



## 2023/24 ANNUAL TEACHING PLANS: MECHANICAL TECHNOLOGY (FITTING AND MACHINING): GRADE 12 (TERM 1)

TERM 1	WEEK 1 (3%)	WEEK 2 (5%)	WEEK 3 (15%)	WEEK 4 (20%)	WEEK 5 (23%)	WEEK 6 (26%)	WEEK 7 (28%)	WEEK 8 (32%)	WEEK 9 (36%)	WEEK 10	WEEK 11
CAPS TOPICS	SAFETY (Generic)	SAFETY (Generic)		TERMINOLOGY (Machining) (Specific)					TOOLS (Specific)	Revision	Assignment
TOPICS/CONCEPTS, SKILLS AND VALUES	<b>HIV/AIDS awareness</b> <b>Knowledge of basic First Aid measures</b> <b>Analyse the OHS Act and regulations where applicable to the following machines:</b> <ul style="list-style-type: none"> <li>Grinding machines (portable, bench and surface)</li> <li>Cutting (drilling machines, power saw, band saw)</li> <li>Shearing machines (manual and power driven)</li> </ul> <b>Referring to the OHS Act, analyse the responsibilities of the:</b> <ul style="list-style-type: none"> <li>Employer</li> <li>Employee</li> </ul>	<b>HIV/AIDS awareness</b> <b>Knowledge of basic First Aid measures</b> <b>Analyse the OHS Act and regulations where applicable to the following machines:</b> <ul style="list-style-type: none"> <li>Press machines</li> <li>Joining (arc, gas)</li> <li>Handling and usage of gas cylinders</li> </ul> <b>Knowledge and application of basic workshop layouts:</b> <ul style="list-style-type: none"> <li>Process layout</li> <li>Product layout</li> </ul>	<b>Lathe:</b> <ul style="list-style-type: none"> <li>Safety measures</li> <li>Taper turning</li> <li>Screw cutting</li> </ul> <b>Balancing of irregular work pieces on a lathe:</b> <ul style="list-style-type: none"> <li>Graphical solution to balance an unbalanced work piece on a face plate</li> </ul>	<b>Milling machine:</b> <ul style="list-style-type: none"> <li>Safety measures</li> <li>Calculations on: <ul style="list-style-type: none"> <li>Centring of cutter</li> <li>Cutting of keyways</li> </ul> </li> <li>Identifying and applying the following milling processes and describing the advantages and disadvantages: <ul style="list-style-type: none"> <li>Gang milling</li> <li>Straddle milling</li> <li>Down cut</li> <li>Up cut</li> </ul> </li> </ul>	<b>Indexing:</b> <ul style="list-style-type: none"> <li>Calculations on the indexing for a square, pentagon and hexagon – including the depth of cut</li> <li>Calculations of the following indexing processes: <ul style="list-style-type: none"> <li>Rapid</li> <li>Simple</li> <li>Angular</li> <li>Differential</li> </ul> </li> </ul>	<b>Dovetail slides:</b> <ul style="list-style-type: none"> <li>Calculation for internal and external dovetail with precision rollers</li> <li>Calculation of included angle</li> <li>Test for accuracy</li> </ul>	<b>Write a Digital Read Out (DRO) programme to incorporate cutting a recess on a work piece:</b> <ul style="list-style-type: none"> <li>Explain the difference between DRO and CNC systems</li> <li>Programming on a 3-axis digital readout system (DRO) on milling machines</li> <li>Absolute and incremental reference systems</li> <li>Tools change position</li> <li>Allowance for diameter thickness</li> </ul>	<b>Manufacturing of spur gear:</b> <ul style="list-style-type: none"> <li>Involute gear tooth form with a module of no more than 3</li> <li>Calculations on: <ul style="list-style-type: none"> <li>Number of teeth</li> <li>Pitch circle diameter</li> <li>Module</li> <li>Outside diameter</li> <li>Addendum</li> <li>Dedendum</li> <li>Full depth – cutting depth</li> <li>Working depth</li> <li>Clearance</li> <li>Circular pitch, chordal tooth thickness, chordal tooth addendum</li> <li>Indexing</li> </ul> </li> </ul>	Describe the principles and functions of advanced engineering equipment: <ul style="list-style-type: none"> <li>Brinell and Rockwell hardness testers</li> <li>Moments and forces testers</li> <li>Tensile testers</li> </ul> <b>Simple calculations on:</b> <ul style="list-style-type: none"> <li>Depth micrometre</li> <li>Screw thread micrometre (included angle)</li> </ul>		
PRACTICAL ACTIVITIES	<b>Practical:</b> Compare the process and product layout of 2 different manufacturing or maintenance workshops	<b>Practical:</b> Compare the process and product layout of 2 different manufacturing or maintenance workshops	<b>Practical:</b> <ul style="list-style-type: none"> <li>Use a lathe to do taper turning</li> <li>Use a lathe to do multi-start screw cutting</li> </ul>	<b>Practical:</b> <ul style="list-style-type: none"> <li>Centre a cutter on a milling machine</li> </ul>	<b>Practical:</b> <ul style="list-style-type: none"> <li>Use a milling machine to show compliance on down cut and up cut milling</li> <li>Use a milling machine to cut a parallel keyway</li> </ul>	<b>Practical:</b> <ul style="list-style-type: none"> <li>Use a milling machine to show compliance on down cut and up cut milling</li> <li>Use a milling machine to cut a parallel keyway</li> </ul>		<b>Practical:</b> Use a milling machine to cut a spur gear	<b>Practical:</b> <ul style="list-style-type: none"> <li>Do tests by using the above advanced engineering equipment</li> <li>Use micrometres to take different measurements</li> </ul>		
REQUISITE PRE-KNOWLEDGE	Gr 11: Basic First Aid HIV/AIDS Awareness OHS Act Machine specific safety measures	Gr 11: Basic First Aid HIV/AIDS Awareness OHS Act Machine specific safety measures	Tools: Purpose made tooling and equipment Lathe work, taper turning & screw cutting	Milling machine safety and parts Milling operations	Milling machine safety and parts Milling operations	Milling machine safety and parts Milling operations	Lathe work Milling operations	Milling operations	Purpose made tooling and equipment		
RESOURCES (OTHER THAN TEXTBOOK) TO ENHANCE LEARNING	OHS Act Safety signs in workshop First Aid training manuals	OHS Act Safety signs in workshop First Aid training manuals	Lathes and tooling, instructional videos, You-Tube videos, etc.	Milling machines and tooling, instructional videos, YouTube videos, etc.	Milling machines with dividing head and tooling, instructional videos, You-Tube videos, etc.	Milling machines with dividing head and tooling, instructional videos, You-Tube videos, etc.	Lathes & milling machines with electronic DROs	Lathes & milling machines with necessary tooling Old question papers	Past question papers		
ASSESSMENT	INFORMAL	Classwork/case studies/worksheets/homework/class tests (theory and practical work)									
	SBA & PAT FORMAL	<b>Assignment</b> <b>PAT Phase 1</b> Occupational Health and Safety Act, Act 85 of 1993, as amended, read with the Hazardous Biological Agents Regulations. Section 8 (1) of the Occupational Health and Safety (OHS) Act, Act 85 of 1993. Safe work practices are types of administrative controls that include procedures for safe and proper work used to reduce the duration, frequency, or intensity of exposure to a hazard. Examples of safe work practices include: Requiring regular hand washing or using of alcohol-based hand rubs. Learners and teachers should always wash hands when they are visibly soiled and after removing any PPE. Keep safe distances and wear a mask at all times. See the document on the workshop safety measures.									

