines • Press machines • Hydraulic operated equipment	5%		
Tools (Generic)	**The principles and functions of the following:** • Stocks and dies (characteristics and drill sizes) • Grinding machines • Cutting machines (drilling machines) • Press machines	10%		
Tools (Specific)	**The principles and functions of the following:** • Dial indicators • Telescopic gauges • Torque wrenches • Outside, Inside micrometers and vernier calliper	15%		
Engines (Specific)	**C.I. Engines:** Combustion chamber designs for direct and indirect injection **Injector:** Function, construction, operation and types of nozzles **Valve assemblies:** • Identify various overhead valve arrangements • Identify various camshafts arrangements on SOHC and DOHC • Cam followers – mechanical and hydraulic valve timing diagram – • Continuously variable valve timing (CVVT) system • Purpose and importance of valve clearance • Timing gears, chains, belt drives and tensioners	20% 25%		

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AUTOMOTIVE GRADE 11 – TERM 2

Topic	Content	%	Date completed	Sign
Systems & Control (Specific)	**Basic function, construction and operation of final drives**: • Spiral bevel type • Hypoid type • Conventional differential • Limited slip differential **Identify the layout and purpose of different drive systems:** • Four-wheel drive • All-wheel drive **Hydraulic brakes:** • Master Cylinder (Parts & Operation) • Vacuum servo unit (purpose and operation) • ABS braking system (basic lay-out and operation) **Define the difference in construction between:** • Front axles • Rear axles: ➢ Semi-floating ➢ Full-floating **Steering systems, layout & operation:** • Types of steering boxes • Power steering • Electric p/steering **Identify the function & purpose of the following steering control components:** • Drag links • Tie rod ends • Ball joints **Suspension layout and operation:** • Define sprung and un-sprung mass • Semi-elliptic leaf • Coil springs • Torsion bars • Control ➢ Telescopic shock absorbers (gas and hydraulic) ➢ Anti-roll bars ➢ Stabilisers	27% 30% 35% 40% 48% 58%		

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AUTOMOTIVE GRADE 11 – TERM 3

Topic	Content	%	Date completed	Sign
Systems & Control (Specific)	**ELECTRICITY** Identify the functions and describe the operation of the conventional ignition system with reference to: • Firing order • Ignition timing • Spark plugs • Purpose of mechanical and vacuum regulators **Starting circuit:** Show an understanding of the basic starting circuit. **Supplemental systems (purpose and operation):** • Traction control • Air bag control	65% 75%		

Topic	Content	%	Date completed	Sign
Maintenance (Generic)	**Engine Lubrication** Oil pumps (purpose and operation): • Gear • Vane • Rotor	80%		
Maintenance (Specific)	**Demonstrate an understanding of oil control methods referring to:** • Oil filtration systems • Pressure relief valve • Seals **Servicing of vehicles:** • Importance of regular servicing	85%		

Topic	Content	%	Date completed	Sign
Forces (Specific)	**Automotive calculations and application:** • Work • Power • Torque • Compression Ratio	90%		

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AUTOMOTIVE GRADE 11 – TERM 4

Topic	Content	%	Date completed	Sign
Terminology (Specific)	**Work shop administration** ➢ Read and interpret job instructions ➢ Read & interpret & adhere manufacturers specifications	100%		

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FITTING AND MACHINING

FITTING & MACHINING GRADE 10 – TERM 1

Topic	Content	%	Date completed	Sign
SAFETY (Generic)	Organise and manage activities responsibly and effectively, including self-management and HIV/Aids awareness; Safety precautions taken into account during performance-based activities in order to avoid injuries or incidents. Explain his/her rights, human rights, contributions and responsibilities: Knowledge of basic first aid **Understand the OHS Act** Learners must be fully aware of all the safety precautions when using the following tools: • Hand tools • pedestal drill • Lathe Machine • Milling Machine • Bench grinder **Identify safe and hazardous acts and conditions (e.g. speed of emery wheels etc.)** Refer specifically to the following tools/machines/equipment (refer to Topic 2: • Power saws • Compressors • Fire extinguisher **Practical:** Identify safe and hazardous acts and conditions (e.g. speed of emery wheels, Maximum lift on hydraulic equipment etc.) Apply personal hygiene measures. Note: Apply personal hygiene measures. Clean workshop on a weekly basis	2% 5% 8%		

