



Republic of Zambia

MINISTRY OF EDUCATION, SCIENCE, VOCATIONAL TRAINING AND EARLY EDUCATION

# DESIGN & TECHNOLOGY

## SYLLABUS

### GRADE 10 – 12



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## **VISION**

Quality, life-long education for all which is accessible, inclusive and relevant to individual, national and global needs and value systems.

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## **PREFACE**

This syllabus is a product of the recommendations made during the National Symposium held in June 2009 and the Baseline survey that was conducted by the Curriculum Development Centre in 2005 where stakeholders suggested that Industrial Arts subjects i.e. Technical Drawing, Woodwork and Metalwork be integrated into one subject; hence the change to Design and Technology.

The teaching of Design and Technology at the Senior Secondary School is designed to build on knowledge and skills acquired at Junior Secondary School level so as to prepare the learners for the demands in the rapidly changing technological world and the attainment of the Vision 2030. In this regard, Design and Technology will equip learners with a variety of knowledge, skills, values and attitudes that can prepare them for further education, entrepreneurship and ultimately, for life in general.

Thus, the review was necessitated by the need to improve the quality of education provided at Junior Secondary School level as outlined and recommended in the policy document Educating Our Future (1996) and the Zambia Education Curriculum Framework (ZECF) 2012.

It is my sincere hope that this syllabus will improve learning and teaching of Design and Technology in schools and have a positive impact on the national economy.

Chishimba Nkocha  
PERMANENT SECRETARY  
MINISTRY OF EDUCATION, SCIENCE, VOCATIONAL TRAINING AND EARLY EDUCATION

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## AIMS OF TEACHING DESIGN AND TECHNOLOGY

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 to produce artefacts by applying acquired knowledge and skills.

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

<b>COMPONENT</b>		<b>DESCRIPTION</b>
<b>1</b>	<b>GRAPHIC COMMUNICATION</b>	Communication by drawings or symbols. The purpose of <i>Graphic Communication</i> in Design and Technology is to help learners develop the ability to convey or transmit information about design problems, ideas and solutions graphically.
<b>2</b>	<b>MATERIALS</b>	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: <i>availability, cost and characteristics</i> 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.
<b>3</b>	<b>TECHNOLOGY</b>	Technology will focus on developing skills used in <i>Structures, Mechanisms and Electronics</i> . Learners will be helped to; <i>identify</i> how these are interrelated, their role in <i>designing</i> and <i>making</i> control systems.
<b>4</b>	<b>ENTREPRENEURSHIP</b>	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.

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.

## **RATIONALE**

The Design and Technology syllabus at Senior Secondary School level is designed to build on the knowledge and skills acquired at both Primary School in (Technology Studies) and Junior Secondary School. Therefore, it will prepare the learners both for the demands in the rapidly changing technological world and also equip them with a variety of knowledge, skills and attitudes to prepare them for further training in various technological fields, employment and for life in general.

Design and Technology will expose learners to a wide range of knowledge; skills and values in designing, manufacturing and evaluation which can help them adapt and cope with the rapidly changing situations. The subject will equip them with concepts and principles that will enable them expand their thinking capacity to handle practical real-life problems in the community and life in general.

At the end of the Senior Secondary School level it is expected that learners taking design and technology will have become creative, resourceful and multi-skilled in using the available materials to solve environmental, social and economic challenges that they may encounter in life.



## KEY COMPETENCIES

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

<b>COMPETENCIES</b>		<b>DESCRIPTION</b>
<b>1</b>	<b><i>Investigative skills</i></b>	<i>Critical thinking</i> : learners are expected to come up with possibilities to tackle a particular need and choose the preferred solution; <i>Creative thinking</i> learners will be expected to produce new ideas that will leading to a conclusion; <i>Inquiring</i> asking questions to obtain suggestions to facilitate solving of problems
<b>2</b>	<b><i>Interpretational skills</i></b>	Learners' ability to classify, convert, identify, explain and interpret evidence. This also involves the interpretation of patterns, sketches, models, charts and illustrations.
<b>3</b>	<b><i>Application skills</i></b>	Drawing, measuring and cutting. Conducting research and assessing information from various sources. Producing artefacts using materials. Application of knowledge in real life situations.
<b>4</b>	<b><i>Communication skills</i></b>	Explaining, displaying, reporting, reading, listening, drawing and designing.
<b>5</b>	<b><i>Valuing and attitudinal skills</i></b>	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
<b>6</b>	<b><i>Participating skills</i></b>	Taking part in group work, through classroom discussions and presentations.

