Republic of Zambia

MINISTRY OF EDUCATION, SCIENCE, VOCATIONAL TRAINING AND EARLY EDUCATION

DESIGN & TECHNOLOGY SYLLABUS

GRADES 8 – 9

PREPARED AND PUBLISHED BY THE CURRICULUM DEVELOPMENT CENTRE
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VISION

Quality, lifelong education for all which is accessible, inclusive and relevant to individual, national and global needs and value systems

PREFACE

The syllabus was produced as a result of the Curriculum review process carried out by the Ministry of Education, Science, Vocational Training and Early Education under the auspices of the Curriculum Development Centre (CDC). The curriculum reform process started way back in 1999 when the Ministry of Education commissioned five (5) curriculum studies which were conducted by the University of Zambia. These studies were followed by a review of the lower and middle basic and primary teacher education curriculum. In 2005 the upper basic education National survey was conducted and information from learners, parents, teachers, school managers, educational administrators, tertiary institutions traditional leaders civic leaders and various stakeholders in education was collected to help design a relevant curriculum.

The recommendations provided by various stakeholders during the Upper Basic Education National survey of 2005 and National symposium on curriculum held in June 2009 guided the review process.

The review was necessitated by the need to provide an education system that would not only incorporate latest social, economic, technological and political developments but also equip learners with vital knowledge, skills and values that are necessary to contribute to the attainment of Vision 2030.

The syllabus has been reviewed in line with the Outcome Based Education principles which seek to link education to real life experiences that give learners skills to access, criticize analyze and practically apply knowledge that help them gain life skills. Its competences and general outcomes are the expected outcomes to be attained by the leaners through the acquisition of knowledge, skills, techniques and values which are very important for the total development of the individual and the nation as a whole.
Effective implementation of Outcome Based Education requires that the following principles be observed: clarity of focus, Reflective designing, setting high expectations for all learners and appropriate opportunities.
It is my sincere hope that this Outcome Based syllabus will greatly improve the quality of education provided at Grade 8 and 9 as defined and recommended in various policy documents including Educating Our Future`1996 and the `Zambia Education Curriculum Framework `2013.

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Permanent Secretary
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Acknowledgements

The syllabus presented here is a result of broad-based consultation involving several stakeholders within and outside the education system.

Many individuals, institutions and organizations were consulted to gather their views on the existing syllabus and to accord them an opportunity to make suggestions for the new syllabus. The Ministry of Education wishes to express heartfelt gratitude to all those who participated for their valuable contributions, which resulted in the development of this syllabus.

The Curriculum Development Centre worked closely with other sister departments and institutions to create this document. We sincerely thank the Directorate of Teacher Education and Specialized Services, the Directorate of Planning and Information, the Directorate of Human Resource and Administration, the Directorate of Open and Distance Education ,the Examinations Council of Zambia, the University of Zambia, schools and other institutions too numerous to mention, for their steadfast support.

We pay special tribute to co-operating partners especially JICA and UNICEF for rendering financial technical support in the production of the syllabus.

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MINISTRY OF EDUCATION, SCIENCE,VOCATIONAL TRAINING AND EARLY EDUCATION

Table of Contents

Page

INTRODUCTION

Technology is defined as a scientific skill that aims at improving the quality of life of mankind and this is mainly achieved either by *improving* the existing item or by *inventing* a completely new one in response to the need.

Design and Technology provides an opportunity for the learners to identify needs and opportunities through exploration at home, school or community. In this regard, the role of the teacher is to help the learners to identify the needs and opportunities for design and technological activities.

Design and technological capability is enhanced through discussion and recording of ideas by means of drawings. The drawings act as a guide during the making process where learners use tools and appropriate materials and produce artefacts.

The Junior Secondary School syllabus in Design and Technology will be developed in *four* strands outlined below.

COMPONENT		***DESCRIPTION***
1	***GRAPHIC COMMUNICATION***	Communication by drawings or symbols. The purpose of *Graphic Communication* in Design and Technology is to help learners develop the ability to convey or transmit information about design problems, ideas and solutions graphically.
2	***RESISTANT MATERIALS***	This area will help the learners investigate various materials and their properties. This will help them to develop skills of how to choose materials for any project and base their choice on: *availability, cost* and *characteristics* of each material. When working with materials, learners will have to use tools. Therefore, they will have to learn about various types of tools, function and use.
3	***SYSTEMS TECHNOLOGY***	Systems Technology will focus on developing skills used in *Structures, Mechanisms* and *Electronics*. Learners will be helped to; *identify* how these are interrelated, their role in *designing* and *making* control systems.
4	***ENTREPRENUERSHIP***	The purpose of teaching entrepreneurship education is to prepare learners for an entrepreneurial career in life. Design and Technology offers learners an opportunity to buy, make and sell items.

