



GAUTENG PROVINCE

Department: Education

REPUBLIC OF SOUTH AFRICA

MECHANICAL TECHNOLOGY 2024

REVISED ANNUAL TEACHING PLAN

Grade 10 - 11

AUTOMOTIVE

AUTOMOTIVE GRADE 10 – TERM 1

Topic	Content	%	Date completed	Sign
SAFETY (Generic)	<p>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:</p> <p>Knowledge of basic first aid</p> <p>Understand the OHS Act Learners must be fully aware of all the safety precautions when using the following tools:</p> <ul style="list-style-type: none"> • Hand tools • pedestal drill • Bench grinder 	2%		
	<p>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:</p> <ul style="list-style-type: none"> • Compressors • Fire extinguisher • Lifts, jacks & trestles. <p>Practical: Identify safe and hazardous acts and conditions (e.g. speed of emery wheels, Maximum lift on hydraulic equipment etc.) Apply personal hygiene measures.</p> <p>Note: Apply personal hygiene measures. Clean workshop on a weekly basis</p>	5%		

Topic	Content	%	Date completed	Sign
TOOLS (Generic)	Basic tools and equipment: <ul style="list-style-type: none"> • Spanners: ring-, flat- and combination- • Sockets and accessories • Pliers • Hammers • Chisels, hacksaws, • Screwdrivers • Allen keys • Files • Stocks & dies. 	7%		
	Application of measuring and marking-off instruments: <ul style="list-style-type: none"> • Steel Rule • Square • Scriber • Tape measure • Combination set • Punches 	12%		
	Practical: Use the marking-off instruments to mark-off a plate (at least 5mm thick) with 5 holes.			
TOOLS & EQUIPMENT (GENERIC)	Understand the OHS Act Learners must be fully aware of all the safety precautions when using the following tools: <ul style="list-style-type: none"> • 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)	<p>Operating principles of 2 and 4 stroke internal combustion engines. (Single cylinder spark ignition engines only):</p> <ul style="list-style-type: none"> • Stroke • Dead centre • Cycle <p>Practical: Demonstrate knowledge of the operating principles of the 2 and 4 stroke internal combustion spark ignition engines</p>	20%		
Engines (Specific)	<p>Identification and function of engine components:</p> <ul style="list-style-type: none"> • Pistons, • piston rings, • crankshaft, • connecting rod, • bearings, • gudgeon pin, • camshaft, • valves, • flywheel, • cylinder head, • engine block, • oil pump, • manifolds, • carburettors, etc <p>Conventional layouts:</p> <ul style="list-style-type: none"> • Engine in front with front- and rear-wheel drives • Engine at rear with rear-wheel drive • Advantages and disadvantages of each position 	<p>25%</p> <p>30%</p>		
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		

Topic	Content	%	Date completed	Sign
JOINING METHODS (Generic)	<p>Calculations on the size of drills and key dimensions:</p> <ul style="list-style-type: none"> • Drill sizes for screw cutting • Width, thickness and length of keys <p>Semi-permanent joining methods:</p> <ul style="list-style-type: none"> • Bolts • Studs • Locking devices • Nuts • Split pins • Rivets 	35%		
	<p>Semi-permanent joining methods:</p> <ul style="list-style-type: none"> • Keys – Identification, fitting and uses of the following types: <ul style="list-style-type: none"> ➤ Parallel key ➤ Taper key, ➤ Gib-head key ➤ Woodruff key <p>Practical: Use the marking-off plate from Topic “Tools” and drill and tap two (2) holes.</p>	40%		

Topic	Content	%	Date completed	Sign
Forces (Generic)	Forces: Different types of forces found in engineering components: <ul style="list-style-type: none"> • Pulling force (Tensile) • Compressive force • Shearing force 	33%		
	Moments: Moments found in engineering components (basic calculations). Definition: Moment = force x perpendicular distance (Spanner used to tighten a nut or bolt)	40%		

