



GAUTENG PROVINCE

Department: Education

REPUBLIC OF SOUTH AFRICA

MECHANICAL TECHNOLOGY 2026

ANNUAL TEACHING PLAN

Grade 12

2
MECHANICAL TECHNOLOGY

FITTING AND MACHINING

GRADE 12

GRADE 12: TERM 1 – FITTING AND MACHINING

WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
1 - 3 12 hours	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 Knowledge and application of basic workshop layouts: - Process layout - Product layout Referring to the OHS Act, analyse the responsibilities of the: - Employer - Employee Practical: Compare the process and product layout of 2 different manufacturing or maintenance workshops		5		

Fitting and Machining Grade 12: Term 1

WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
4 - 5 8 hours		Lathe: - Safety measures - Taper turning (compound slide method – inside and outside tapers) ➤ Calculations for setting over of compound slide and tail stock - 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 and square threads ➤ Square thread (calculation of helix, leading and following angles for the cutting tools) ➤ Methods of cutting multi-start screw threads (Theory only): Set over of compound slide Change gear		10		
		Milling machine: - Safety measures Calculations on: ➤ Centring of cutter ➤ Cutting of keyways Identifying and apply the following milling processes and describe the advantages and disadvantages: ➤ Gang milling ➤ Straddle milling ➤ Down cut ➤ Up cut		15		
				20		

		Practical: • Use a lathe to do taper turning • Use a lathe to do multi-start screw cutting • Use a milling machine to show compliance on down cut and up cut milling • Use a milling machine to cut a parallel keyway				
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WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
6 - 8 12 hours	TERMINOLOGY Machining (Specific)	Indexing: • Calculations on the indexing for a square, pentagon and hexagon – including the depth of cut • Calculations of the following indexing processes: ➤ Rapid ➤ Simple ➤ Angular ➤ Differential Dovetail slides: • Calculation for internal and external dove tail with precision rollers • Calculation of included angle. • Test for accuracy Write a Digital Read Out (DRO) Program to incorporate cutting a recess on a work piece: • Explain the difference between DRO and CNC systems • Programming on a 3-axis digital readout system (“DRO”) on milling machines • Absolute and incremental reference systems • Tools change position • Allowance for diameter thickness Balancing of irregular work pieces on a lathe: • Graphical solution to balance an unbalanced work piece on a face plate		25		
				28		

Fitting and Machining Grade 12: Term 1

			Practical component	%	Date completed	Signature
		Manufacturing of spur gear: • Involute gear tooth form with a module of no more than 3 • Calculations on: ➤ Number of teeth ➤ Pitch circle diameter ➤ Module ➤ Outside diameter ➤ Addendum ➤ Dedendum ➤ Full depth – cutting depth ➤ Working depth ➤ Clearance ➤ Circular pitch, chordal tooth thickness, chordal tooth addendum ➤ Indexing Practical: Use a milling machine to cut a spur gear		32		
WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
9 4 hours	TOOLS (Specific)	Describe the principles and functions of advanced engineering equipment: • Brinell and Rockwell hardness testers • Moments and forces testers • Tensile testers Simple calculations on: • Depth micrometre • Screw thread micrometre (included angle) Practical: • Do tests by using the above advanced engineering equipment • Use micrometres to take different measurements		36		
10	REVISION	HOD Signature: _____ Date: _____ All theory including practical application and PAT tasks for term 1 have been completed Marks entered onto electronic mark sheet				
11	CONTROL TEST					

SPECIFIC CONTENT

Mechanical Technology Specialisation ATP 2026

Mechanical Technology Specialisation ATP 2026

Fitting and Machining Grade 12: Term 3

GRADE 12 – TERM 3

SPECIFIC CONTENT

WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
7 - 8 8 hours	JOINING METHODS (Specific)	Use basic calculations on the size of drills for bolts and nuts (ISO metric): • Root diameter • Crest diameter • Effective diameter • Pitch • Lead for multi-start screw threads		63		
		Use basic calculations on the size of drills for bolts and nuts (Square thread): • Crest diameter • Effective diameter • Pitch • Lead for multi-start screw threads • Helix angle • Following angle – cutting tool – support by means of a clear drawing • Leading angle – cutting tool - support by means of a clear drawing • Clearance angle - support by means of a clear drawing Practical: Use basic calculations to determine the dimensions of a square thread		70		