AIMS OF TEACHING DESIGN AND TECHNOLOGY

Thus, the aims of Design and Technology syllabus are to:

1. Foster the learners' awareness of local, regional and national needs so as to contribute towards development and fully attain the Vision 2030;
2. Equip learners to play an effective and productive role in the economic life of the nation;
3. Promote positive attitudes towards the challenges of co-operation, work, entrepreneurship and self-employment.

KEY COMPETENCIES

Learners taking Design and Technology are expected to develop the following competencies:

COMPETENCIES		***DESCRIPTION***
1	***Investigative skills***	*Critical thinking*: learners are expected to come up with possibilities to tackle a particular need and choose the preferred solution; *Creative thinking* learners will be expected to produce new ideas that will leading to a conclusion; *Inquiring* asking questions to obtain suggestions to facilitate solving of problems
2	***Interpretational skills***	Learners' ability to classify, convert, identify, explain and interpret evidence. This also involves the interpretation of patterns, sketches, models, charts and illustrations.
3	***Application skills***	Drawing, measuring and cutting. Conducting research and assessing information from various sources. Producing artefacts using materials. Application of knowledge in real life situations.
4	***Communication skills***	Explaining, displaying, reporting, reading, listening, drawing and designing.
5	***Valuing skills***	Sensitivity to needs, feelings and problems of self and others, cooperative behaviour, weighting individual needs against the needs of others, commitment to the removal prejudices. Appreciating the beauty of the natural environment and preserving it for future generations
6	***Participating skills***	Taking part in group work, through classroom discussions and presentations.

SUGGESTED TEACHING METHODOLOGY

The Design and Technology syllabus encourages the learner-centred approach as prescribed in the Zambia Education Curriculum Framework. The emphasis should be on skills, problem solving and hands-on activities which will increase leaner participation as individuals or in groups. This approach maximises the quality of learning when the following principles are put into practice.

In order to develop learning with understanding, skills and attitudes to contribute to the development of society, the starting point for teaching and learning is to recognise that learners come to the school a wealth of knowledge and experience gained from the family, community and through interaction with the environment. Therefore, learning in school must build on the learner's prior knowledge and experience.

This is best achieved when learners are actively involved in the learning process through hands on activities. However, each learner has individual needs, pace of learning, experiences and abilities. To accommodate this, the teacher must determine the needs of the learners and shape the learning experiences accordingly. Therefore, teaching methods must be varied but flexible within well-structured sequences of lessons and should include among others:

- Working in Pairs
- Group Work
- Individual Work
- Field trip Method
- Project Method
- Discussion Method
- Guest Speaker
- Demonstration Method
- Team Teaching

The teacher should have reasons for choosing a particular teaching method, employ strategies and techniques to make the lesson interesting.

The syllabus outlines the learning outcomes and the teacher must decide, in relation to the learning outcomes to be achieved, when it is best to let learners *discover* or *explore* information for themselves; when they need *directed learning, reinforcement* or when the learners can be allowed to find own way through a topic. In this way, outcomes can be attained in a spiral manner considering that in any lesson, different outcomes can be covered through knowledge, values and skills. The objective is to ensure that learners are able to apply the knowledge in real life situations.

SUGGESTED TIME ALLOCATION

The standard period allocation has been prescribed in the Zambia Education Curriculum Framework (ZECF) 2012. At Junior Secondary School level, Design and Technology will have **twelve (12)** periods of **sixty (60)** minutes per week. However, since the teaching of Design and Technology involves the production of an artefact, time for project work may vary from school to school as much of this will be done outside the prescribed learner-teacher contact time considering that facilities, equipment, materials and the level of the learners may also vary.

While information concerning teaching of different skills, resources, scheming, teaching methods and evaluation would be found in the Teacher's Guide, teachers should be mindful of the Specific Outcomes which are preceded by the General Outcomes found in this syllabus. Therefore, scheming should be based on the Specific Outcome. In some cases, more lessons will be required before achieving a certain Specific Outcome.

OUTLINE OF THE SYLLABUS

This syllabus seeks to instil a sense of appreciation of technology to make sure that learners can adapt and cope with changing situations. It will also provide learners with broader design and technology concepts and principles that will allow them to expand their thinking capacity to tackle real-life situations.

The main topics, sub-topics and outcomes are arranged in this order for easy of reference. Some topics may be similar in both Grades 8 and 9, but the levels of knowledge, skills and values to be attained are not the same. Hence, when preparing lessons teachers should strive at building on what the learners already know.