## ASSESSMENT

Assessment is an integral part of the teaching and learning process. It helps to determine whether teaching and learning has taken place and whether outcomes have been achieved. Assessment is meant to help the learner improve. It should, however, be recognized that learners are different and thus will achieve the outcomes according to their abilities. This assessment will be both Formative and Summative. Formative assessment will be done on a daily basis as Continuous Assessment (CA), while Summative assessment will be conducted at the end of the learning process, either termly or yearly, using a formally set examination.

## 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 learner 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 FOR EACH COMPONENT

The standard period allocation prescribed in the Zambia Education Curriculum Framework for Design and Technology at this level, is *ten (10)* periods of *sixty (60)* minutes per week.

	<b><i>COMPONENT</i></b>	<b><i>MINIMUM NUMBER OF PERIODS ALLOCATED PER TERM</i></b>
<b><i>1</i></b>	<b><i>GRAPHIC COMMUNICATION</i></b>	20 periods
<b><i>2</i></b>	<b><i>MATERIALS</i></b>	40 periods
<b><i>3</i></b>	<b><i>TECHNOLOGY</i></b>	20 periods
<b><i>4</i></b>	<b><i>ENTREPRENEURSHIP</i></b>	

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 time considering that facilities, tools, materials and the level of the learners may also vary.

While, information concerning teaching of different skills, planning of work, 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 and that their scheming should be based on them. 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 ensure that learners adapt and cope with changing situations. It will also provide learners with broader concepts and principles that will allow them to expand their thinking capacity to tackle real-life problems.

The main topics, sub-topics and outcomes are arranged in this order for easy of reference. Some topics may be similar in Grades 10, 11 and 12, but the levels of knowledge, skills, concepts and attitudes to be attained are not the same. Therefore, when preparing lessons teachers will have to aim at building on what the learners already know.

It is suggested that the Design Process, Graphic Communication and Materials feature prominently in Grade 10 Term 1, because they will lay a strong foundation for other knowledge and skills for other components.

## PROJECT WORK

The core theme of Design and Technology is problem solving through designing, making (Realisation) and evaluation. This problem solving is achieved through **Project Work**. This is because the project;

1. gives the subject its vitality and realism
2. leads to pupils becoming self-motivated
3. provides a platform upon which many associated skills can be developed.
4. provides a link between *theory* and *practical* applications.

Therefore, the main activity of the subject is the Project Work. As already noted, project has three key stages. These are: Designing, Realising and Evaluating.

<i>COMPONENT</i>		<i>DESCRIPTION</i>
<b>1</b>	<b><i>DESIGNING</i></b>	The Designing stage is concerned with identifying a problem and researching the topic. This will lead to a stage of formulating a series of ideas before choosing to develop one of the as a final solution. In planning, it is essential to check and consider materials, components and equipment available as well as the cost.
<b>2</b>	<b><i>REALISATION</i></b>	The Realisation stage is usually concerned with the making of the designed item. The quality of making and finishing is critical if the learner is to derive enjoyment and confidence from the experience and be able to carry out a viable evaluation.
<b>3</b>	<b><i>EVALUATION</i></b>	On completion of the project, an evaluation must be carried out. Learners can ask themselves questions such as: “ <b>Does it work?</b> ” “ <b>What does it look like?</b> ” <b>Does it satisfy the original brief?</b> It is important to evaluate the whole process from beginning to completion, so that lessons can be learnt and improvements suggested.

For teachers, there are also three phases of a project, which need careful management i.e. **setting of brief**, managing **the practical work** and course **assessment**, which will be based upon the project work, since it is the core activity.

All projects will have to be accompanied by a well prepared portfolio which will be assessed simultaneously. Portfolios at senior secondary school will have to be made on A3 paper.

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## GRADE 10 - DESIGN AND TECHNOLOGY.