Topic	Content	%	Date completed	Sign
TOOLS (Generic)	**Basic tools and equipment:** • Spanners: ring-, flat- and combination- • Sockets and accessories • Pliers • Hammers • Chisels, hacksaws, • Screwdrivers • Allen keys • Files • Stocks & dies. **Application of measuring and marking-off instruments:** • Steel Rule • Square • Scriber • Tape measure • Combination set • Punches **Practical:** Use the marking-off instruments to mark-off a plate (at least 5mm thick) with 5 holes.	12% 16%		

Topic	Content	%	Date completed	Sign
MATERIALS (Generic)	**Characteristics, composition and use of:** • Ferrous metals and alloys: ➢ Low carbon steel ➢ Medium carbon steel ➢ High carbon steel ➢ Cast iron: • Grey cast iron • White cast iron ➢ Stainless steel (manganese, chrome, vanadium, titanium, tungsten, molybdenum and cobalt) • Non-ferrous elements: ➢ Copper, tin, lead, zinc, aluminium, nickel • Non-ferrous alloys: ➢ Brass, bronze, phosphor bronze, white metal, duralumin and solder **Practical:** • Collect a sample of 5 non-ferrous elements and 5 non-ferrous alloys • Give 2 uses for each sample collected	18% 25%		

Topic	Content	%	Date completed	Sign
TERMINOLOGY (Machining) (Specific)	**Simple readings on:** • Vernier callipers • Outside, inside and depth micrometers **Practical:** Use the abovementioned measuring instruments and demonstrate the measurement of given sizes.	30%		

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FITTING & MACHINING GRADE 10 – TERM 2

Topic	Content	%	Date completed	Sign
TERMINOLOGY (Machining) (Specific)	**Lathe:** • Classification • Types of bed: V and flat and gap • Functions of: ➢ Feed shaft ➢ Head stock ➢ Lead screw ➢ Tail stock ➢ Carriage • Function and purpose of the 3- and 4-jaw chuck • Coolants (Application and advantages and disadvantages) • Cutting tool (high speed steel): ➢ Clearance angles ➢ Cutting angles ➢ Differentiate between high-speed steel cutting tools and tungsten tip tools ➢ Tool holders and boring bars (Types and uses) • Apply cutting procedures for diameter turning and facing	40% 48%		

Topic	Content	%	Date completed	Sign
TERMINOLOGY (Machining) (Specific)	• Taper turning (Methods, Advantages and disadvantages): ➢ Compound slide ➢ Tail stock ➢ Taper turning attachment ➢ Cutting tool • Screw cutting (Compound slide – Theory only): ➢ Characteristics and elements of metric V-thread ➢ Parallel ➢ Half of the included angle of the thread ➢ Use of the screw thread pitch gauge and screw cutting gauge **Practical:** • Facing and parallel turning of a work piece on the centre lathe. • Machining of an outside taper using the compound slide only on the same work piece used for the facing and parallel turning	55% 60%		

Topic	Content	%	Date completed	Sign
FORCES (Generic)	**Forces:** Differentiate between the different types of forces found in engineering components: • Pulling force (Tensile) • Compressive force • Shearing force **Components of forces**: • Graphical and mathematical solution of the horizontal and vertical component of a single force acting at an angle. **Practical:** Use basic calculations to determine forces.	63% 68%		

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FITTING & MACHINING GRADE 10 – TERM 3

Topic	Content	%	Date completed	Sign
JOINING METHODS (Generic)	**Calculations on the size of drills and key dimensions:** • Drill sizes for screw cutting • Width, thickness and length of keys Semi-permanent joining methods: • Bolts • Studs • Locking devices • Nuts • Split pins • Rivets Semi-permanent joining methods: • Keys – Identification, fitting and uses of the following types: ➢ Parallel key ➢ Taper key, ➢ Gib-head key ➢ Woodruff key **Practical:** Use the marking-off plate from Topic "Tools" and drill and tap two (2) holes.	73% 78% 82%		

