GRADE 9 TERM 1

TERM 1	Week 1 27-29 January (3 days)	Week 2 1-5 February	Week 3 8-12 February
CAPS Topics	**Design**	**Design skills**	
Topics / Concepts, Skills and Values	Learners complete the baseline assessment: ▪ **Conventions** ▪ **Working drawing** techniques for planning: - Single view flat 2D drawing with dimensions, line types and scale. - Isometric – using underlying isometric grid	• First angle orthographic projection: three-dimensional objects on flat paper. • Concept of drawing three different views: front, top and side. Simple cubes. • Line types: dark, feint, dashed, wavy, chain. Scale and dimensions. • More complex 3D objects drawn in orthographic projection with instruments. • Design problem: flight of stairs and wheelchair ramp. • Design brief specifying number of steps, height of stair risers, width and gradient of ramp, handrail, etc.	
Requisite pre-knowledge	Graphic Communication	Graphic Communication Design Brief	
Resources (other than textbook) **to enhance learning**	DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource YouTube videos, etc.	DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource YouTube videos, etc.	
Informal Assessment: Remediation	**Baseline Assessment**	Informal Assessment	
SBA (Formal)			

TERM 1	Week 4 15-19 February	Week 5 22-26 February	Week 6 1-5 March
CAPS Topics	**Design skills**	**Structures**	
Topics / Concepts, Skills and Values	-- Sketch the stair and ramp in 3D using isometric projection. Draw a plan for the stair and ramp using first angle orthographic projection to an appropriate scale, using correct views, line types and dimensions according to convention	• Forces can be static or dynamic, and loads can be even or uneven. • Strength of materials under the action of forces – metal cross-sections: • Tension (pulling); compression (pushing); bending of beams (compression and tension). • Torsion – using internal cross-bracing to resist twisting. • Properties of various construction materials: mass/density; hardness; stiffness; flexibility, corrosion resistance and prevention of corrosion.	
Requisite pre-knowledge	Graphic Communication	Structures Properties of material	
Resources (other than textbook) **to enhance learning**	DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource YouTube videos, etc.	DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource YouTube videos, etc.	
Informal Assessment: Remediation	Informal Assessment	Informal Assessment	
SBA (Formal)			

TERM 1	Week 7 8-12 March	Week 8 15-19 March	Week 9 23-26 March (4 days)	Week 10 29-31 March (3 days)
CAPS Topics	**Investigation skills Design skills**		**Making skills Costing**	
Topics / Concepts, Skills and Values	**Investigate:** provide the scenario so that learners can investigate the problem situation and various possible structures which could solve the problem(s) they identify. Analysis of existing products relevant to the identified problem in terms of fitness-for-purpose (including suitability of materials), safety for users, costs of materials and costs of construction. Realistic costs of real materials, labour, transport, etc. Textbook writers must supply useful resources for this. • **Sketch initial ideas:** each learner generates two possible ideas. • **Evaluate and adapt**: teams evaluate individual ideas and develop a final idea. • **Design brief:** learners write a design brief with specifications for the final idea. • **Flow chart:** teams discuss how to proceed, then each learner draws a flow chart.		**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. • **Budget:** costing of the "real-life" solution, including correct materials and labour costs **Consolidation of work done in term 1:** • More examples of first angle orthographic drawings • Forces, strengthening of structures • Properties of construction materials • Design brief and budgeting	
Requisite pre-knowledge	Investigation skills; Design Skills		Graphic Communication	
Resources (other than textbook) **to enhance learning**	DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource YouTube videos, etc.		DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource YouTube videos, etc.	
Assessment **Informal Assessment:** Remediation			Informal	
Assessment **SBA (Formal)**	**Formal Assessment**			