Topic	Content	%	Date completed	Sign
Maintenance (Generic)	Properties of lubricants: <ul style="list-style-type: none"> • Viscosity • Pour point, etc. 			
	Grading of oil according to viscosity: (SAE standards) <ul style="list-style-type: none"> • Transmission oil • Engine oil • Differential oil • Cutting fluid • Grease 	46%		
	Friction: <ul style="list-style-type: none"> • Characteristics and Application 			
	Define the following types of maintenance: <ul style="list-style-type: none"> • Preventive • Predictive • Reliability centred maintenance 	50%		
	Lack of maintenance on equipment <ul style="list-style-type: none"> • Excessive wear • Overheating/seizing; and distortion • Failure 	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: <ul style="list-style-type: none"> • Flywheel • Diaphragm pressure plate • Clutch Plate • Clutch couplings, etc. • Hydraulic: Master & slave cylinders, pipes • Fault finding 	62%		
	Identify and investigate the various components of the constant mesh manual gearbox and define the construction, function, operation and power flow of: <ul style="list-style-type: none"> • Gears • Shafts • Synchronising unit, • Selector mechanism. Function, construction and operation of drive shafts: <ul style="list-style-type: none"> • The Slip Joint • Universal Joint • Constant Velocity Joint • Flexible coupling 	68%		

Topic	Content	%	Date completed	Sign
Maintenance (Specific)	<p>Lubrication Systems:</p> <ul style="list-style-type: none"> • Splash feed, Pressure Feed and Full pressure feed <p>Oil:</p> <ul style="list-style-type: none"> • Oil purity, oil dilution, Crankcase ventilation • Oil Filtration systems: Full-flow and by-pass systems <p>Temperature Control:</p> <ul style="list-style-type: none"> • Factors generating heat <p>Cooling systems:</p> <ul style="list-style-type: none"> • Direct air • Indirect air cooling <p>Components:</p> <ul style="list-style-type: none"> • Radiators, • Radiator pressure cap, • Water pumps, • Thermostat, • By-pass system, etc. <p>Practical:</p> <ul style="list-style-type: none"> • Do a visual inspection on a cooling system • Do a pressure test <p>Check and maintain all fluid levels:</p> <ul style="list-style-type: none"> • Water • Oil • Brake fluid 	72%		
Systems & Control (Specific)	<p>Basic carburetion:</p> <ul style="list-style-type: none"> • Function of a carburettor • Basic principle of operation, etc. <p>Air filters:</p> <ul style="list-style-type: none"> • Purpose and types. <p>Hydraulic brake system:</p> <ul style="list-style-type: none"> • Master Cylinder (function) • Wheel Cylinders • Disc brake assembly • Brake shoe assembly • Hand brake assembly. 	82%		
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		

AUTOMOTIVE GRADE 10 – TERM 4

Topic	Content	%	Date completed	Sign
Systems & Control (Specific)	Electricity: <ul style="list-style-type: none"> • Electron theory – basic electrical principles: <ul style="list-style-type: none"> ➤ 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: <ul style="list-style-type: none"> ➤ Volts ➤ Amps ➤ Ohms • Use of the Multi-meter • Basics series and parallel circuits • Battery – lead acid type 	92%		
		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		

MECHANICAL TECHNOLOGY

AUTOMOTIVE GRADE 11 – TERM 2

Topic	Content	%	Date completed	Sign
Systems & Control (Specific)	Basic function, construction and operation of final drives: <ul style="list-style-type: none"> • Spiral bevel type • Hypoid type • Conventional differential • Limited slip differential 	27%		
	Identify the layout and purpose of different drive systems: <ul style="list-style-type: none"> • Four-wheel drive • All-wheel drive 	30%		
	Hydraulic brakes: <ul style="list-style-type: none"> • Master Cylinder (Parts & Operation) • Vacuum servo unit (purpose and operation) • ABS braking system (basic lay-out and operation) 	35%		
	Define the difference in construction between: <ul style="list-style-type: none"> • Front axles • Rear axles: <ul style="list-style-type: none"> ➤ Semi-floating ➤ Full-floating 	40%		
	Steering systems, layout & operation: <ul style="list-style-type: none"> • Types of steering boxes • Power steering • Electric p/steering 			
	Identify the function & purpose of the following steering control components: <ul style="list-style-type: none"> • Drag links • Tie rod ends • Ball joints 	48%		
	Suspension layout and operation: <ul style="list-style-type: none"> • Define sprung and un-sprung mass • Semi-elliptic leaf • Coil springs • Torsion bars • Control <ul style="list-style-type: none"> ➤ Telescopic shock absorbers (gas and hydraulic) ➤ Anti-roll bars ➤ Stabilisers 	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: <ul style="list-style-type: none"> • Firing order • Ignition timing • Spark plugs • Purpose of mechanical and vacuum regulators 	65%		
	Starting circuit: Show an understanding of the basic starting circuit. Supplemental systems (purpose and operation): <ul style="list-style-type: none"> • Traction control • Air bag control 	75%		