Topic	Content	%	Date completed	Sign
SYSTEMS AND CONTROL (Drive systems) (Specific)	**MECHANICAL:** Identify different drive systems referring to application., • Spur gears • Pulleys and belt drives • Chain drives **Identification and application on the following screw threads (properties, uses, profiles and angles):** • ISO Metric V-thread (fine and coarse) • Square thread • Acme thread **Practical:** Identify the most suitable mechanical drive system for various applications	85% 90%		

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FITTING & MACHINING GRADE 10 – TERM 4

Topic	Content	%	Date completed	Sign
MAINTENANCE (Generic)	**Properties of lubricants:** • Viscosity • Pour point • Flash point Grading of oil according to viscosity: (SAE standards) • Transmission oil • Grease Friction: • Characteristics • Application Define the following types of maintenance: • Preventive • Predictive • Reliability centred maintenance Identify the outcome of the lack of maintenance on equipment used in the workshop: • Excessive wear • Overheating/seizing; and distortion (lack of cooling and lubrication) • Failure e.g. hydraulics/pneumatics, controls and cables Disadvantages of an unbalanced work piece or machine part **Practical:** Analyse and predict the outcome of the lack of maintenance on equipment used in the workshop	92% 95% 100%		

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FITTING & MACHINING GRADE 11 – TERM 1

Topic	Content	%	Date completed	Sign
SAFETY (Generic)	**HIV/Aids Awareness** Knowledge of basic First Aid measures Analyse the OHS Act and regulations where applicable **Machine specific safety measures when dealing with:** • Grinding machines • Cutting machines • Press machines • Lathe Machines • Milling Machines • Hydraulically Operated equipment **Practical:** Perform a first aid exercise to demonstrate action to be taken when a fellow learner hurts him/herself in the workshop.	2% 7%		

Topic	Content	%	Date completed	Sign
TOOLS (Generic)	**The principles and functions of the following:** • Stocks and dies (characteristics and drill sizes) • Grinding machines • Cutting machines (drilling machines) • Press machines **Practical:** Explain the safety precautions to be followed when using the various cutting and grinding machines Press machines	11%		
TOOLS (Specific)	**The principles and functions of the following:** • Dial indicators • Telescopic gauges • Torque wrenches • Outside, Inside micrometers and • Vernier calliper **Practical:** Demonstrate competent use of: • Dial indicators • Telescopic gauges • Torque wrenches • Inside micrometers	16%		

Topic	Content	%	Date completed	Sign
TERMINOLOGY Machining (Specific)	**Lathe:** • Safety measures • Set up of irregular work pieces – 4 jaw chuck • Steadies (purpose and use) • Mandrels (purpose and use) • Taper turning (compound slide method – inside and outside tapers) ➢ Calculations for setting over of compound slide **Screw cutting** ➢ Description of the pitch and leads for single- and multi-start screw threads ➢ Uses of screw thread dial gauge, pitch gauge, centre gauge and graduated collar when screw thread cutting is carried out ➢ Methods to determine the locating positions on the dial gauge ➢ Calculations of depth of V-threads ➢ Square thread (calculations of the helix, leading and following angles for the cutting tools) **Practical – Lathe:** • Set-up of an irregular work piece in a 4-jaw chuck • Use the lathe to do taper turning • Use the lathe to do V-thread screw cutting	22% 30%		

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FITTING & MACHINING GRADE 11 – TERM 2

Topic	Content	%	Date completed	Sign
TERMINOLOGY Machining (Specific)	**Milling machine:** • Safety measures • Milling machine parts • Calculations on: ➢ Centring of cutter ➢ Cutting of key ways – parallel • Milling cutters (identification and uses): ➢ Side and face cutter ➢ End mill ➢ Flute mill ➢ T-slot mill ➢ Helical cutter ➢ Involute gear tooth cutter **Practical – Milling machine:** • Centring of cutter • Cutting of parallel key way	38%		

Topic	Content	%	Date completed	Sign
MATERIALS (Generic)	**Distinguish between the following properties of engineering materials:** • Hardness • Plasticity • Elasticity • Ductility • Malleability • Brittleness • Toughness	45%		