TERM 2	Week 1 13- 16 April (4 days)	Week 2 19- 23 April	Week 3 28-30 April (3 days)	Week 4 3-7 May
CAPS Topics	**Mechanical Systems and Control Investigation skills**		**Mechanical Systems and Control Investigation skills**	
Topics / Concepts, Skills and Values	• Revise: syringe mechanics using two equal sized syringes linked by a tube. • Force transfer between the syringes filled with: ○ Compressed air – pneumatic system. ○ Water – hydraulic system. • Action research: learners experiment / teacher demonstrates with two different sizes of syringes linked by a tub and filled with hydraulic fluid (water). Learners experience force transfer with either force multiplication or force division • Gases (like air) are compressible. Liquids (like water, oils) are incompressible. Pascal's principle – pressure exerted on one part of a hydraulic system will be transferred equally, without any loss, in all directions to other parts of the system. • Note that equal volumes of liquid are moved through the systems, and this results in different extensions (amount of movement) where syringes (cylinders) are of different sizes, so less distance/more force (MA > 1); and more distance /less force (MA < 1).(why is this part left out?) • The hydraulic press (including simple calculations). • The hydraulic jack. • Investigation: Design considerations ~ fit-for-purpose: ■ Evaluate the design of the hydraulic jack in terms of: • Who is it for? What is it for? Will it do the job? What should it be made of? What should it cost? Is it cost-effective? Does it look good (aesthetics)? Is it safe/easy to use for the end user (ergonomics)? • Draw a systems diagram that describes how a hydraulic jack function.		• Action research: practical investigations: • Use a single wheel fixed pulley to change the direction of pull (MA = 1). • Use a single wheel moveable pulley to change the direction of pull (MA > 0). • Use a pulley block system (block and tackle) to determine the relationship between loadbearing ropes on moveable pulley wheels and M.A (force multiplication). • Investigate: learners find out about the following mechanical control systems: ○ Ratchet and pawl. ○ Disc brake. ○ Bicycle brake. ○ Cleat.	
Requisite pre-knowledge	Mechanical systems and control		Mechanical Systems and Control	
Resources to enhance learning	DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource "YouTube videos" etc.		Sasol Inzalo workbooks/ Textbooks and any applicable resource "YouTube videos" etc.	
Informal Assessment	Informal Assessment		Informal Assessment	
SBA (Formal)				

TERM 2	Week 5 10-14 May	Week 6 17-21 May	Week 7 24-28 May	Week 8 31 May- 4 June
CAPS Topics	**Mechanical systems and control Investigation skills and Evaluation skills**		**Mechanical systems and control Investigation skills Design and Making**	

Topics / Concepts, Skills and Values	• Lead learners as they **revise** the interactions of the following:
	• Spur gears of equal size counter-rotating.
	• Spur gears of unequal size counter-rotating – note velocity/force relationships.
	• Spur gears using an idler to synchronise rotation.
	• Lead learners as they find out about the interactions of the following:
	  ○ Bevel gears of equal size – axis of rotation 90o.
	  ○ Bevel gears of unequal size – axis of rotation 90o – note velocity/force relationships.
	  ○ Rack-and-pinion gear system as found on automatic gates and steering racks.
	• Worm gear system for large reduction in speed and increase in force.
			• **Artistic Drawing**: single vanishing point perspective.
			  ■ Learners draw a 3D wooden object using single VP perspective. They enhance the drawing
			• showing the texture of the wood grain, colour and shadows.
			• Learners use single VP perspective to draw an inside view of the classroom.	

Requisite pre-knowledge	Mechanical systems and control		**Mechanical systems and control Graphic Communication Skills**	
Resources (other than textbook) **to enhance learning**	DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource “YouTube videos” etc.		DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource “YouTube videos” etc.	
Assessment **Informal Assessment:** Remediation	Informal		Informal	
Assessment **SBA (Formal)**				

TERM 2	Week 9 7-11 June	Week 10 14-18 June (4 days)	WEEK 11 21- 25 June
CAPS Topics	**Investigation Design**		**Controlled test**
Topics / Concepts, Skills and Values	• Investigate the situation so that an appropriate machine can be designed to solve the problem, need or want given in the scenario. Investigate the possible mechanisms and controls to be used together to make the machine. • The design brief: each learner writes his/her suggestion for the design giving specifications and constraints. • Sketches: each learner produces two sketches of viable possible designs. And then decide on a final solution • **Plan: working drawings** • Learners produce drawings for their model/prototype using first angle orthographic projection. • Each learner draws a plan of the design OR, if it is very complex, one or more aspects of the design. Each learner must demonstrate her/his competency in using this drawing technique.		Revision of content
Requisite pre-knowledge	Investigation Skills Design Skills		
Resources (other than textbook) **to enhance learning**	DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource “YouTube videos” etc.		DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource “YouTube videos” etc.
Informal Assessment: Remediation	Informal Assessment		
SBA (Formal)	Formal Controlled Test		