## 2023/24 ANNUAL TEACHING PLANS: MECHANICAL TECHNOLOGY (FITTING AND MACHINING): GRADE 12 (TERM 2)

TERM 2		WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11
<b>CAPS TOPICS</b>		<b>FORCES (Specific)</b> (37%) (38%) (39%) (40%)				<b>Forces (42%)</b> (44%)		<b>MAINTENANCE (Specific)</b> (47%) (52%)		<b>PAT consolidation and revision</b>	<b>June controlled test/exams</b>	<b>June controlled test/exams</b>
<b>TOPICS/CONCEPTS, SKILLS AND VALUES</b>		<b>Forces:</b> Basic calculations: • System of forces (maximum of four forces) • Resultant and equilibrant	<b>Forces:</b> Basic calculations: • Resultant and equilibrant	<b>Moments:</b> 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 (only two)	<b>Moments:</b> A simply supported beam with two vertical point loads and one uniformly distributed load (UDL) acting on the beam including reactions at the supports (only two)	<b>Stress/strain:</b> Basic calculations on: • Stress • Strain (stress/strain diagram only for mild steel)	<b>Stress/strain:</b> Basic calculations on: • Safety factor • Modulus of elasticity and • Change in length	<b>Suitable preventative maintenance in operating systems for:</b> • Gear • Belt and • Chain drives <b>The use of the following materials for bushes and gears:</b> • Thermoplastic composites • Thermo-hardened composites	<b>Minimum and maximum coefficient of friction for the following different materials:</b> • Copper • Cast iron • Thermo-composites • Stainless steel • White metal • Rubber			
<b>PRACTICAL ACTIVITIES</b>						<b>Practical:</b> Use basic calculations to determine forces, moments and stress	<b>Practical:</b> Use basic calculations to determine forces, moments and stress		<b>Practical:</b> Collect and identify samples of thermoplastic and thermo hardened composites			
<b>REQUISITE PRE-KNOWLEDGE</b>			Effects of forces moments Basic calculations on stress		Causes of malfunction on lathes, milling machines and power tools							
<b>RESOURCES (OTHER THAN TEXTBOOK) TO ENHANCE LEARNING</b>			Old Gr.12 textbook, N3 & N4 Engineering Science and Strengths of Materials textbook Beam tester Shear tester and tensile tester		Vehicle workshop manuals Assorted books on different materials, YouTube videos, etc.							
<b>ASSESSMENT</b>	<b>INFORMAL</b>											
	<b>SBA &amp; PAT FORMAL</b>	<b>PAT Phase 2</b> Mid Year Examination										