ASSESMENT

The core theme of Design and Technology is problem solving which is best achieved through **Project Work**. This is because Project work provides a link between *theory* and *practical*. Therefore, the main activity of the subject is the Project Work which has three key stages: Designing, Realising and Evaluating.

Designing will involve making of the Portfolio and that learners at this level will be expected to be using A4 paper.

GRADE 8

KEY COMPETENCIES AT GRADE 8 LEVEL	GENERAL OUTCOMES
▪ Show knowledge of applying safety precautions at all times. ▪ Demonstrate knowledge and ability to use geometrical concepts in designing articles. ▪ Demonstrate ability and skill of producing small article of commercial/marketable value using available materials.	• Apply good personal working habits • Care for the workroom and equipment

GRADE 8

Safety

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
8.1 SAFETY	**8.1.1 INTRODUCTION TO THE WORK ROOM**	8.1.1.1 Apply basic first aid techniques	• Orientation to workrooms, working and marking areas Safety precautions: (personal, equipment, workroom) Daily routine • First Aid Box and techniques applied in First.	• Identifying areas for specific activities in the workroom. • Applying first Aid	• Appreciating the features of the advanced workroom. • Participating in groups to care for emergency cases.

GRADE 8

Graphic Communication

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	**SKILL**	**VALUES**
8.2 PLANE GEOMETRY.	**8.2.1 Drawing lines.**	8.2.1.1 Construct lines from given data	• Construct lines using: Compass, Dividers, Drawing board, T-square (Perpendiculars, parallel lines; dividing a line into a number of parts and ratio)	• Manipulating drawing instruments • Constructing technical lines to communicate. ideas	• Justifying the reason for using a particular drawing instrument • Appreciating the value of lines in communication
			• Prepare Standard Boarder lines of 10mm and Title blocks.	• Preparing of drawing paper to the required standard.	• Adhering to the standard way of preparing drawing paper
	8.3.1 Angles	8.3.1.1 Construct angles from given data.	• Construct angles other than 60˚, 90˚, 75˚, 30˚, 105˚	• Constructing angles following correct steps.	• Producing accurate angles.
	8.3.2 Triangles	8.3.1.2 Construct triangles from given data.	• Construct (Equilateral, Isosceles, Scalene, Acute, Obtuse and Right Angled) triangles using sides, angles and perimeter.	• Constructing triangles accurately.	• Appreciating the knowledge and value of triangles
	8.3.3 Quadrilaterals	8.3.3.1 Construct quadrilaterals using specified data.	• Construct quadrilaterals using sides, angles and diagonals (Rectangle, Square, Kite, Rhombus, Parallelogram)	• Accurate construction of quadrilaterals	• Appreciating the importance of producing accurate Quadrilaterals.

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	8.3.4 Circles	8.3.4.1 Construct circles from given data. 8.3.4.2 Circumscribe and inscribe circles to triangles.	• Construct circles using the radius or diameter • Circumscribing and Inscribing	• Accurate construction of circles	• Using circle concept creatively in designs
	8.3.5 Polygons	8.3.5.1 Construct regular polygons from given data 8.3.5.2 Construct irregular polygons from given data	• Construct: (Hexagons, Pentagons, Heptagons, Octagons) given: Side, diameter, Across Corners and Across Flats • Construct **Irregular** (Hexagons, Pentagons) given sides and angles	• Constructing regular and irregular polygons accurately.	• Applying the concept of polygon shapes to design artefacts.
8.2.3 PICTORIAL DRAWING	**8.2.3.1 Isometric Projection**	8.2.3.1 Construct drawings in Isometric Projection	• Principles of Isometric Projection. • Isometric projection of straight edges, slanting edges, circles in isometric	• Constructing isometric drawings with accuracy.	• Expressing design ideas in Isometric drawings.
	8.2.3.2 Freehand Drawing	8.2.3.2.1 Apply freehand drawing to communicate ideas	• Principles of isometric drawing in freehand drawing.	• Freehand sketching of ideas.	• Expressing design ideas through freehand sketches.
8.2.4 ORTHOGRAPHIC PROJECTION	**8.2.4.1 Orthographic Projection**	8.2.4.1.1 Transform simple Isometric drawings to Orthographic.	• First and Third Angle Projections (add some hidden details) • Title Block data: Name, School, Title, Symbol of Projection, and Scale	• Communicating details of a drawing through elevations.	• Designing prototype structures / artefacts ready for realisation.
		8.2.4.1.2 Produce the missing elevation when two are given	• Produce End Elevations and Plans	• Interpreting of missing views	• Communicating design ideas.

