basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

MULTI-GRADE TEACHING ANNUAL TEACHING PLAN

SUBJECT: TECHNOLOGY

TERM 1: STRUCTURES

	TOPICS AND CONTENT		
WEEKS	**GRADE: 7**	**GRADE: 8**	**GRADE :9**
1 and 2	Introduction: What is Technology? Design process skills. **Refer to Technology Senior Phase CAPS Policy document page 14. Introduce to all Grades.**		
	Introduce the scenario for the Assignment Case Study: investigate photographs of existing cell phone towers noting structural elements, reinforcing techniques and design issues such as visual pollution, stability, base size and centre of gravity.	**Introduce the scenario for the Assignment** Case Study: Electric pylon - use pictures of arrange of pylon designs noting the variety of designs that solves the same problem effectively and use of internal cross bracing and triangulation.	**Introduce the scenario for the Assignment** • Investigate the situation and the need described in the scenario • Bridge: Investigate different types of bridges.
Informal assessment; remediation			

3 and 4	Case Study: examine features of a school desk. Write down the design brief with specifications for a school desk. (enabling task) [Note: All grades do this]		
	Natural and man-made structures Types of structures: shell, frame, solid Purpose of structures: contain, protect, support, span		Properties of construction material: mass, density, hardness, stiffness, flexibility, corrosion.
	Write the design brief for the Assignment	Design brief with specifications and constraints. Assignment.	Learners write the design brief with specifications for the final idea. Assignment
Informal assessment; remediation			
5 and 6	**Graphic communication skills: Introduction**	**Graphic communication skills: Revision**	**Graphic communication skills: Revision**
	Purpose of graphics: develop ideas and communicate ideas.	**Purpose of graphics**: develop ideas and communicate ideas.	**Purpose of graphics**: develop ideas and communicate ideas
	Conventions: outlines (thick/dark); construction lines (thin/feint); hidden detail (dashed) scale; dimensioning.	**Conventions**: outlines (thick/dark); construction lines (thin/feint); hidden detail (dashed) scale; dimensioning.	**Conventions**: outlines (thick/dark); construction lines (thin/feint); hidden detail (dashed) scale; dimensioning.

5 and 6	**Sketching**: free-hand sketching to show two different design ideas in 3D oblique for a cell phone tower to be erected near the school. **Assignment**	**Sketching**: free-hand sketching. Learners draw two initial idea sketches in 3D isometric. **Assignment**	**Sketching**: free-hand sketching. Each learner generate two possible ideas **Assignment**
	Strengthening structures by folding, tubing and triangulation.	Strengthening structures using folding, tubing, triangular webs and internal cross- bracing.	Strength of materials under the action of forces: compression, tension, torsion and shear.
	Working Drawings: 2-Dimensional drawing of ONE face of an object using conventions (dark lines; feint lines; dashed lines; dimensions; scale).	**Working Drawings:** 2-Dimensional drawing of ONE view/ face of an object using conventions (dark lines; feint lines; dashed lines; dimensions; scale). **Assignment**	**Working Drawings:** Each learner draws the plan (or an aspect of the plan) using first angle orthographic projection with suitable scale, correct line types and dimensions. **Assignment**
	Artistic drawings: Single vanishing point perspective of the initial idea of the cell phone tower; texture rendering; shading; colour. **Assignment**	**Artistic drawings**: Double vanishing point perspective; texture rendering; shading; shadows; color. **Assignment**	**Artistic drawings**: Single and double vanishing point perspective; texture rendering; shading; colour. **Assignment**
Informal assessment; remediation			
7 and 8	Frame structures: roof trusses and towers	Reinforcing – Struts, Ties. Stabilising: base size, base angles, centre of gravity, ground anchors.	Suitability of materials (fitness for purpose) in terms of properties , safety and cost effectiveness