Topic	Content	%	Date completed	Sign
Maintenance (Generic)	Engine Lubrication Oil pumps (purpose and operation): <ul style="list-style-type: none"> • Gear • Vane • Rotor 	80%		
Maintenance (Specific)	Demonstrate an understanding of oil control methods referring to: <ul style="list-style-type: none"> • Oil filtration systems • Pressure relief valve • Seals Servicing of vehicles: <ul style="list-style-type: none"> • Importance of regular servicing 	85%		

Topic	Content	%	Date completed	Sign
Forces (Specific)	Automotive calculations and application: <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> ➤ Read and interpret job instructions ➤ Read & interpret & adhere manufacturers specifications 	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		

FITTING AND MACHINING

FITTING & MACHINING GRADE 10 – TERM 1

Topic	Content	%	Date completed	Sign
SAFETY (Generic)	<p>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:</p>	2%		
	<p>Knowledge of basic first aid</p> <p>Understand the OHS Act Learners must be fully aware of all the safety precautions when using the following tools:</p> <ul style="list-style-type: none"> • Hand tools • pedestal drill • Lathe Machine • Milling Machine • Bench grinder 	5%		
	<p>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:</p> <ul style="list-style-type: none"> • Power saws • Compressors • Fire extinguisher 	8%		
	<p>Practical: Identify safe and hazardous acts and conditions (e.g. speed of emery wheels, Maximum lift on hydraulic equipment etc.) Apply personal hygiene measures.</p> <p>Note: Apply personal hygiene measures. Clean workshop on a weekly basis</p>			

Topic	Content	%	Date completed	Sign
TOOLS (Generic)	Basic tools and equipment: <ul style="list-style-type: none"> • Spanners: ring-, flat- and combination- • Sockets and accessories • Pliers • Hammers • Chisels, hacksaws, • Screwdrivers • Allen keys • Files • Stocks & dies. 	12%		
	Application of measuring and marking-off instruments: <ul style="list-style-type: none"> • Steel Rule • Square • Scriber • Tape measure • Combination set • Punches 	16%		
	Practical: Use the marking-off instruments to mark-off a plate (at least 5mm thick) with 5 holes.			

Topic	Content	%	Date completed	Sign
MATERIALS (Generic)	Characteristics, composition and use of: <ul style="list-style-type: none"> • Ferrous metals and alloys: <ul style="list-style-type: none"> ➤ Low carbon steel ➤ Medium carbon steel ➤ High carbon steel ➤ Cast iron: <ul style="list-style-type: none"> • Grey cast iron • White cast iron ➤ Stainless steel (manganese, chrome, vanadium, titanium, tungsten, molybdenum and cobalt) • Non-ferrous elements: <ul style="list-style-type: none"> ➤ Copper, tin, lead, zinc, aluminium, nickel • Non-ferrous alloys: <ul style="list-style-type: none"> ➤ Brass, bronze, phosphor bronze, white metal, duralumin and solder 	18%		
	Practical: <ul style="list-style-type: none"> • Collect a sample of 5 non-ferrous elements and 5 non-ferrous alloys • Give 2 uses for each sample collected 	25%		

Topic	Content	%	Date completed	Sign
TERMINOLOGY (Machining) (Specific)	Lathe: <ul style="list-style-type: none"> • Classification • Types of bed: V and flat and gap • Functions of: <ul style="list-style-type: none"> ➤ 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): <ul style="list-style-type: none"> ➤ 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)	<ul style="list-style-type: none"> • Taper turning (Methods, Advantages and disadvantages): <ul style="list-style-type: none"> ➤ Compound slide ➤ Tail stock ➤ Taper turning attachment ➤ Cutting tool • Screw cutting (Compound slide – Theory only): <ul style="list-style-type: none"> ➤ 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 	55%		
	Practical: <ul style="list-style-type: none"> • 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 	60%		

Topic	Content	%	Date completed	Sign
FORCES (Generic)	Forces: Differentiate between the different types of forces found in engineering components: <ul style="list-style-type: none"> • Pulling force (Tensile) • Compressive force • Shearing force 	63%		
	Components of forces: <ul style="list-style-type: none"> • 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.	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: <ul style="list-style-type: none"> • Drill sizes for screw cutting • Width, thickness and length of keys 	73%		
	Semi-permanent joining methods: <ul style="list-style-type: none"> • Bolts • Studs • Locking devices • Nuts • Split pins • Rivets 	78%		
	Semi-permanent joining methods: <ul style="list-style-type: none"> • Keys – Identification, fitting and uses of the following types: <ul style="list-style-type: none"> ➢ 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.	82%		