GRADE 9 TERM 3				
TERM 3	**Week 1** **13-16 July (4 days)**	**Week 2** **19-23 July**	**Week 3** **26-30 July**	**Week 4** **2-6 August**
CAPS Topics	**Electrical Systems & Control** **Investigation skills**		**Electronic Systems & Control Investigation skills**	
Topics / Concepts, Skills and Values	• **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. • **Revise 2 – simple circuits:** - One cell, switch, two lamps in series. - Two cells in series, switch, two lamps in series. • **Ohm's law quantitatively**: *as voltage increases, current increases if resistance is constant*. Action research: testing Ohm's Law practically – measure the voltage (potential difference) and the current strength in each of the following circuits: One cell connected to a 20W resistor – note the voltmeter and ammeter readings. • Two cells connected to the 20W resistor – note the voltmeter and ammeter readings. • Three cells connected to the 20W resistor – note the voltmeter and ammeter readings • Plot the readings on a graph and determine the relationship between potential difference and • current strength while keeping the resistance constant.		Calculate Values Calculate values: $R = \frac{V}{I}$ use to calculate R if V and I are known. $V = IR$ use to calculate V if I and R are known. $I = \frac{V}{R}$ use to calculate **I** if V and R are known. **Note**: **R** - *represents the resistance of a resistor in ohms* .... [Ω]. **V** - *represents the potential difference in volts* ..... [V]. **I** - *represents the current strength in amperes* ..... [A]. Switches: Manual switches controlled by the user, e.g. Push SPST, SPDT, DPDT Diodes and LED (Light Emitting Diode): A diode is a component that allows current to flow in one direction only. A LED allows current to flow in one direction only and also gives off light and is often used as an indicator that a circuit is 'ON'. Resistor colour codes: • Low value resistors often have their resistance value printed on them in numbers. • Higher value resistors are coded using coloured bands. The first three bands give the value of the resistor in ohms. The fourth band is an accuracy rating as a percentage.	
Requisite pre-knowledge	• simple circuit components, component symbols: simple circuits: input devices, control devices and output devices • Ohm's law qualitatively • Alternating current		Resistors as output devices	
Resources (other than textbook) **to enhance learning**	DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource "YouTube videos" etc.		DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource "YouTube videos" etc.	
Informal Assessment: Remediation	Informal		Informal	
SBA (Formal)				

TERM 3	Week 5 10-13 Aug (4 days)	Week 6 16-20 August	Week 7 23-27 August	Week 8 30 Aug-3 Sept
CAPS Topics	**Electronic Systems & Control Investigation & Design skills**		**Investigate: Electronic Systems & Control Investigation & Design skills**	
Topics / Concepts, Skills and Values	**Transistors:** only npn-type will be used at this level. A transistor is a device that can act as a ***switch*** and it can ***amplify*** a small current **Sensors** – important **input devices**: • **LDR** (**L**ight **D**ependent **R**esistor) – a component whose resistance decreases with light [dark: high resistance; bright light: – low resistance]. with light [dark high resistance; bright light – low resistance]. • Thermistor: a component whose resistance varies with temperature. Two types exist: • -- + t: resistance increases with increasing temperature. • -- - t: resistance decreases with increasing temperature. • • Touch or moisture detector: a component that can be bridged using a 'wet' finger, thus completing the circuit, indicating the touch. • Capacitors: a component which can store and then release electrical energy. • Simple electronic circuits: • Learners draw, these simple electronic circuits: • LED, 470Ω resistor, switch, and 4,5V series battery. • LDR, buzzer, 3V series battery. • NPN transistor, buzzer or bell, thermistor, variable resistor, 1kΩ resistor, 6V series battery • 6V series battery, LED, 470Ω resistor, 1 000µF capacitor, switch. INVESTIGATE the situation and the nature of the need so that an appropriate circuit can be chosen to solve the problem, need or want given in the scenario. • A given circuit must be incorporated into the design of a device that will use the electronics to address the problem, need or want.		THE DESIGN BRIEF: Each learner writes his/her suggestion for the design with specifications & constraints. SKETCHES Each learner draws the circuit diagram. Each learner produces a sketch in 3D showing the device that will use the electronic circuit	
Requisite pre-knowledge	Electrical Circuit diagrams		Investigation and design skills	
Resources to enhance learning	DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource "YouTube videos" etc.		DBE Sasol Inzalo workbooks/ textbooks and any applicable resource etc.	
Informal Assessment: Remediation				
SBA (Formal)	Formal Assessment		Formal Assessment	