Topic	Content	%	Date completed	Sign
FORCES (Specific)	**Forces:** Effects of forces, moments and torques on engineering components applying design principles Basic calculations on: Forces found in engineering components: • System of forces (maximum of three forces) • Resultant and equilibrant **Moments:** Moments found in engineering components: (By calculation only) • Law of moments: ➢ Sum of LHM = Sum of RHM A simply supported beam with two vertical point loads acting on the beam supported by two supports. **Basic calculations on stress:** • Square tubing • Round tubing **Practical:** Use basic calculations to determine forces, moments and stress	51% 55% 59%		

Topic	Content	%	Date completed	Sign
JOINING METHODS (Specific)	**Identify the characteristics of the ISO metric V-thread.** Use basic calculations for the ISO metric V-thread: • Root diameter • Crest diameter • Effective diameter • Pitch • Lead for multi-start screw threads **Practical:** Use basic calculations to determine the following for ISO metric V-thread: • The drill size to tap a V-thread • Tap hole(s) according to bolt size	65%		

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FITTING & MACHINING GRADE 11 – TERM 3

Topic	Content	%	Date completed	Sign
SYSTEMS AND CONTROL: Drive systems (Specific)	**MECHANICAL COMPONENTS:** **Uses, functions, advantages and disadvantages of the following compound drives:** • Gear train • Pulley systems (i.e. block and tackle) • V-Belt drives • Chain drives **Basic velocity calculations on:** • Gears (compound) Including idler gears • Pulley systems and • Belts (v-belts) **Transfer of movement:** • Spur gears • Gear Ratio • Power transmission **HYDRAULICS / PNEUMATICS** **Basic calculations on:** Pistons and reservoirs (only a single cylinder): volume, pressure, force, area Description, identification and application of: • Valves, pipes, pressure gauges **Practical:** Practically determine the transfer of movement of mechanical and hydraulic operating systems mentioned above including drive systems through a simple designed project	75% 84% 89%		

Topic	Content	%	Date completed	Sign
PUMPS (Specific)	**Identify the following pumps by referring to purpose, construction and operating principles:** • Mono pumps • Centrifugal pumps • Reciprocating pumps • Gear pumps **Practical:** Identify the above pumps by referring to purpose, construction and operating principles:	95%		

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FITTING & MACHINING GRADE 11 – TERM 4

Topic	Content	%	Date completed	Sign
MAINTENANCE (Specific)	**Identify causes of malfunction of lathes and milling machines.** • Lack of lubrication or incorrect lubrication • Overloading • Friction • Balancing **Practical:** Analyse and predict the outcome of the lack of maintenance on equipment used in the workshop:	100%		

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WELDING AND METALWORK

WELDING AND METALWORK GRADE 10 – TERM 1

Topic	Content	%	Date completed	Sign
Safety (Generic)	Organise and manage activities responsibly and effectively, including self-management and **HIV/Aids awareness**; **First Aid** - Safety precautions taken into account during performance-based activities in order to avoid injuries or incidents. **Understanding of the OHS Act** Learners must be fully aware of all the safety precautions to be taken during performance-based activities, in order to avoid injuries or incidents. Refer specifically to the following tools/machines/equipment: • Different hand tools • Pedestal drill • Bench grinder • Guillotine • Bending machine • Power saws **Identify safe and hazardous acts and conditions e.g. speed of emery wheels, etc.** Apply personal hygiene measures. Refer specifically to the following tools/machines/equipment (refer to Topic 2: Tools): • Different hand tools • Pedestal drill • Pedestal grinder • Guillotine • Compressors • Fire extinguishing apparatus **Practical:** Identify safe and hazardous acts and conditions (e.g., speed of emery wheels, Maximum lift on hydraulic equipment etc.) Apply personal hygiene measures. Note: Clean workshop on a weekly basis.	2% 5% 8%		