Topic	Content	%	Date completed	Sign
SYSTEMS AND CONTROL (Drive systems) (Specific)	MECHANICAL: Identify different drive systems referring to application., <ul style="list-style-type: none"> • Spur gears • Pulleys and belt drives • Chain drives 	85%		
	Identification and application on the following screw threads (properties, uses, profiles and angles): <ul style="list-style-type: none"> • ISO Metric V-thread (fine and coarse) • Square thread • Acme thread Practical: Identify the most suitable mechanical drive system for various applications	90%		
REVISION / INFORMAL ASSESSMENT(S)	Date(s) completed _____	HOD Signature: _____ Date: _____		
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FITTING & MACHINING GRADE 10 – TERM 4

Topic	Content	%	Date completed	Sign
MAINTENANCE (Generic)	Properties of lubricants: <ul style="list-style-type: none"> • Viscosity • Pour point • Flash point 	92%		
	Grading of oil according to viscosity: (SAE standards) <ul style="list-style-type: none"> • Transmission oil • Grease 			
	Friction: <ul style="list-style-type: none"> • Characteristics • Application 			
	Define the following types of maintenance: <ul style="list-style-type: none"> • Preventive • Predictive • Reliability centred maintenance 	95%		
	Identify the outcome of the lack of maintenance on equipment used in the workshop: <ul style="list-style-type: none"> • 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	100%		
	Practical: Analyse and predict the outcome of the lack of maintenance on equipment used in the workshop			
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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	2%		
	Machine specific safety measures when dealing with: <ul style="list-style-type: none"> • 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.	7%		

Topic	Content	%	Date completed	Sign
TOOLS (Generic)	The principles and functions of the following: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Dial indicators • Telescopic gauges • Torque wrenches • Outside, Inside micrometers and • Vernier calliper Practical: Demonstrate competent use of: <ul style="list-style-type: none"> • Dial indicators • Telescopic gauges • Torque wrenches • Inside micrometers 	16%		

Topic	Content	%	Date completed	Sign
TERMINOLOGY Machining (Specific)	Lathe: <ul style="list-style-type: none"> • 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) <ul style="list-style-type: none"> ➤ Calculations for setting over of compound slide 	22%		
	Screw cutting <ul style="list-style-type: none"> ➤ 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) 	30%		
	Practical – Lathe: <ul style="list-style-type: none"> • 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 			
REVISION / INFORMAL ASSESSMENT(S)	Date(s) completed _____	HOD Signature: _____ Date: _____		
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FITTING & MACHINING GRADE 11 – TERM 2

Topic	Content	%	Date completed	Sign
TERMINOLOGY Machining (Specific)	Milling machine: <ul style="list-style-type: none"> • Safety measures • Milling machine parts • Calculations on: <ul style="list-style-type: none"> ➤ Centring of cutter ➤ Cutting of key ways – parallel • Milling cutters (identification and uses): <ul style="list-style-type: none"> ➤ Side and face cutter ➤ End mill ➤ Flute mill ➤ T-slot mill ➤ Helical cutter ➤ Involute gear tooth cutter Practical – Milling machine: <ul style="list-style-type: none"> • Centring of cutter • Cutting of parallel key way 	38%		

Topic	Content	%	Date completed	Sign
MATERIALS (Generic)	Distinguish between the following properties of engineering materials: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • System of forces (maximum of three forces) • Resultant and equilibrant 	51%		
	Moments: Moments found in engineering components: (By calculation only) <ul style="list-style-type: none"> • Law of moments: <ul style="list-style-type: none"> ➤ Sum of LHM = Sum of RHM A simply supported beam with two vertical point loads acting on the beam supported by two supports.	55%		
	Basic calculations on stress: <ul style="list-style-type: none"> • Square tubing • Round tubing Practical: Use basic calculations to determine forces, moments and stress	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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Gear train • Pulley systems (i.e. block and tackle) • V-Belt drives • Chain drives 	75%		
	Basic velocity calculations on: <ul style="list-style-type: none"> • Gears (compound) Including idler gears • Pulley systems and • Belts (v-belts) Transfer of movement: <ul style="list-style-type: none"> • Spur gears • Gear Ratio • Power transmission 	84%		
	HYDRAULICS / PNEUMATICS Basic calculations on: Pistons and reservoirs (only a single cylinder): volume, pressure, force, area Description, identification and application of: <ul style="list-style-type: none"> • Valves, pipes, pressure gauges 	89%		
	Practical: Practically determine the transfer of movement of mechanical and hydraulic operating systems mentioned above including drive systems through a simple designed project			

Topic	Content	%	Date completed	Sign
PUMPS (Specific)	Identify the following pumps by referring to purpose, construction and operating principles: <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • 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%		
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		

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.	2%		
	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:			
	<ul style="list-style-type: none"> • Different hand tools • Pedestal drill • Bench grinder • Guillotine • Bending machine • Power saws 	5%		
	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): <ul style="list-style-type: none"> • Different hand tools • Pedestal drill • Pedestal grinder • Guillotine • Compressors • Fire extinguishing apparatus 	8%		
	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.			