GRADE 8

Design and Communication

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
8.3.1 DESIGN PROCESS	**8.3.1.1 Design Process Cycle**	8.3.1.1.1 Produce an artefact from the theme	• Studying, defining and interpreting the theme. Adapting the theme to real life situation • Deriving a ***situation*** from the theme • Identifying a ***problem*** from the situation • Formulate ***design brief*** from the problem • Formulate relevant ***specifications*** to guide the design activity • Conduct ***research*** • Generate ***possible solutions*** • Development of ***chosen solution*** • Development ***Working drawings*** and Time Plan • Produce a detailed and sequential ***production plan*** of the intended artefact	• Producing prototypes (models). • Communicating ideas on the design process • Communicating design ideas on paper.	• Appreciating designing process. • Appreciating the role of systematic planning in solving problems • Promoting team work.

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	8.3.1.2 Realisation	8.3.1.2.1 Produce quality artefact.	• Gathering materials • Select appropriate construction techniques • Marking, cutting and shaping. • Apply appropriate finish • Produce an aesthetically appealing artefact	• Correct use of tools • Assembling components • Application of finishes	• Appreciation of planning before making artefact • Awareness of finishes on various materials

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
8.3.2 DESIGNING	**8.3.2.1 Rendering**	8.3.2.1.1 Apply enhancements on drawings	• Colours, texturing, shading	• Communicating information through enhancements	• Appreciating the knowledge of enhancements in designing
	8.3.2.2 Symbols	8.3.2.2.1 Design symbols used to communicate.	• Designing symbols to show presence of: building, danger signs, directions etc.	• Communicating information through symbols creatively.	• Awareness of communication through symbols.
	8.3.2.3 Logos	8.3.2.3.1 Design logos from specified information	• Company logos. organisations, clubs and school logos	• Communicating information through logos.	• Awareness of logos.
8.3.3 PORTFOLIO	**8.3.3.1 Presentation**	8.3.3.1.1 Present all components of the portfolio in a logically	• Portfolio presentation: content, sequencing, binding • Draw design ideas using a variety of graphical techniques, enhance ideas using a variety of presentation techniques, arrange sequentially all components of the portfolio	• Communicating information graphically and in writing • Organising material requirements.	• Keeping orderly record of a portfolio. • Participating in group work in problem solving

GRADE 8

Resistant Materials

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
8.4.1 MATERIALS	**8.4.1.1 Classification of materials.**	8.4.1.1.1 Classify materials.	• **Wood:** Classify indigenous and exotic trees suitable for timber. Properties of Softwood, hardwood, Cross section of a log.	• Identifying indigenous and exotic timber	• Appreciating the value of timber. • Awareness of timber processing
			• Stages in timber processing. Felling, conversion, seasoning	• Analysing the processes of preparing timber	
			• **Metals:** Properties of metals Ferrous metals (carbon and alloy steels, cast irons) Non-ferrous metals (zinc, tin, copper, lead, aluminium) Alloys: (brass, bronze, solder, steel, duralumin) General uses of metals	• Classifying ferrous and no-ferrous metals	• Appreciating the value of metals
			• **Plastics:** Thermoplastics, Thermosets and their properties	• Identifying thermosets and thermoplastics	• Awareness of behaviour of different plastics.
			• **General uses**: eyeglass frames, toothbrushes, insulations, bottles, furniture etc.	• Communicating various uses of plastics.	

GRADE 8

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	**SKILL**	**VALUES**
		8.4.1.3.3 Explain the effects of plastics on the environment and the safe ways of disposing them off.	• Pollution and recycling	• Communicating the effects of plastics on the environment	• Promote effective disposal of plastics from the environment.
	8.4.1.4 Preparation of Materials.	8.4.1.4.1 Apply correct procedure of preparing materials before use.	• Measuring, marking out, Cutting and testing	• Application of appropriate methods of preparing materials	• Preparing materials adequately before use.
	8.4.1.5 Wasting of Materials.	8.4.1.5.1 Demonstrate methods of cutting materials with correct wasting tools.	• **Wood:** saws, chisels, planes. **Metal:** Hacksaws, Files, Drill bits, chisels **Plastic:** Coping saws, ten on saw and dovetail (including methods of drilling and cutting curves)	• Demonstrating correct techniques of wasting (cutting) material	• Appreciate accurate cutting of wasting tools.
		8.4.1.5.2 Demonstrate the correct method of using holding tools when wasting materials	• Vices and sawing board	• Demonstrating correct way of using holding tools when wasting materials	• Appreciate the value of holding tools when working with materials