	3-D Oblique Technique: 45º cabinet projection to scale with correct line types and dimensions.	**3-D Isometric** Projection 30º: drawn using underlying grid to scale with correct line types and dimensions.	**3-D Isometric** Projection: 30º, drawn using underlying grid to scale, correct line types and dimensions.
	Making includes working drawings, choosing materials and tools, and building the model. • Each learner lists the resources to be used. • Each learner draws a working drawing for the cell phone tower showing one phase in 2D.	**Make:** • 3D isometric projection of the idea with dimensions and drawn to scale. • A working drawing in 2D showing one view with dimensions and line types.	**Working drawings:** each learner draws the plan (or an aspect of the plan) using first angle orthographic projection with suitable scale, correct line types and dimensions.
Informal assessment; remediation			
9 and 10		A sketch in double VP perspective enhanced using colour, texture or shading (any two).	**Budget:** costing of "real – life" solution, including correct materials and labour costs.
Informal assessment; remediation			
SBA (Formal Assessment)	Assignment Covering **All** aspects of Investigate 30 marks and Design (40 Marks)		

TERM 2: PROCESSING

	TOPIC / CONCEPT		
WEEK	**GRADE 7**	**GRADE 8**	**Grade 9**
Week 1 and 2	**Introduce the scenario for the Assignment**	**Introduce the scenario for the Assignment** **Context:** will be given by material developers.	**Introduce the scenario for the Assignment** **Scenario:** describe a situation where cutting, joining, bending **and/or** moulding plastics can be used to make a plastic product that will satisfy a need, want or opportunity.
	Recycling scrap metals – sorting ferrous and non-ferrous metals .	▪ Recycling: paper (Case Study)	Types of plastics and their uses Recycling plastics to provide raw material for manufacture of new plastic products.
Informal assessment; remediation			
Week 3 and 4	Improving properties of materials ▪ Improving the properties of wood: waterproofing. ▪ Improving the properties of textiles: waterproofing, fire-resistance.	Improving properties of materials to adapt them to suit particular purposes: ▪ Withstand forces – tension / compression / bending / torsion / shear	Extending Life Span: Preserving food ▪ **Theoretical:** 1. Storing grain 2. Pickling 3. Drying and/or salting Extending Life Span: Preserving food ▪ **Theoretical:** 4. Storing grain 5. Pickling 6. Drying and/or salting ▪ **Theoretical:** Preserving metal: 1.Painting 2. Galvanising 3. Electroplating

	Positive and negative impacts of technological products on the environment and/or society.	Positive and negative impacts of technological products on the environment and/or society.	Positive and negative impacts of technological products on the environment and/or society
Informal assessment; remediation			
Week 5 and **6**	Emergency shelter and food for refugees. • Shack fires. • Clothing for emergency service.	Investigate impact of Plastic shopping bags	Remanufacturing waste plastic into pellets for re-use.
	Learners investigate materials and building techniques used by indigenous people for constructing housing in Rural South Africa.	Investigate a technological product that can have a negative impact on society.	Investigate plastics used on modern cars and around the home.
	Design brief with specifications and constraints.	Learners adapt a material or design a product that will solve the problem or reduce the impact or negative effects of the technology identified.	Learners sketch their plastic item using isometric projection on grid paper.
Informal assessment; remediation			
Week 7 and 8	Learners sketch design ideas for an emergency shelter that can be transported to and erected at a site where people have become homeless.	Learners sketch free hand sketches showing two possible solutions. Assignment Learners draw their chosen idea in 3D using isometric projection.	Learners draw using first angle orthographic projection.
Informal assessment; remediation			
Week 9 and 10	**Controlled Test (content of term 1 and 2) Gr 7 =30 marks Gr 8 & 9 = 40 marks**		