Topic	Content	%	Date completed	Sign
TERMINOLOGY (Welding) (Specific)	**Explain the following terms with the aid of sketches:** • Arc • Arc length • Leg length • Included angle • Parent metal • Penetration • Reinforcement • Root • Root face • Root run • Run • Tack welding • Toe of weld • Weld bead • Welding voltage • Welding current • Welding heat **PRACTICAL:** Explain the welding terms by means of sketches **TEMPLATES** • Materials used for template: wood, cardboard steel and hardboard • Principle of simple setting-out of the right angle and the application of Pythagoras' theory **Practical:** Do calculations on the theorem of Pythagoras and apply the principle by setting a right-angled project. **PRINCIPLES AND FUNCTIONS OF** • Arc welding machines such as AC and DC • Arc welding accessories **ELECTRICAL ASPECTS REGARDING ARC WELDING** Explain the following: • Volts • Current (Ampere) • Resistance • Polarity • Arc voltage • Direct current • Alternating current • Earthing • Single phase • Three phase • Voltage drop **Practical:** Demonstrate an understanding of arc welding equipment by assembling the equipment in the correct sequence.	15% 20% 23%		

Topic	Content	%	Date completed	Sign
TOOLS (Generic)	**Basic tools and equipment:** • Spanners: ring-, flat- and combination- • Sockets and accessories • Pliers • Hammers • Chisels, hacksaws, • Screwdrivers • Allen keys • Files • Stocks & dies. **Application of measuring and marking-off instruments:** • Steel Rule • Square • Scriber • Tape measure • Combination set • Punches **Practical:** Use the marking-off instruments to mark-off a plate (at least 5mm thick) with 5 holes.	28% 32%		

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WELDING AND METALWORK GRADE 10 – TERM 2

Topic	Content	%	Date completed	Sign
Joining methods (Generic)	**Calculations on the size of drills and key dimensions:** • Drill sizes for screw cutting • Width, thickness and length of keys **Semi-permanent joining methods:** • Bolts • Studs • Locking devices • Nuts • Split pins • Rivets **Keys – Identification, fitting and uses of the following types:** • Parallel • Taper • Gib head • Woodruff keys	35% 37% 40%		
Forces (Generic)	**Forces:** Differentiate between the different types of forces found in engineering components: • Pulling force (Tensile) • Compressive force • Shearing force **Components of forces:** • Parallelogram of forces – resultant of two forces graphically only; **Moments**: Moments found in engineering components (basic calculations): **Definition:** Moment = force x perpendicular distance (Spanner used to tighten a nut or bolt) Stress (Basic calculations on): • Square bar • Round bar **Practical:** Calculations to determine • forces, • moment and • stress	42% 48% 55%		

Topic	Content	%	Date completed	Sign
Terminology (Welding symbols and joints)	**Identifying the different WELDING SYMBOLS:** • Elements of welding symbols **Theory and Application of PERMANENT JOINTS (Arc welding):** • Lap joint • Butt joint • T-joint • Edge • Corner **Practical:** Apply the identified welding symbols by welding different types of joints using arc-welding.	60% 65%		

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WELDING AND METALWORK GRADE 10 – TERM 3

Topic	Content	%	Date completed	Sign
MAINTENANCE (GENERIC)	Define the following types of maintenance: • Preventive • Predictive • Reliability centred maintenance Lack of maintenance on equipment • Excessive wear • Overheating/seizing; and distortion • Failure Disadvantages of an unbalanced work piece or machine part Practical: Analyse and predict the outcome of the lack of maintenance on equipment used in the workshop	70% 75%		

Topic	Content	%	Date completed	Sign
TERMINOLOGY DEVELOPMENTS (Specific)	**Development of:** • Elbows with one joint only • Right angled and oblique T pieces of equal diameters • Unequal diameter pipes, including shapes of holes. All branches to be on centre of the main pipe • Right cones with top and base parallel to the horizontal plane **Practical:** Demonstrate an understanding of developments by developing/ producing models from the drawings of right angled and oblique T-pieces of equal and unequal diameters, and the right cones with the top and base parallel to the horizontal	85%		

REVISION / INFORMAL ASSESSMENT(S)	**Date(s) completed** _____	**HOD Signature:** _____ **Date:**_____
CONTROLLED TEST	**Date completed** _____	**All theory including practical application and PAT tasks for term 1 have been completed** **Marks entered onto electronic mark sheet**