GRADE 8

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	8.4.1.6 Joining Materials	8.4.1.6.1 Apply different methods of joining materials in artefact making	• Permanent and temporary joints • **Wood**: Stopped Housing, Stub mortice and tenon, Single dovetail • **Metal:** Tinplate joints, riveting soldering, screw threads • **Plastic:** Laminating	• Demonstrating ability to join materials for different purposes	• Appreciating various joints used in projects.
	8.4.1.7 Adhesives	8.4.1.7.1 Apply adhesives correctly when bonding materials	• Use of: Casein, Animal, PVA, Contact, glue, PVC weld, Tensol cement • Observe safety when working with glues	• Applying adhesives on materials	• Appreciation of adhesives • Awareness of safety precautions when applying adhesives
	8.4.1.8 Fixings	8.4.1.8.1 Fix iron mongers to penetrate materials.	• Describing and labelling parts of: screws, nails and rivets. • Fixing screws, nails, rivets, self-tapping.	• Applying various fixings on different materials	• Recognising importance of using Iron mongers on projects.

GRADE 8

Systems Technology

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
8.5.1 TECHNOLOGY	**8.5.1.1 Mechanisms**	8.5.1.1.1 Identify different types of mechanisms	• Forms of motions, types of mechanisms: (levers, linkages, input and output movements)	• Communicating various types of mechanisms	• Being aware of the application of mechanisms in projects • Curiosity in applying knowledge on mechanisms
		8.5.1.1.2 Apply mechanisms in artefact making.	• Application of mechanisms in artefact making	• Demonstration of mechanisms in real life situations	
	8.5.1.2 Basic Eletricity	8.5.1.2.1 Identify basic electrical parts and their conventional symbols	• Basic electrical parts: (switches, bulbs, cells, parallel and series circuits) conventional symbols	• Communicating electrical ideas using symbols	• Participating in group discussions to design projects.
		8.5.1.2.2 Apply basic electrical circuit diagrams in artefact making.	• Drawing circuit diagrams: (Cells, switches, bulbs, electric wires or cables)	• Drawing circuit diagrams • Application of circuits on artefacts.	
	8.5.1.3 Electronics	8.5.1.3.1 Design and construct a simple electronic circuit.	• Electronic Circuit • Use of resistors, capacitors, transistors, diodes, (semi-conductors) bread board (circuit board) • Observe potential hazards.	• Drawing electronic circuit diagrams • Constructing electronic circuits from diagrams	• Appreciating the importance of electronic circuits

GRADE 8

Entrepreneurship

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
8.6.1 ENTREPRENEURSHIP	**8.6.1.1 Careers**	8.6.1.1.1 Make business plans for the selected entrepreneurial activity	• Start-up costs, fixed costs, marketing, advertising	• Communicating information on business plans	• Respecting other people's ideas
		8.6.1.1.2 Implementing business plans into production.	• Analysing activities for projects • Start-up capital: contributions, loans, borrowing from friends or school	• Producing finished articles.	• Sustainable development.

GRADE 9

KEY COMPETENCIES AT GRADE 9 LEVEL	GENERAL OUTCOMES
▪ Demonstrate ability to produce an artefact to solve problems from a portfolio ▪ Display basic skill to construct small structures from available materials ▪ Demonstrate ability to manage small scale entrepreneurship groups.	• Apply geometrical constructions in designing • Demonstrate ability to manage a small business

GRADE 9

Graphic Communication

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
9.1.1 PLANE FIGURES	**9.1.1.1 Tangents**	9.1.1.1.1 Construct tangents satisfying given conditions	• Construct **tangents** to a point **on** and **away** from the circumference, radius corners	• Constructing tangents to circles	• Appreciating use of tangents in design.
	9.1.1.2 Circles in Contact	9.1.1.1.2 Construct circles in contact satisfying given conditions.	• Construct circles in contact: (Internal and external to two equal and unequal circles)	• Blending of curves.	• Curiosity in applying knowledge on circles in contact
	9.1.1.2 Ellipse	9.1.1.2.1 Construct an ellipse from given data	• Construct ellipses using Concentric Circle and Rectangle Methods Minor axis, Major axes, focal points	• Drawing elliptical designs using various methods	• Applying circle concepts in designing
9.1.2 SURFACE DEVELOPMENT	**9.1.2.1 Surface Development of Solids.**	9.1.2.1.1 Develop surfaces of solids	• Develop surfaces of plain and truncated prisms (triangular, rectangular, hexagonal, pentagonal), plain and truncated cylinders.	• Applying surface development concept in designing and making	• Appreciating the use of surface development in designs.