TERM 3: MECHANICAL SYSTEMS AND CONTROL

WEEK	TOPIC / CONCEPT		
	GRADE 7	**GRADE 8**	**Grade 9**
Week 1 and 2	Systems and Control: Mechanical/ Levers	Systems and Control: Mechanical/ Pneumatics and Hydraulics, Gears	
	Investigate: Simple mechanisms Practical investigation: 1st, 2nd, and 3rd class levers as simple mechanisms – demonstration lessons	**Calculate Mechanical advantage (MA)** • Levers: Calculations for MA using ratios. • Calculations using LOAD/EFFORT; load ARM/effort ARM; etc. • *Do NOT use the method of "taking moments about a point".* • Gears: mechanical advantage calculations for gears using ratios. Calculations using tooth ratios; gear wheel diameters; velocity ratios	**Investigate** Learners find out about the following mechanical control systems: Ratchet and pawl Disc brake Bicycle brake and Cleat.
Informal assessment; remediation			
Week 3 and 4	Investigate first class levers that demonstrate mechanical advantage: - MA>1 - MA=1 - MA<1	Simple mechanisms as components of more complex machines designed to provide users with a mechanical advantage: ▪ Linked lever systems.	Consolidation of Week 1
	(Demonstration lessons) Investigate simple linked first-class levers (Pair of pliers, hedge trimming shears) Investigate simple linked second-class levers (office punch, nut crackers) Investigate simple linked third-class levers (office staplers, pair of tweezers) Tabulate different products under the following headings: - 1st class lever	**REPRESENT GEAR SYSTEMS GRAPHICALLY**: use circular templates and/or pair of compasses to draw gear systems with: ▪ The driven gear rotating in the opposite direction to the driver (counter rotation). ▪ The driven gear rotating in the same direction to the driver (include an idler gear).	

	- 2nd class lever - 3rd class lever	▪ The driven gear rotating faster than the driver (with and without an idler). ▪ The driven gear rotating slower than the driver (with and without an idler).	
	Introduce the pulley Type of wheel and axle	**DESIGN BRIEF:** learners write a design brief with specifications for a device that will use a combination of gears to achieve: ▪ A mechanical advantage with force multiplication of three times. ▪ An increase in output velocity of four times.	Pulley systems – fixed pulley, moveable pulley, and multiple pulleys (block & tackle).
Informal assessment; remediation			
Week 5 and 6	Demonstrate and explain mechanical advantage using syringes, water and air to illustrate pneumatics and hydraulics	▪ Mechanical advantage – including simple calculations ▪ Systems diagrams ***NOTE:[No content according to CAPS on Hydraulics and Pneumatics for Grade 8 but revision of grade 7 work in preparation for the Grade 9 content is necessary]***	**Action research**: learners experiment with **two** <u>different sizes</u> of syringes linked by a tube and filled with hydraulic fluid (water). Learners **experience** force transfer with either force multiplication or force division (depending on which syringe is the driver/master).
	Investigate force transfer between two equal syringes. Investigate force transfer between two unequal syringes. (Demonstration sessions)		Investigate Pascal's Principle. ▪ Investigation: evaluate the design of the hydraulic jack in terms of: fit – for – purpose. (Advantages and disadvantages of Hydraulics)
	Demonstrate and explain the technique of sketching a circle in an oblique projection. Sketch a syringe in an oblique projection. Sketch a syringe in 2D view. (Demonstrate by using an example first)	Sketches (2D) showing gear systems that: Provide an output force four times greater than the input force (MA = 4:1). Provide double the rotation rate on a driven axle at 90^{o} to the driver axle.	

		SYSTEM ANALYSIS – bicycle gear system Analysis of the gears used on modern bicycles – terminology: master/slave or driver/driven; chain wheel; cogs	▪ Interacting mechanical systems and sub-systems ▪ Gear systems – spur, bevel, rack & pinion, worm Systems where mechanical, electrical or pneumatic systems are combined
	.	**SYSTEMS DIAGRAMS** • Analyse a mechanical system by breaking it into input-process-output. • Draw a Systems Diagram for a gear system with a mechanical advantage of 4:1. • Plan a mechanical system to produce a specific output. • Systems diagram for a gear train with the driven gear rotating faster than the driver.	
Informal assessment; remediation			
Week 7 and 8	**Investigate:** Learners make individual A^3 posters with labelling to indicate and explain how mechanical advantage is create through levers.	• INVESTIGATE and report on one of the following: *Distribute the investigations so all are covered and reported in each class*. • INVESTIGATE: The impact on the environment as a result of mining of: Acid mine drainage..... **OR** • INVESTIGATE: The impact on the environment as a result of mining of: Dust pollution from mine dumps on residential areas. ..... **OR** • INVESTIGATE: Iron age technology: Indigenous mining of iron in South Africa before the modern era..... **OR**	Identify and solve problems that can be solved by mechanical systems integrated with electrical /electronic or hydraulic or pneumatic.