Fitting and Machining Grade 12: Term 3

WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
3 - 6 16 hours	SYSTEMS AND CONTROL Drive systems (Specific)	MECHANICAL COMPONENTS: Uses, functions, advantages and disadvantages of the following drive systems: • Gears • Pulleys • Belts (V- and flat) and • Chains Basic power and velocity calculations on: • Gears – Transmission of torque ($T=Fr$) and power ($P=2\pi NT/60$) • Gears (compound): Angular velocity and direction of rotation – including idler gears • V-belts, chains and pulleys: Linear velocity ($V=\pi DN$), and angular velocity ($N_1D_1=N_2D_2$) HYDRAULICS / PNEUMATICS Applied calculations on: • Pistons and reservoirs – hydraulic jack (ram and plunger) • The force exerted in a closed circuit. Identification and use of hydraulic components indicated by the symbols: • Motor • Pump • Filter • One-way valve • Spring-loaded double-action control valve • Pressure gauge • Non-return valve • Reservoir Practical – hydraulics: Design and illustrate schematically a double-action hydraulic control system Practical – mechanical systems: Use basic calculations to determine the outcome of the abovementioned drive systems		82		
				92		

WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
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1 - 2 8 hours	MATERIALS (Generic)	Identify materials by: • Sound test • Bending test • Filing test and • Machining test Methods of enhancing the properties of steel (only heated temperature and cooling apply): • Tempering • Case hardening • Hardening • Annealing • Normalising Practical: Test FOUR different types of materials using the: • Sound test • Bending test • Filing test • Machining test		97		
7 - 11	TRIAL EXAMINATION	HOD Signature: _____ Date: _____ All theory including practical application and PAT tasks for term 3 have been completed Marks entered onto electronic mark sheet				

FITTING AND MACHINING

GRADE 12 – TERM 4

WEEK	TOPIC	CONTENT	
1 - 3	REVISION		HOD Signature:
4 - 9	EXAMINATION		_____ Date: _____ All theory including practical application and PAT tasks for term 4 have been completed Marks entered onto electronic mark sheet

MECHANICAL TECHNOLOGY – AUTOMOTIVE

GRADE 12 – TERM 1

WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
1 - 3 12 hours	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 Knowledge and application of basic workshop layouts: - Process layout - Product layout Referring to the OHS Act analyse the responsibilities of the: - Employer - Employee Practical: Compare the process and product layout of TWO different manufacturing or maintenance workshops		5		

WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
4 - 6 12 hours	TOOLS (Specific)	Identification and application of diagnostic equipment: • Compression tester • Cylinder leakage tester • Gas analyser (all crankcase gases) • Computerised diagnostic scanner • Wheel balancer • Wheel alignment equipment (bubble gauge and turn tables) Practical: Use any 2 of the diagnostic equipment mentioned above to simulate a real-life situation		10 20		
7 - 9 12 hours	ENGINES (Specific)	Crankshafts: • Balancing of crankshafts • Vibration damper (function and assembly) • Cylinder layouts • Crank arrangements • Firing orders Describe the operating principles and construction of: • Turbochargers • Super chargers Practical: Compare and identify different crankshafts layouts and match to the different cylinder blocks		31 38		
10	REVISION	HOD Signature: _____ Date: _____ All theory including practical application and PAT tasks for term 1 have been completed Marks entered onto electronic mark sheet				
11	CONTROL TEST					

GRADE 12: TERM 2 – AUTOMOTIVE

WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
1 - 2 8 hours	MATERIALS (Generic)	Identify materials by: • Sound test • Bending test • Filing test • Machining test		44		
		Methods of enhancing the properties of steel (only heated temperature and cooling apply): • Tempering • Case hardening • Hardening • Annealing • Normalising Practical: Test TWO different materials using the: • Sound test • Bending test • Filing test • Machining test		49		
3 - 4 8 hours	FORCES (Specific)	Application of the following automotive calculations: • Work, Power, Torque, Compression Ratio • Indicated Power, Brake Power, Mechanical Efficiency Practical: • Measure stroke • Measure cylinder bore • Measure combustion chamber volume Use specifications and measurements obtained from a given engine and calculate the Indicated power		60		

Automotive Grade 12: Term 2

WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
5 - 6 8 hours	MAINTENANCE (Specific)	Diagnose faults by using and reading test equipment: • Gas analysing • Compression test • Cylinder leakage • Pressure test Practical: Use abovementioned equipment to diagnose faults on an engine		68		
7 - 8 8 hours	SYSTEMS AND CONTROL (Specific) (DRIVE TRAINS)	Describe the operational purpose and functions of the automatic gearbox: • Torque converters • Epicyclical gear trains • Brake bands/locking devices • Control body (purpose only) • Gear Ratios Practical: ▪ Explain the power flow through the torque convertor ▪ Identify various main components of the automatic gearbox		75		
9 - 11	EXAMINATION	HOD Signature: _____ Date: _____ All theory including practical application and PAT tasks for term 2 have been completed Marks entered onto electronic mark sheet				