Topic	Content	%	Date completed	Sign
TERMINOLOGY (Welding) (Specific)	<p>Explain the following terms with the aid of sketches:</p> <ul style="list-style-type: none"> • 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 <p>PRACTICAL: Explain the welding terms by means of sketches</p> <p>TEMPLATES</p> <ul style="list-style-type: none"> • Materials used for template: wood, cardboard steel and hardboard • Principle of simple setting-out of the right angle and the application of Pythagoras' theory <p>Practical: Do calculations on the theorem of Pythagoras and apply the principle by setting a right-angled project.</p>	15%		
	<p>PRINCIPLES AND FUNCTIONS OF</p> <ul style="list-style-type: none"> • Arc welding machines such as AC and DC • Arc welding accessories 	20%		
	<p>ELECTRICAL ASPECTS REGARDING ARC WELDING</p> <p>Explain the following:</p> <ul style="list-style-type: none"> • Volts • Current (Ampere) • Resistance • Polarity • Arc voltage • Direct current • Alternating current • Earthing • Single phase • Three phase • Voltage drop <p>Practical: Demonstrate an understanding of arc welding equipment by assembling the equipment in the correct sequence.</p>	23%		

Topic	Content	%	Date completed	Sign
TOOLS (Generic)	Basic tools and equipment: <ul style="list-style-type: none"> • Spanners: ring-, flat- and combination- • Sockets and accessories • Pliers • Hammers • Chisels, hacksaws, • Screwdrivers • Allen keys • Files • Stocks & dies. 	28%		
	Application of measuring and marking-off instruments: <ul style="list-style-type: none"> • Steel Rule • Square • Scriber • Tape measure • Combination set • Punches 	32%		
	Practical: Use the marking-off instruments to mark-off a plate (at least 5mm thick) with 5 holes.			
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 10 – TERM 2

Topic	Content	%	Date completed	Sign
Joining methods (Generic)	Calculations on the size of drills and key dimensions: <ul style="list-style-type: none"> • Drill sizes for screw cutting • Width, thickness and length of keys 	35%		
	Semi-permanent joining methods: <ul style="list-style-type: none"> • Bolts • Studs • Locking devices • Nuts • Split pins • Rivets 	37%		
	Keys – Identification, fitting and uses of the following types: <ul style="list-style-type: none"> • Parallel • Taper • Gib head • Woodruff keys 	40%		
Forces (Generic)	Forces: Differentiate between the different types of forces found in engineering components: <ul style="list-style-type: none"> • Pulling force (Tensile) • Compressive force • Shearing force 	42%		
	Components of forces: <ul style="list-style-type: none"> • Parallelogram of forces – resultant of two forces graphically only; 	48%		
	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): <ul style="list-style-type: none"> • Square bar • Round bar 	55%		
	Practical: Calculations to determine <ul style="list-style-type: none"> • forces, • moment and • stress 			

Topic	Content	%	Date completed	Sign
Terminology (Welding symbols and joints)	Identifying the different WELDING SYMBOLS: <ul style="list-style-type: none"> • Elements of welding symbols 	60%		
	Theory and Application of PERMANENT JOINTS (Arc welding): <ul style="list-style-type: none"> • Lap joint • Butt joint • T-joint • Edge • Corner Practical: Apply the identified welding symbols by welding different types of joints using arc-welding.	65%		
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 10 – TERM 3

Topic	Content	%	Date completed	Sign
MAINTENANCE (GENERIC)	Define the following types of maintenance: <ul style="list-style-type: none"> • Preventive • Predictive • Reliability centred maintenance Lack of maintenance on equipment <ul style="list-style-type: none"> • Excessive wear • Overheating/seizing; and distortion • Failure Disadvantages of an unbalanced work piece or machine part	70%		
	Practical: Analyse and predict the outcome of the lack of maintenance on equipment used in the workshop	75%		