### GENERAL OUTCOMES:

- Care for the workroom and equipment
- Apply good personal working habits
- Explain the properties and characteristics of materials
- Select appropriate materials for making artifacts.
- Select appropriate tools for the production of artifacts
- Demonstrate proper use of tools and good workmanship
- Apply appropriate methods of joining materials.
- Demonstrate correct application of graphical communication techniques
- Demonstrate graphical communication techniques
- Apply geometrical constructions techniques to solve problems
- Apply concepts and principles of energy and mechanisms in problem solving situations
- Demonstrate knowledge and values of entrepreneurship
- Develop entrepreneurial skills
- Outline the Design Process from the theme
- Generate design ideas and develop proposals that meet the needs

### KEY COMPETENCIES

- Show knowledge and of working with materials using hand tools.
- Demonstrate ability to use relevant geometrical constructions to determine basic shapes.
- Demonstrate ability and skill of producing a portfolio
- Design logos and symbols from give information

## Unit 1.0 Safety

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>10.1 SAFETY</b>	10.1.1 SAFETY IN THE WORK ROOM	10.1.1.1 Apply safety rules in the workroom	<ul style="list-style-type: none"> <li>• Safety rules</li> <li>• Personal safety</li> <li>• Machine safety</li> <li>• Power safety</li> <li>• First Aid, the techniques</li> <li>• Fire assembly point</li> </ul>	<ul style="list-style-type: none"> <li>• Communicating importance of safety at work.</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciating the value of safety to the worker.</li> </ul>
	10.1.2 FIRST AID	10.1.1.2 Apply first aid techniques in treating injuries 10.1.1.1 Observe fire drill			
	10.2.1 WORK ROOM MANAGEMENT	10.1.2.1 Observe the daily routine in the Workroom	<ul style="list-style-type: none"> <li>• Workroom routine</li> <li>• Storage of tools, maintenance.</li> </ul>	<ul style="list-style-type: none"> <li>• Observing orderliness and maintaining tools for perfect use.</li> </ul>	<ul style="list-style-type: none"> <li>• Organising the work place in an orderly manner.</li> </ul>

## Unit 2.0 Resistant Materials

Materials

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>10.2 MATERIALS</b>	10.2.1 WOOD	10.2.1.1 Outline the timber processes before use	<ul style="list-style-type: none"> <li>• Conversion:                             <ul style="list-style-type: none"> <li>- plain, tangential, quarter</li> <li>- advantages and disadvantages</li> <li>- Seasoning: natural and artificial, advantages and disadvantages</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Identifying stages of timber processes before use.</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciating the use well seasoned timber on projects.</li> </ul>
		10.2.1.2 Describe common timber defects	<ul style="list-style-type: none"> <li>• Defects: Shrinkage – warping, cupping, bowing, twisting, knots, splits, shakes</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying natural and artificial defects in timber.</li> </ul>	<ul style="list-style-type: none"> <li>• Controlling defects before use.</li> </ul>
		10.2.1.3 Classify prescribed Manufactured boards and their use	<ul style="list-style-type: none"> <li>• Plywood, lamin, batten, block board, chip board, hard and soft boards Medium Density Fibre board  (MDF) or Supawood; uses</li> </ul>	<ul style="list-style-type: none"> <li>• Classifying artificial boards accordingly.</li> </ul>	<ul style="list-style-type: none"> <li>• Investigating different types of artificial boards used on the market.</li> </ul>
		10.2.1.4 Apply different methods of treating edges of manufactured boards	<ul style="list-style-type: none"> <li>• Lipping, tongue and groove, plastic, aluminium, veneering</li> </ul>	<ul style="list-style-type: none"> <li>• Edge finishing</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciating beauty on neat edge treated piece.</li> </ul>



## Resistant Materials

Materials

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>10.2 MATERIALS</b>	<b>10.2.2 METAL</b>	10.2.2.1 Explain the production of iron  10.2.2.2 Identify and classify plain carbon steels 10.2.2.3 Identify and classify alloy steels	<ul style="list-style-type: none"> <li>• Pig iron, wrought iron, cast iron</li> <li>• Mild steels, medium carbon steels, high carbon steel</li> <li>• High speed steels, Spring steels, stainless steels</li> </ul>	<ul style="list-style-type: none"> <li>• Artefact realising with different materials.</li> <li>• Manipulating available materials and properties in to make artefacts.</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciating use of different materials on projects.</li> </ul>
	<b>10.2.3 PLASTICS</b>	10.2.3.1 Describe the common structure and chemistry of plastics 10.2.3.2 Describe the various processes involving plastics 10.2.3.4 Apply safety precautions when machining plastics	<ul style="list-style-type: none"> <li>• Thermoplastics, Thermosets , Elastomers Polymerization</li> <li>• Forming, moulding, deforming, joining and finishing plastics, shaping plastics using heat</li> <li>• Safety precautions: goggles, mask, apron, dust coat</li> </ul>		<ul style="list-style-type: none"> <li>• Enterprising</li> </ul>
	<b>10.2.4 OTHER MATERIALS</b>	10.2.4.1 Describe the uses of other locally available materials 10.2.4.2 Explain the factors to consider when selecting materials to ensure suitability for purpose	<ul style="list-style-type: none"> <li>• Leather, rubber, glass, grass, foam, rexin, clay, paper, canvas, concrete, ceramics and any local materials</li> <li>• Properties: attraction, Functional</li> </ul>		