		INVESTIGATE: Bias in technology: Gender bias in career choice / opportunities related to mining. **OR** • INVESTIGATE: Lifting mechanisms (wire rope-driven mine head-gear) in use at South African mines for raising people and ore. • Sketch: initial idea sketches to meet the requirements given in the scenario.	
Week 7 and 8		Design brief with specifications and constraints.	
Informal assessment; remediation			
WEEK 9	**Design: Design brief** Write a design brief and list specifications and constraints for possible solution for the design situation		**Design brief:** Each learner writes his/her suggestion for the design giving specifications and constraints.
	• Sketch two designs for a possible solution in oblique projection using dark and feint lines to solve the problem in scenario • Label both design ideas • Select the best design idea Render only the final selected design	• Sketches (2D) showing gear systems that: • Provide an output force four times greater than the input force (MA = 4:1). • Provide double the rotation rate on a driven axle at 90^{o} to the driver axle.	**Sketches:** each learner produces two sketches of viable possible designs. learner must demonstrate competency in using drawing techniques
			Artistic Drawing: single vanishing point perspective. Learners use single VP perspective to draw an inside view of the classroom.

		SYSTEM ANALYSIS – bicycle gear system • Analysis of the gears used on modern bicycles – terminology: master/slave or driver/driven; chain wheel; cogs. **SYSTEMS DIAGRAMS** • Analyse a mechanical system by breaking it into input-process-output. • Draw a Systems Diagram for a gear system with a mechanical advantage of 4:1. • Plan a mechanical system to produce a specific output. Systems diagram for a gear train with the driven gear rotating faster than the driver.	
Week 10	Revision and Consolidation		

TERM 4: ELECTRONIC SYSTEMS & CONTROL

WEEK	TOPIC / CONCEPT		
	GRADE 7	**GRADE 8**	**Grade 9**
Week 1 and 2	**Introduce the scenario:** • Design an electro-magnetic crane.	**Introduce the scenario:** Crime is a problem facing every community in South Africa. Design an alarm system.	**Introduce the scenario:** Investigate the situation and the nature of the need so that an appropriate circuit can be chose to solve the problem, need or want given in the scenario.
	• Learners to examine pictures of cranes in order to get ideas that they can use. • Learners can select from the pictures the crane they would like to make if possible at home. • Learners can identify the material available to them if they will make the crane at home.	**Class discussion:** • Energy for heating, lighting and cooking in rural and informal settlements. • Energy from illegal connections; ethical issues; safety considerations. • CLASS DISCUSSION: equitable sharing of resources – industry needs reliable power for job creation; schools need power for lighting and computing.	A given circuit must be incorporated into the design of a device that will use the electronics to address the problem, need or want.
	Electrical circuit basics: • Teacher demonstrate a simple electric circuit with an energy source (cell), switch, conductor and a light bulb or buzzer. Sketch the circuit showing how to use component symbols.	• **REVISE** Simple circuit components; input devices (electrochemical cell; generator; solar panel), output devices (resistor; lamp; heater; buzzer; motor); control device (switches). Note: Some devices can serve as input, output, process or control device.	• **Revise 1 – component symbols:** - Cells in series and parallel. - Lamps in series and parallel. - Switches in series (AND logic) and parallel (OR logic). - Current in the circuit – conventional current flows from positive to negative.