TERM 3		Week 9 6-10 Sept	Week 10 13-17 Sept	WEEK 11 20-23 Sept (4 days)
CAPS Topics		**Making Skills**		Revision and Consolidation
Topics / Concepts, Skills and Values		Plans: working drawings • The learners produce plans for their device/model/prototype using first angle orthographic projection. The plans should include a 3D “assembly” drawing in exploded view showing how the model fits together. • Each Learner draws a working drawing of the design OR an aspect of the design.		Revision and consolidation of term 3 work
Requisite pre-knowledge		Graphic Communication Design and Making skills		
Resources (other than textbook) **to enhance learning**		Siyavula workbook/ Textbooks Applicable resources		Siyavula workbook/ Textbooks Applicable resources
Assessment	**Informal Assessment:** Remediation	Informal		Informal
	SBA (Formal)			

GRADE 9 TERM 4

TERM 4		Week 1 5-8 Oct (4 days)	Week 2 11-15 Oct	Week 3 18-22 Oct	Week 4 25-29 Oct
CAPS Topics		**Processing: Indigenous technology Design skills**		**Processing Investigation & Design skills**	
Topics / Concepts, Skills and Values		• **PRESERVING METALS** Three methods theoretically, 1.1 Painting 1.2 Galvanising 1.3Electroplating. • **PRESERVING FOOD** Three methods theoretically 2.1 Storing grain 2.2. Pickling 2.3. Drying and/or salting		• **TYPES OF PLASTICS AND THEIR USES** • **Investigation:** identification of plastic identifying codes and sorting for recycling. • **Properties of plastics** • Reduce – reuse – recycle CASE STUDY: Remanufacturing waste plastic into pellets for re-use. • Systems diagram: Draw a systems diagram describing a plastics recycling project. • Case study: Moulding recycled plastic pellets into products. **Problem identification:** learners identify a need or want that can be satisfied by the making of a plastic item of their own design.	
Requisite pre-knowledge		Improving properties of materials.		Re-using materials for making products during the design processes encountered in previous grades	
Resources (other than textbook) **to enhance learning**		Siyavula workbook/ Textbooks Applicable resources		Siyavula workbook/ Textbooks Applicable resources	
Assessment	**Informal Assessment:** Remediation	Informal		Informal	
	SBA (Formal)	N/A		N/A	

TERM 4		Week 5 1-5 Nov	Week 6 8-12 Nov	WEEK 7 15-19 Nov	Week 8 22-26 Nov	Week 9 30 Nov-3 Dec	Week10 6-8 Dec (3 days)
CAPS Topics		**Processing Design skills**		**Design Skills**		**FORMAL TEST**	
Topics / Concepts, Skills and Values		• Case study: plastics used on modern motor cars. • Case study: plastics used around the home. .		Sketch: learners sketch their plastic item using isometric projection on grid paper. **Plan:** learners draw their plastic item using first angle orthographic projection		Controlled Test	
Requisite pre-knowledge		3D isometric projection		3D isometric projection			
Resources (other than textbook) **to enhance learning**		DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource “YouTube videos” etc.		DBE Sasol Inzalo workbooks/ Textbooks and any applicable resource “YouTube videos” etc.		Question Paper	
Assessment	Informal	Informal		informal			
	N/A	**FORMAL CONTROLLED TEST**					