## 2023/24 ANNUAL TEACHING PLANS: MECHANICAL TECHNOLOGY (FITTING AND MACHINING): GRADE 12 (TERM 3)

TERM 3		WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10
CAPS TOPICS		JOINING METHODS (Specific) (65%)	SYSTEMS & CONTROL: Drive systems (specific) (72%) (82%) (83%) (86%) (92%)					Materials (100%)	Revision and completion of PATs	Prelim exams	Prelim exams
TOPICS/CONCEPTS, SKILLS AND VALUES		Use basic calculations on the size of drills for bolts and nuts (ISO metric): <ul style="list-style-type: none"><li>Root diameter</li><li>Crest diameter</li><li>Effective diameter</li><li>Pitch</li><li>Lead for multi-start screw threads</li><li>Helix angle</li><li>Following angle – cutting tool – support by means of a clear drawing</li><li>Leading angle – cutting tool – support by means of a clear drawing</li></ul> Clearance angle – support by means of a clear drawing	MECHANICAL COMPONENTS: Uses, functions, advantages and disadvantages of the following drive systems: <ul style="list-style-type: none"><li>Gears</li><li>Pulleys</li><li>Belts (V- and flat) and</li><li>Chains</li></ul>	Basic power and velocity calculations on: <ul style="list-style-type: none"><li>Gears – transmission of torque and power</li><li>Gears: Angular velocity and direction of rotation - including idler gears</li><li>V-belts, chains and pulleys: Linear velocity and angular velocity</li></ul>	HYDRAULICS/ PNEUMATICS Applied calculations on: <ul style="list-style-type: none"><li>Pistons and reservoirs – hydraulic jack (ram and plunger)</li></ul> The force exerted in a closed circuit	HYDRAULICS/PNEUMATICS Applied calculations on: The force exerted in a closed circuit	Identification and use of hydraulic components indicated by the symbols: <ul style="list-style-type: none"><li>Motor</li><li>Pump</li><li>Filter</li><li>One-way valve</li><li>Spring-loaded double-action control valve</li><li>Pressure gauge</li><li>Non-return valve</li><li>Reservoir</li></ul>	Identify materials by: <ul style="list-style-type: none"><li>Sound test</li><li>Bending test</li><li>Filing test and</li><li>Machining test</li></ul> Methods of enhancing the properties of steel (only heated temperature and cooling apply): <ul style="list-style-type: none"><li>Tempering</li><li>Case hardening</li><li>Hardening</li><li>Annealing</li><li>Normalising</li></ul>			
	PRACTICAL ACTIVITIES	Practical: Use basic calculations to determine the dimensions of a square thread		Practical – mechanical systems: Use basic calculations to determine the outcome of the abovementioned drive systems			Practical – hydraulics: Design and illustrate schematically a double-action hydraulic control system	Practical: Test four different types of materials using the: <ul style="list-style-type: none"><li>Sound test</li><li>Bending test</li><li>Filing test</li></ul> Machining test			
	REQUISITE PRE-KNOWLEDGE	Functions, advantages and disadvantages of compound drives Velocity calculations Transfer of movement			Hydraulics/ pneumatics	Pumps – purpose and operation of various pumps		Properties of engineering materials			
	RESOURCES (OTHER THAN TEXTBOOK) TO ENHANCE LEARNING	Engines and components with drive systems Gearboxes and engines with different drive systems			Hydraulics/ pneumatics testers	Instructional videos, YouTube videos, etc.		Hand tools and testing equipment Instructional videos, YouTube videos, etc.			
ASSESSMENT	INFORMAL	Classwork/case studies/worksheets/homework/class tests (theory and practical work)									
	SBA & PAT FORMAL	PAT Phase 3 and 4 Preparatory examination The legislation governing workplaces in relation to COVID-19 is the Occupational Health and Safety Act, Act 85 of 1993, as amended, read with the Hazardous Biological Agents Regulations. Section 8 (1) of the Occupational Health and Safety (OHS) Act, Act 85 of 1993 Safe work practices are types of administrative controls that include procedures for safe and proper work used to reduce the duration, frequency, or intensity of exposure to a hazard. Examples of safe work practices for SARS-CoV-2 include: Requiring regular hand washing or using of alcohol-based hand rubs. Learners and teachers should always wash hands when they are visibly soiled and after removing any PPE. Keep safe distances and wear a mask at all times See the document on the workshop safety measures									

2023/24 ANNUAL TEACHING PLANS: MECHANICAL TECHNOLOGY (FITTING AND MACHINING): GRADE 12 (TERM 4)

TERM 4		WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5-10
CAPS TOPICS		Final PAT moderation and revision			Final examinations	Examinations
ASSESSMENT	INFORMAL ASSESSMENT: REMEDIATION	Classwork/case studies/worksheets/homework/class tests (theory and practical work)				
	SBA (FORMAL)	Final examination				