WELDING AND METALWORK GRADE 10 – TERM 4

Topic	Content	%	Date completed	Sign
MATERIALS (GENERICS)	**Characteristics, composition and use of:** • Ferrous metals and alloys: ➢ Low carbon steel ➢ Medium carbon steel ➢ High carbon steel Cast iron: • Grey cast iron • White cast iron Stainless steel (manganese, chrome, vanadium, titanium, tungsten, molybdenum and cobalt) • Non-ferrous elements: ➢ Copper, tin, lead, zinc, aluminium, nickel • Non-ferrous alloys: ➢ Brass, bronze, phosphor bronze, white metal, duralumin and solder **Practical:** • Collect a sample of 5 non-ferrous elements and 5 non-ferrous alloys • Give 2 uses for each sample collected.	95% 100%		

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FINAL EXAMINATION	**Date completed** _____	**All theory including practical application and PAT tasks for term 1 have been completed** **Marks entered onto electronic mark sheet**

WELDING AND METALWORK GRADE 11 – TERM 1

Topic	Content	%	Date completed	Sign
Safety (Generic)	**HIV/AIDS Awareness** Knowledge of basic First Aid measures Analyse the OHS Act and regulations where applicable to the following machines: • Grinding machines (portable, bench and surface) • Cutting (drilling machines, power saw, band saw) • Shearing machines (manual and power driven) • Press machines • Joining (arc, gas) • Handling and usage of gas cylinders	2% 5%		
TERMINOLOGY Machining (Specific)	**The use of TEMPLATES:** • Materials used for templates: wood, cardboard, steel plate and hardboard • Principle of simple setting out of the right angle and the application of Pythagoras theorem, the ratio of 45° and 60° right angled triangles. • Use principles 3, 4 and 5 • Standard cross centres and benchmarks • Transference of floor diagrams to templates • Use of strip, flange and web templates for steel sections. Ordinary and bushed steel templates. • Use of coloured and lettered holes, instructions and conventional marks on templates. **The application of ROOF TRUSSES:** Calculations of: • Rise • Slope • Pitch The layout of roof trusses, details of purlins, truss shoes, wall plates, expansion and footing. **Practical:** Develop a roof truss using the given instructions and templates and by applying the theorem of Pythagoras.	15% 18%		

TERMINOLOGY Machining (Specific)	**CALCULATION OF COSTS:** • Quantification from drawings • Compiling of cutting lists • Calculation of cost of roof trusses and lattice beams **EXPLAIN THE FOLLOWING TERMS:** • Deposited metal • Fusion zone • Gap • Heat effected zone • Kerf • Spatter • Weld pool **WELDING SYMBOLS:** • Fusion weld symbols • Supplementary symbols	22% 25%		

Topic	Content	%	Date completed	Sign
Tools (Specific)	**The principles and functions of the following purpose-made tooling and equipment:** • Stocks and dies (characteristics and drill sizes) • Grinding machines (portable, bench) • Cutting machines (drilling machines, power saw, horizontal band saw) • Guillotine machine (manual and power driven) • Press machines • Joining equipment (arc, spot, gas) • Rolling machine • Punch and cropper machine • Plasma cutter • Cut –off machine **Practical:** Demonstrate the use and care of purpose-made tooling and equipment when producing a product and when doing maintenance.	35%		

REVISION / INFORMAL ASSESSMENT(S)	**Date(s) completed** _____	**HOD Signature:** _____ **Date:**_____
ASSIGNMENT	**Date completed** _____	**All theory including practical application and PAT tasks for term 1 have been completed** **Marks entered onto electronic mark sheet**

WELDING AND METALWORK GRADE 11 – TERM 2

Topic	Content	%	Date completed	Sign
FORCES (Specific)	**FORCES:** Effects of forces, moments and torques on engineering components applying design principles. Forces found in engineering components. Determine graphically: **SYSTEM OF FORCES (Bows notation)** • Triangle of forces • Polygon of forces • Resultant and equilibrant **PRACTICAL:** Determine graphically the magnitude of forces found in engineering components using triangle of force, polygon of forces and resultant forces. **Moments:** • Moments found in engineering components. (By calculation only): • Law of moments: Sum of LHM=Sum of RHM • A supported beam with TWO vertical point loads acting on the beam with two supports. • The calculation of shear force and bending moment diagram and graphically illustrated. **PRACTICAL:** Do calculations on moments of force found in engineering components? **STRESS AND STRAIN (Calculations of)** • Stress and strain (Hooke s law) • Compressive/ tensile stresses • Young's modulus of elasticity (ignore factor of safety) • Determine change in length • Stress/strain diagram **PRACTICAL:** Do calculations on stress and strain as indicated	45% 50% 55%		