GRADE 9

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
9.1.3 ORTHOGRAPHIC PROJECTION	**9.1.3.1 Projection of Solids**	9.1.3.1.1 Draw the projections of solids prisms and cylinders	• Plain and truncated prims (hexagonal and pentagonal) • Plain and truncated cylinders	• Communicating design of prisms in orthographic	• Drafting of solids in orthographic views
	9.1.3.2 Orthographic Projection	9.1.3.2.1 Produce sectional elevation angle given the cutting plane.	• Elevations, plans, cutting plane, sectioning, section subtitle, hatching lines, sectioning of webs and curved surfaces.	• Interpreting design hidden data from a graphic presentation.	• Appreciating the value of a drawing to realisation • Displaying commitment to time schedule procedure
	9.1.3.3 Working Drawings	9.1.3.3.1 Produce working drawings of an artefact.	• Pictorial isometric, detail drawings, assembly drawings, parts list, cutting list	• Sketching freehand working drawings	
9.1.4 GRAPHICS	**9.1.4.1 Computer drawing**.	9.1.4.1.1 Design working drawing using computer.	• Draw working drawings indicating views clearly. • Use of AutoCAD, Corel draw.	• Drawing using computers.	• Appreciating quality work.

GRADE 9

Design and Communication

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
9.2.1 DESIGN PROCESS	**9.2.1.1 Evaluation**	9.2.1.1.1 Appraise the artefact in line with the brief and specifications	• Test the artefact whether it meets the brief and specifications • Analysis of artefact providing strengths and weaknesses • Suggest possible modifications • Outline limitations in designing and making the artefact	• Testing the product.	• Examine that the product addresses the need of user.
9.2.2 PORTFOLIO	**9.2.2.1 Presentation**	9.2.2.1.1 Present all components of the portfolio in a logically	• Portfolio presentation: content, sequencing, binding • Draw design ideas using graphical techniques, enhance ideas using a variety of presentation techniques, arrange sequentially components of the portfolio	• Communicating information graphically and in writing • Organising material requirements.	• Keeping orderly record of a portfolio. • Participating in group work in problem solving

GRADE 9

Resistant Materials

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
9.3.1 RESISTANT MATERIALS	**9.3.1.1 Heat Treatment**	9.3.1.1.1 Produce articles from metals.	• Hardening, annealing, normalising, tempering, casehardening • Work with metals to produce artefacts.	• Communicating different methods of treating metals • Fogging	• Appreciating the effects of heat on materials.
	9.3.2.1 Heat Application	9.3.2.1.1 Describe the effects of heat on plastics	• Plastic memory, bending, Vacuum forming, Press forming, cold casting and embedding.	• Investigating effects of heat on plastics.	
	9.3.3.1 Impelling tools.	9.3.3.1.1 Demonstrate ability to use impelling tools in joining materials.	• Types and uses of hammers (Claw, cross pane, ball pane) mallets (carpenter's mallet, rubber mallet) and screwdrivers (London Pattern, cabinet pattern)	• Specifying impelling tools used to work. • Driving nails and screws in materials.	• Appreciating the use of impelling tools to drive materials.
	9.3.4.1 Finishing Materials	9.3.4.1.1 Selecting correct finishes to apply on the product.	• Pre-finishing processes – sand paper. • Observe safety when applying finishes.	• Investigating the effects of finishes on materials.	• Producing quality work.
		9.3.4.1.2 Apply finishes on different materials	• Finishing using: Varnish, paint, oil, polish, wax, stain, plastic coating, blueing, banishing.	• Applying finishes on artefacts.	

GRADE 9

Systems Technology

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
9.4.1 SYSTEMS TECHNOLOGY	**9.4.1.1 Structures**	9.4.1.1.1 Apply the concept of forces in structures	• Identification: Natural and artificial structures Types: Shell and Frame structures	• Designing simple structures meeting the market standards.	• Appreciating harmonious structures.
			• Static and dynamic forces.	• Observing the behaviour of forces in structures.	• Working with forces
		9.4.1.1.2 Design methods to strengthen and stabilise structures.	• Strength, Stability, Rigidity, ties and struts	• Designing stable structures,	• Appreciating the importance of strong structures.
		9.4.1.1.4 Construct simple structures to meet the demands of design situations.		• Constructing simple structures	• Embracing team work.
	9.4.1.2 Energy	9.4.1.2.1 Identify forms and common sources of energy	• Electrical, mechanical, (heat) Kinetic, potential Sources; fossils, bio, solar, tidal, wind, hydro, thermal.	• Applying different forms of energy to design artefacts.	• Appreciating the use of energy in systems,
		9.4.1.2.2 Select and use appropriate energy sources in response to a given design problem.	• Application of energy		

GRADE 9

Entrepreneurship

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
9.5.1 ENTREPRENEURSHIP	**9.5.1.1 Careers**	9.5.1.1.1 Manage small business	• Organising, supervising, service provision.	• Record keeping and monitoring of activities.	• Enterprising through team work.
		9.5.1.1.2 Managing credit	• Choose an appropriate payment method: Instalments, Banks stop order, Cash	• Budgeting	
		9.5.1.1.3 Prepare final accounts for the Business	• Income and expenditure sheet	• Managing account books.	