		• CORRECT CONNECTIONS, short circuits. Electrical components and their accepted symbols.	
	• Circuit diagram: Each learner draw a circuit diagram using the correct symbols for components	• DRAWING ELECTRICAL CIRCUITS using accepted symbols (as in Grade 12 see Addendum C). TEACHER SET UP CIRCUITS using a range of components. Learners draw the circuits using symbols.	• **Revise 2 – simple circuits:** - One cell, switch, two lamps in series. Two cells in series, a switch and two lamps in series.
Informal assessment; remediation			
Week 3 and 4	**Investigate:** - Learners to investigate the making of a electric-magnetic crane	**Investigation**: introduce Ohms law (qualitatively – no calculations). Learners use one cell, then two cells, and then three cells connected in series and note the effect on the brightness of a bulb. They must conclude that more cells in series (more voltage) will cause the current strength to increase, if the resistance does not change.	**Investigation**: action research: testing Ohms law practically – measuring the voltage(potential differences) and the current strength in each of the following circuit: 1. One cell connected to a 20Ω resistor 2. Two cells connected to a 20Ω resistor 3. Three cells connected to a 20Ω resistor – **(Note the voltmeter and ammeter readings with all connections above).** A given circuit must be incorporated into the design of a device that will use electronics to address the problem, need or want.
	- Each learner works out a flow chart detailing the sequence of manufacture of the crane with its electromagnet.	Investigation of AND logic gates and simple cases where it is used. Investigation of OR logic gates and simple cases where it is used**.**	

Informal assessment; remediation			
Week 5 and **6**	**Introduction to electromagnetism**: the electromagnet. ▪ **Practical demonstration** by the teacher on different types of permanent magnets – bar and horse shoe-magnets (Magnetic and non – magnetic metals.) Learners test metal samples made of iron, steel (an alloy), nickel- which will stick. Copper, lead and aluminium brass–which will not stick. Each learner completes a table of results.		
		▪ Draw circuit diagrams, conventions and component symbols. ▪ Input devices, control devices, output devices. Circuit design (simple) and circuit interpretation.	How simple electronic circuits and devices are used to make an output respond to an input. Learners should be able to read a ***given*** electronic circuit diagram and assemble the components into a working circuit. Input components: electrochemical cells, photovoltaic cells.
	Practical Investigation: Learners find the shapes of magnetic fields using iron filings on paper above magnets.		
		Impact of technology: Generate electricity for the nation – advantages and disadvantages of: • Thermal power stations (steam turbines – sources of heat: coal, gas, nuclear, sun). • Hydroelectric power stations (including pumped storage schemes). • Wind-driven turbines.	▪ Storage components: electrochemical cells, capacitors ▪ Control components: switches, resistors, diodes, light emitting diodes (LED), transistors. ▪ Sensor components: thermistors, light dependent resistors (LDR). ▪ Output components: lamp, buzzer / bell, light emitting diodes (LED). ▪ Resistor codes

Informal assessment; remediation			
Week 7 and 8	**Demonstration:** Simple electromagnet - teacher to demonstrate a simple electromagnet made by winding insulated copper wire around an iron nail. When an electric current flows in the wire coil (solenoid) a magnetic field is created and this is amplified by the iron core. Switching the current off causes the magnetic field to fade away. Note**: *avoid iron coated-with-copper (like some paper clips) which will stick to magnets*.**		
		Circuits with more than one input or control device. Logic conditions: ▪ **AND** logic (series); truth table ▪ **OR** logic (parallel); truth table. Ohm's Law: *qualitative* treatment.	Ohm's Law: *quantitative* treatment with graphs and calculations.
	Drawing - each learner uses the Oblique technique to draw an idea for the crane chosen from the two ideas sketched the previous week. The idea should be drawn on squared paper (quadrant) using pencil and ruler	**Circuit diagram**: Draw the circuit diagram using correct symbol conventions.	**Sketches** – Each learner draws the circuit diagram. Each learner produces a sketch in 3D showing the device that will use the electronic circuit.
Informal assessment; remediation			
Week 9 and 10	**Revision and consolidation of Term 4 Content/ FORMAL ASSESSMENT –** TEST (Term 3- 4 Content) **Gr 7 = 30 Marks** **Gr 8 & 9 = 40 Marks**		