Topic	Content	%	Date completed	Sign
MAINTENANCE (Specific)	**Identify causes of malfunction of lathes and milling machines.** • Lack of lubrication or incorrect lubrication • Overloading • Friction • Balancing **Practical:** Analyse and predict the outcome of the lack of maintenance on equipment used in the workshop:	60%		
JOINING METHODS (Specific)	**Identify the application and uses of the following processes:** • Gas welding • MIG welding **PRACTICAL:** Apply the theoretical knowledge in performing welding processes to produce a project using oxy acetylene, and MIG/MAGS welding. **Apply the welding process to CARBON STEEL** • The heating and cooling cycle • To control the hardness • Pre heating and tempering **The use and application of SPOT (Resistance) WELDING:** • Description of process • Current • Electrodes • Time cycle • Maintenance and care of electrodes tips **Identify defects in welds, the causes and remedies for:** • Blow holes • Porosity • Incomplete penetration • Undercutting • Weld crater • Restarts • Slag inclusion • Cracks **PRACTICAL:** Identify defects from different welds, the causes and remedies.	65% 70%		

REVISION / INFORMAL ASSESSMENT(S)	**Date(s) completed** _____	**HOD Signature:** _____ **Date:**_____
MIDYEAR TEST / EXAMINATION	**Date completed** _____	**All theory including practical application and PAT tasks for term 1 have been completed** **Marks entered onto electronic mark sheet**

WELDING AND METALWORK GRADE 11 – TERM 3

Topic	Content	%	Date completed	Sign
JOINING METHODS(Specific)	**HEAT TREATMENT OF STEEL:** • The changes in structure of carbon steel during heating cooling processes • The iron carbon equilibrium diagram: ➢ The temperature range of 500-900˚C ➢ Carbon content between 0% and 1.4% • Description of the purpose and methods for the following: ➢ Annealing ➢ Normalizing ➢ Hardening ➢ Tempering ➢ Case hardening **PRACTICAL:** • Apply knowledge of heat treatment in performing tempering process on a cutting tool. • Apply knowledge of heat treatment in performing normalizing process on a tempered cutting tool.	74% 77%		

Topic	Content	%	Date completed	Sign
MATERIALS (GENERIC)	**Function and operation of the following equipment used during the manufacturing of steel:** • Blast furnace – refining of iron ore • Bessemer convertor • Electric arc furnace **Distinguish between the following properties of engineering materials:** • Hardness • Plasticity • Elasticity • Ductility • Malleability • Brittleness • Toughness	85% 88%		

Topic	Content	%	Date completed	Sign
TERMINOLOGY DEVELOPMENT (Specific)	Development of: • Transformations between parallel horizontal planes: ➢ Square to square ➢ Square to round • Cones on and off centres ➢ Oblique cones with top and base parallel to the horizontal plane ➢ Right cylindrical Y-connections **PRACTICAL:** Apply the knowledge gained on development to produce TWO transformations between parallel horizontal planes and a right cylindrical Y-connection.	95%		

REVISION / INFORMAL ASSESSMENT(S)	**Date(s) completed** _____	**HOD Signature:** _____ **Date:**_____
CONTROLED TEST	**Date completed** _____	**All theory including practical application and PAT tasks for term 1 have been completed** **Marks entered onto electronic mark sheet**

WELDING AND METALWORK GRADE 11 – TERM 4

Topic	Content	%	Date completed	Sign
TERMINOLOGY: Steel Sections (Specific)	**Knowledge of steel sections such as:** • Angle sections • Channel sections • I-beam sections **Referring to:** • Identification of the profile of the sections • Uses of different sections • Joining of the different sections **Practical:** Identify different types of steel sections as used in steel structures around the school or nearby buildings	100%		

REVISION / INFORMAL ASSESSMENT(S)	**Date(s) completed** _____	**HOD Signature:** _____ **Date:**_____
FINAL EXAMINATION	**Date completed** _____	**All theory including practical application and PAT tasks for term 1 have been completed** **Marks entered onto electronic mark sheet**