Topic	Content	%	Date completed	Sign
TERMINOLOGY DEVELOPMENTS (Specific)	Development of: <ul style="list-style-type: none"> • 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: _____ All theory including practical application and PAT tasks for term 1 have been completed Marks entered onto electronic mark sheet		
CONTROLLED TEST	Date completed _____			

WELDING AND METALWORK GRADE 10 – TERM 4

Topic	Content	%	Date completed	Sign
MATERIALS (GENERIC)	Characteristics, composition and use of: <ul style="list-style-type: none"> • Ferrous metals and alloys: <ul style="list-style-type: none"> ➤ Low carbon steel ➤ Medium carbon steel ➤ High carbon steel Cast iron: <ul style="list-style-type: none"> • Grey cast iron • White cast iron Stainless steel (manganese, chrome, vanadium, titanium, tungsten, molybdenum and cobalt) <ul style="list-style-type: none"> • Non-ferrous elements: <ul style="list-style-type: none"> ➤ Copper, tin, lead, zinc, aluminium, nickel • Non-ferrous alloys: <ul style="list-style-type: none"> ➤ Brass, bronze, phosphor bronze, white metal, duralumin and solder 	95%		
	Practical: <ul style="list-style-type: none"> • Collect a sample of 5 non-ferrous elements and 5 non-ferrous alloys • Give 2 uses for each sample collected. 	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		

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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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. 	15%		
	The application of ROOF TRUSSES: Calculations of: <ul style="list-style-type: none"> • Rise • Slope • Pitch The layout of roof trusses, details of purlins, truss shoes, wall plates, expansion and footing.	18%		
	Practical: Develop a roof truss using the given instructions and templates and by applying the theorem of Pythagoras.			

TERMINOLOGY Machining (Specific)	CALCULATION OF COSTS: <ul style="list-style-type: none"> Quantification from drawings Compiling of cutting lists Calculation of cost of roof trusses and lattice beams 	22%		
	EXPLAIN THE FOLLOWING TERMS: <ul style="list-style-type: none"> Deposited metal Fusion zone Gap Heat effected zone Kerf Spatter Weld pool WELDING SYMBOLS: <ul style="list-style-type: none"> Fusion weld symbols Supplementary symbols 	25%		

Topic	Content	%	Date completed	Sign
Tools (Specific)	The principles and functions of the following purpose-made tooling and equipment: <ul style="list-style-type: none"> 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: _____		
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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) <ul style="list-style-type: none"> 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.	45%		
	Moments: <ul style="list-style-type: none"> 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?	50%		
	STRESS AND STRAIN (Calculations of) <ul style="list-style-type: none"> 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	55%		

WELDING AND METALWORK GRADE 11 – TERM 3

Topic	Content	%	Date completed	Sign
JOINING METHODS(Specific)	HEAT TREATMENT OF STEEL: <ul style="list-style-type: none"> • The changes in structure of carbon steel during heating cooling processes • The iron carbon equilibrium diagram: <ul style="list-style-type: none"> ➢ The temperature range of 500-900 °C ➢ Carbon content between 0% and 1.4% • Description of the purpose and methods for the following: <ul style="list-style-type: none"> ➢ Annealing ➢ Normalizing ➢ Hardening ➢ Tempering ➢ Case hardening 	74%		
	PRACTICAL: <ul style="list-style-type: none"> • 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. 	77%		

Topic	Content	%	Date completed	Sign
MATERIALS (GENERIC)	Function and operation of the following equipment used during the manufacturing of steel: <ul style="list-style-type: none"> • Blast furnace – refining of iron ore • Bessemer convertor • Electric arc furnace 	85%		
	Distinguish between the following properties of engineering materials: <ul style="list-style-type: none"> • Hardness • Plasticity • Elasticity • Ductility • Malleability • Brittleness • Toughness 	88%		

Topic	Content	%	Date completed	Sign
TERMINOLOGY DEVELOPMENT (Specific)	Development of: <ul style="list-style-type: none"> • Transformations between parallel horizontal planes: <ul style="list-style-type: none"> ➤ Square to square ➤ Square to round • Cones on and off centres <ul style="list-style-type: none"> ➤ 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: _____		
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 11 – TERM 4

Topic	Content	%	Date completed	Sign
TERMINOLOGY: Steel Sections (Specific)	Knowledge of steel sections such as: <ul style="list-style-type: none"> • Angle sections • Channel sections • I-beam sections Referring to: <ul style="list-style-type: none"> • 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		