GRADE 12: TERM 3 – AUTOMOTIVE

WEEK	TOPIC	PRESCRIBED CONTENT	Practical component	%	Date completed	Signature
1 - 6 24 hours	SYSTEM AND CONTROL (Specific)	Steering Geometry: - Alignment to manufacturers specifications - Toe-in and toe-out - Castor and camber - Kingpin inclination - Ackermann principle (toe-out on turns) Practical: Use testing equipment and demonstrate competency to test and adjust various wheel alignment angles to specifications: - Toe-in and toe-out - Castor and camber Application of wheel balancing: - Static - Dynamic Practical: Use a wheel balancer and demonstrate competency to balance a wheel ELECTRICITY: Purpose and operation of engine management: - Petrol - Diesel - Catalytic converter - Speed Control systems (Theory only) - Charging systems (Alternator) Practical: Use a diagnostic scanner on an engine to test various systems Electrical fuel pump (Theory): - Purpose and operation - Pressure control (basic) Practical: Test fuel pump pressure		85		
				90		
				100		
7 - 11	EXAMINATIONS	HOD Signature: _____ Date: _____ All theory including practical application and PAT tasks for term 3 have been completed Marks entered onto electronic mark sheet				

GRADE 12: TERM 4 – AUTOMOTIVE

WEEK	TOPIC	PRESCRIBED CONTENT				
1 - 3	REVISION		HOD Signature: _____ Date: _____ All theory including practical application and PAT tasks for term 4 have been completed Marks entered onto electronic mark sheet			
4 - 9	EXAMINATIONS					

WELDING AND METALWORK

GRADE 12

WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
1 - 3 12 hours	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 Knowledge and application of basic workshop layouts: - Process layout - Product layout Referring to the OHS Act analyse the responsibilities of the: - Employer - Employee Practical: Compare the process and product layout of TWO different manufacturing or maintenance workshops		5		

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GRADE 12 – TERM 2

WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
1 - 4 16 hours	FORCES (Specific)	FORCES AND MOMENTS: Effects of forces and moments on engineering components applying design principles: STEEL FRAMEWORKS: Determine graphically the magnitude and nature of forces on the members of frameworks with a maximum of 11 (eleven) parts. (Only parallel and vertical loads.) Calculate the reactions. Basic calculations on: • Moments found in engineering components: (By calculation only) • A simply supported beam with two vertical point loads and one uniformly distributed load (UDL) acting on the beam (including reactions at the supports) • A simply supported beam with THREE vertical point loads and without uniformly distributed load (UDL) acting on the beam • Calculate the reactions at the supports • Calculate the bending moments at each and shear forces between points Draw the following diagrams to scale: • Space diagram • Bending moment diagram • Shear force diagram Practical: Do calculations of moments and, using a bending moment tester, perform a bending moment test on a beam. STRESS AND STRAIN (Calculation of): • Stress and strain (Hooke's law) • Compressive/tensile stresses • Young's modulus of elasticity (<u>include the factor of safety</u>) • Determine change in length (Δl) • Stress/strain diagram Practical: Do calculations on stress and strain whilst taking into consideration Young's modulus for each material.		45		
				50		

WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
5 - 8 16 hours	JOINING METHODS (Specific)	INSPECTION OF WELDS (Inspection during and after completion of oxy-acetylene and arc welding): • Clean bead • Constant width and height of bead • Fusion and penetration • Presence of pits • Undercutting • Distortion • Cracks • Spatter • Slag inclusion • Start and termination of weld • Correct flame • Pressure • Current Application of destructive tests on welded joints: • Nick break • Nick bend • Machinability tests Practical: Perform destructive tests on a welded joint using nick break, nick bend and machinability test to identify defects. Describe and compare the following non-destructive tests: • Visual inspection • X-rays • Dye penetration • Ultrasonic test Practical: Perform the above non-destructive tests on a welded joint to identify defects.		60		
				70		

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GRADE 12 – TERM 3

WEEK	TOPIC	CONTENT	Practical component	%	Date completed	Signature
1 - 2 8 hours	MAINTENANCE (Specific)	Refer to manufacturers' manual. Suitable preventative maintenance in operating systems for guillotine, pedestal drill, power saw, roller, punch and shearing machine and pedestal grinder. Identify causes of malfunction of: - Lack of lubrication or incorrect lubrication - Overloading - Friction Practical: Perform periodic maintenance as prescribed by manufacturers on specific machines.		90		
3 - 8 24 hours	TERMINOLOGY DEVELOPMENTS (Specific)	Development of: Marking-off templates, by calculation only, of the following between horizontal parallel planes: - A cone frustum of slight taper - Square to round transformers (on centre only) - Hoppers with square or rectangular openings (on and off centre) Practical: Do calculations on cone frustum, square to round transition and hoppers.		100		
9 - 11	TRIAL EXAMINATION	HOD Signature: _____ Date: _____ All theory including practical application and PAT tasks for term 3 have been completed Marks entered onto electronic mark sheet				

WELDING AND METALWORK
GRADE 12 – TERM 4

WEEK	TOPIC	CONTENT				
1 - 3	REVISION		HOD Signature: _____ Date: _____ All theory including practical application and PAT tasks for term 4 have been completed Marks entered onto electronic mark sheet			
4 - 9	EXAMINATION					