APPENDIX 1 SCOPE AND SEQUENCE - DESIGN AND TECHNOLOGY

THEME	TOPIC	GRADE 8	GRADE 9
DESIGN AND TECHNOLOGY	Introduction to design and technology.	Components: Graphic Communication, Materials, Basic technology Entrepreneurship	
SAFETY	Safety	Safety rules. Accidents and injuries First Aid and techniques	SURFACE DEVELOPMENT Development of Cylinders and prisms
WORK ROOM MANAGEMENT	Work room management	Working and Marking areas, Work bench Parts Workroom routine Storage of tools.	
DRAWING	INSTRUMENTS	Set squares, Compass, Dividers, Rule. Drawing board T-square, Pencils.	
	PAPER LAYOUT	Paper sizes, Border line and Title block	
	COLOURS	Primary, Secondary colours, use of colour	
	SYMBOLS	Symbols, explanatory diagrams.	GRAPHS Line graphs, bar and column diagrams, circle or pie diagrams
	LINES	Constructing and bisecting of lines	
	PLANE GEOMETRY	***Angles***: Types of angles and construction	
		Triangles: Equilateral, Isosceles, Scalene, Acute, Obtuse and Right Angled. Construct triangles using sides, angles and perimeter.	
		Quadrilaterals: Rectangle, Square, Kite, Rhombus, Parallelogram. Construct using; sides, angles and diagonals.	
		CIRCLES: Parts of a circle Construction of circles , Concentric circles Circumscribing and, Inscribing circles.	***CIRCLES*** : Tangents Circles in contact Ellipse

THEME	TOPIC	GRADE 8	GRADE 9
	POLYGONS	Regular and irregular. Construction of **regular** and **irregular** polygons.	
DRAWING	SOLID GEOMETRY	***Pictorial drawing***: Freehand sketching, Principles of pictorial drawing. Isometric drawing	
	SURFACE DEVELOPMENT		***Cylinders and prisms:*** Development of plane and truncated prisms. Plane and truncated cylinders
	ORTHOGRAPHIC PROJECTION	Principle planes. Front, Plan, End elevations Hidden details. Dimensioning. First and Third Angle Projections	***Projection of solids:*** Projections of plane and truncated solids
			Projection of elevation, presentation of hatch lines, sectioning of webs and curved surfaces
			Working drawings: Projection of elevations. Sectioning of webs and curved surfaces Produce working drawings of an artefact. Designing, sketching.
MATERIALS	MATERIAL TREATMENT	Softwood, hard wood Cross section of a log Felling, conversion, seasoning of timber. Uses of wood.	**Metal:** Hardening, annealing, normalising, tempering, casehardening, bending, forming and casting. **Plastics:** memory bending, vacuum forming, press forming, cold casting and embedding. Plastic coat.
	Joining materials	Wood, Metal and Plastic Joints.	Impelling tools used in joining materials: Hammers, mallets, screw drivers.
	Adhesives and fixings	Types of adhesives ***Fixings*:** screws, nails, rivets, self tapping)	
	Finishing materials.		Pre-finishing/ finishing processes ***WOOD:*** Use of abrasives, varnishing and painting. ***METAL:*** Draw filing, (polishing), emery cloth, blueing, galvanising, tinplating, terneplate, painting, oiling, applying lacquer, **Plastic:** Filing, polishing, scrapping **Plastic:**

THEME	TOPIC	GRADE 8	GRADE 9
			- Plastic memory bending - Vacuum forming Press forming, cold casting and embedding.
	METAL	Metal properties and uses. - **Ferrous:**(carbon and alloy steels, cast irons) - **Non-ferrous: (**zinc, tin, copper, lead, aluminium) - **Alloys:** (brass, bronze, solder, steel, duralumin)	TREATMENT Hardening, annealing, normalising, tempering, casehardening, bending, forming and casting.
	PLASTICS	**Thermoplastics, Thermosets.** Properties, uses and storage of plastics. Recycling	
	Preparation of materials	Notations used - Measuring tools - Marking tools - Testing tools Correct Method of using tools and care for them.	
	Wasting of materials	Wasting tools for Wood, Metal and Plastics Holding tools Correct method of using these tools.	
BASIC TECHNOLOGY	Mechanisms	Types of mechanisms: levers, linkages, input and output movements, functions of mechanisms	STRUCTURES Natural and artificial structures Static and dynamic forces, principle of strength, stability and rigidity. Construction on simple structures
	Basic electricity and electronics.	Circuit, bread board (circuit board) cells in series & parallel. Conventional symbols for, Switches, Resistors, Transistors, Capacitors and Conductors. Magnets and electromagnetism	ENERGY: Forms of energy: Electrical, mechanical and heat. Kinetic, potential, conserving and storing energy, converting of energy, positive and negative effects of energy.
DESIGNING	Design process	Design Process:	
ENTREPRENEURSHIP	Career	Produce different products from chosen materials.	