## Resistant Materials

Materials

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>10.3. CUTTING AND JOINING MATERIALS.</b>	10.3.1 PREPARATION OF MATERIALS	10.3.1.1 Apply correct tools and procedure when preparing materials.	<ul style="list-style-type: none"> <li>Measuring tools</li> <li>Marking out tools</li> <li>Testing tools</li> </ul>	<ul style="list-style-type: none"> <li>Identifying the correct tool to use when measuring marking and testing.</li> </ul>	<ul style="list-style-type: none"> <li>Producing accurate articles.</li> </ul>
	10.3.2 WASTING OF MATERIALS	10.3.2.1 Use wasting tools correctly on material  10.3.2.2 Apply correct techniques when wasting materials	<ul style="list-style-type: none"> <li>Wasting tools used on Wood, Metal, Plastics, concrete, ceramics glass</li> <li>Cutting on waste side</li> </ul>	<ul style="list-style-type: none"> <li>Investigating behaviour of wasting tools on different materials.</li> </ul>	<ul style="list-style-type: none"> <li>Appreciating the use of different saws when working.</li> </ul>
	10.3.3 JOINING MATERIALS	10.3.3.1 Apply different methods of joining materials  10.3.3.2 Apply safety precautions when joining materials	<ul style="list-style-type: none"> <li>Permanent and Temporary joints:</li> <li><b>Wood:</b> Haunched Mortice and tenon, Common Dovetail, Stopped Bridle</li> <li><b>Metal:</b> Riveting, Soldering, Welding, Brazing, Force fitting and tolerance</li> <li><b>Plastic:</b> Laminating, Screwing.</li> <li>Precautions to:               <ul style="list-style-type: none"> <li>-work pieces and</li> <li>-humans</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Identifying correct joints used on different materials.</li> </ul>	<ul style="list-style-type: none"> <li>Appreciating strong and permanent joints on projects.</li> </ul>

## Unit 3.0 Graphic Communication

Graphic Communication

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>10.4 GRAPHIC COMMUNICATION</b>	10.4.1 DRAFTING AIDS	10.4.1.1 Apply varied effects to lettering work. 10.4.1.2 Use drafting equipment when lettering 10.4.1.3 Produce lettering effects by the use of computers.	<ul style="list-style-type: none"> <li>• Effects to lettering.</li> <li>• French, fillet, flex curves, use of stencils</li> <li>• Input, output, configuration, software</li> </ul>	<ul style="list-style-type: none"> <li>• Lettering manually and Computer aided.</li> </ul>	<ul style="list-style-type: none"> <li>• Designing graphics.</li> </ul>
	10.4.2 FREEHAND SKETCHING	10.4.2.1 Use freehand sketching to present three dimensional objects. 10.4.2.2 Construct three dimensional solids using instruments.	<ul style="list-style-type: none"> <li>• Oblique Perspective</li> </ul>	<ul style="list-style-type: none"> <li>• Visualisation</li> </ul>	<ul style="list-style-type: none"> <li>• Applying oblique / perspective drawing in designs.</li> </ul>
		10.4.2.2 Apply appropriate enhancement techniques on freehand sketches. 10.4.2.3 Produce freehand sketches which communicate ideas and information about an artefact.	<ul style="list-style-type: none"> <li>• Enhancements                             <ul style="list-style-type: none"> <li>- Texture, use of colours, shape and form, line and shadow.</li> </ul> </li> <li>• Isometric / Oblique</li> </ul>	<ul style="list-style-type: none"> <li>• Freehand sketching.</li> </ul>	<ul style="list-style-type: none"> <li>• Applying a variety of enhancement to appreciate beauty.</li> </ul>
	10.4.3 SYMBOLS AND LOGOS	10.4.3.1 Describe the use of symbols and Logos in communication  10.4.3.2 Design symbols and logos from specified information.	<ul style="list-style-type: none"> <li>• Symbols used in:                             <ul style="list-style-type: none"> <li>- Graphic communication</li> <li>- Basic Technology</li> <li>- companies</li> <li>- institutions</li> <li>- associations</li> <li>- Logos</li> </ul> </li> <li>• Designing</li> </ul>	<ul style="list-style-type: none"> <li>• Designing</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciating message derived from symbols and logos</li> </ul>
	10.4.4 PLANE FIGURES	10.4.4.1 Construct plane figures from the given data.	<ul style="list-style-type: none"> <li>• Triangles, Quadrilaterals, Regular and Irregular</li> </ul>	<ul style="list-style-type: none"> <li>• Constructing different plane</li> </ul>	<ul style="list-style-type: none"> <li>• Applying principles of</li> </ul>