APPENDIX 2

PROJECT EVALUATION GUIDE

		TICK YOUR SELECTION BELOW				
I made a …… Did you work with somebody else? **YES** ☐ **NO** ☐		**VERY PLEASED**	**PLEASED**	**FAIRLY HAPPY**	**UNHAPPY**	**I DID NOT DO THIS PART**
Investigation	I carried out an investigation and feel					
Research	I carried out research and feel					
Ideas	I sketched various ideas and feel					
Models	I made a model and feel					
Development	I developed my design and feel					
Planning	I planned my work step-by-step and feel					
Making	I made my design and feel					

If it was made again, how could it be improved?
Explain using notes or/and sketches

I liked ☐ disliked ☐ this project? Tick a box, then given a reason for your answer:

What was the most difficult part to make? Explain your answer.

How did you improve or alter your design as it was made?

How did you test work, to make sure it did what it was supposed to do?

What did other people say about your work? (e.g. parents, teachers, industrial advisers etc.)

Who did you ask and what comments did the make?

APPENDIX 3

DESIGN & TECHNOLOGY PROJECT ASSESMENT SHEET

THEME:	***Centre Name/Centre:***

Candidate Number:	***SURNAME***	***FIRST NAME***

	PART	***TOPIC***	***TOTAL MARKS***	***MARKS SCORED***	***TEACHER'S COMMENTS***
1. PORTFOLIO	*1.1*	*Situation*			
	1.2	*Design Brief*			
	1.3	*Research/Analysis*			
	1.4	*Specification*			
	1.5	*Initial ideas*			
	1.6	*Development*			
	1.7	*Working drawings*			
	1.8	*Production planning*			
	1.9	*Presentation*			
2. PRODUCT	*2.1*	*Suitability*			
	2.2	*Workmanship*			
	2.3	*Use of materials*			
	2.4	*Evaluation*			
			TOTAL MARKS		

APPENDIX 4

LIST OF EQUIPMENT REQUIRED FOR DESIGN AND TECHNOLOGY AT THIS LEVEL

Equipment, Tools and Machinery		
A Graphic Communications Equipment		
2H Pencils	300 mm Rule	Compass and Dividers
Coloured Pencils	A3 Tee Squares	Set Squares
A3 Drawing Boards	Drawing Boards Clips/Cello tape	French Curve
B Materials		
Measuring and Marking Out Tools		
Measuring Tape	**Callipers:** Internal and External, Old leg, Veneer	Marking Knife
Steel Rules		Surface and Angle Plate
Try Squares	**Gauges:** Marking, Mortice and Cutting	Pencil/Wet Chalk
Sliding Bevel		Wing Compass
Micrometer	**Punches:** Centre and dot	
Wasting Tools		
Saws:	**Planes:**	**Files:** Flat, Half round, Triangular, Square,
Bench: Rip, Cross cut, Panel	Jack, smoothing, spoke shaves	Needle file, rasp
Back: Tenon, Dovetail, Gents	**Chisels *(Wood):*** firmer, Mortice, Paring,	
Frame: Coping, Bow, Compass, hacksaw,	Bevel edged	
Junior hacksaw	**Chisels *(Metal):*** Flat cold, Half round,	
Special: Key hole, Abra	Cross cut	
Driving/Impelling/Percussion Tools		
Hammers:	**Mallets:**	**Screwdrivers:**
Claw, Ball pein, Cross pein, planishing,	Carpenter's, Bossing, Rubber	Flat, Phillips, Electrical
Warrington pattern, pin		
Holding Tools		
Vices: Wood bench vice, Metal bench vice,	G Cramp, Sash Cramp, Mitre Cramp	Vee Block, Vice Grip, Tool clamp
Machine vice, Hand vice		
Boring: Ratchet brace, Twist bits, Brad awl,		***Other Equipment (Plastic)***
Centre bit, Countersunk, Jennings auger bit		Hot Air guns, Strip benders
Drills: Hand drill, Breast drill, Pillar drill		
Glass bits		