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
		10.4.4.2 Produce figures of equal area according to specified linear and area ratios. 10.4.4.3 Reduce and enlarge plane figures to given linear and are ratios.	polygons. <ul style="list-style-type: none"> <li>Figures of equal area               <ul style="list-style-type: none"> <li>- Linear ratios</li> <li>- Area ratios</li> </ul> </li> <li>Enlargement and reduction.</li> </ul>	figures.	reduction and enlargement to design artefacts.
	10.4.5 TANGENTS AND CIRCLES IN CONTACT	10.4.5.1 Construct internal and external tangents from given data 10.4.5.2 Construct circles in contact satisfying given conditions 10.4.5.3 Circumscribe Inscribe and plane figures	<ul style="list-style-type: none"> <li>Tangents</li> <li>Circles in contact</li> <li>Inscribing and circumscribing</li> </ul>	<ul style="list-style-type: none"> <li>Constructing circles and tangents to circles.</li> </ul>	<ul style="list-style-type: none"> <li>Designing articles using concept of tangents and circle construction.</li> </ul>
	10.4.6 LOCI	10.4.6.1 Construct simple mechanisms to satisfy given conditions 10.4.6.2 Construct special curves to satisfy given conditions	<ul style="list-style-type: none"> <li>Paths of simple mechanisms (maximum of three linkages)</li> <li>Involute, ellipse, helix, Archimedean spiral, cycloid, parabola, hyperbola</li> </ul>	<ul style="list-style-type: none"> <li>Constructing and tracing paths of a mechanism</li> </ul>	<ul style="list-style-type: none"> <li>Designing.</li> </ul>

## Unit 4.0 Systems Technology

Technology

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>10.5 TECHNOLOGY</b>	10.5.1 ENERGY	<p>10.5.1.1 Describe different forms and sources of energy</p> <p>10.5.1.2 Explain ways of converting and conserving energy</p> <p>10.5.1.4 Apply appropriate energy sources in response to design problems</p>	<ul style="list-style-type: none"> <li>Forms: Heat, mechanical, electrical, chemical, sound, light, Kinetic and potential, renewable and non-renewable. Sources: Sun (Solar) tidal, wind. Hydro, nuclear, Geothermal, Fossil fuels, Bio fuels (Baggase).</li> <li>Effects and dangers of energy sources.</li> </ul>	<ul style="list-style-type: none"> <li>Communicating information on different sources of energy.</li> </ul>	<ul style="list-style-type: none"> <li>Applying suitable form of in artefacts.</li> </ul>
	10.5.2 MECHANISMS	<p>10.5.2.1 Describe various types of mechanisms</p> <p>10.5.2.2 Demonstrate application of motion in projects</p> <p>10.5.2.2 Apply mechanisms in response to design problems.</p>	<ul style="list-style-type: none"> <li>Levers, pulleys, linkages, cams and follower, gears, screws, ramps, wedges, crank mechanisms, chain and sprocket</li> <li>Motions: Linear, Reciprocating, Rotary, Oscillating, Transmission and Transformation of motion.</li> <li>Application of Mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>Communicating knowledge on mechanisms and motion.</li> </ul>	<ul style="list-style-type: none"> <li>Designing motional artefacts.</li> </ul>

## Unit 5.0 Entrepreneurship

Entrepreneurship

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>10.6 ENTREPRENEURSHIP</b>	10.6.1 CAREERS	10.6.1.1 Identify and select entrepreneurial activity in Design and Technology in a group 10.6.1.2 Make a business plan for the selected entrepreneurial activity 10.6.1.3 Mobilise resources	<ul style="list-style-type: none"> <li>Formation of entrepreneurial groups to mobilise resources in a team.</li> </ul>	<ul style="list-style-type: none"> <li>Analysing entrepreneurial activities within locality.</li> </ul>	<ul style="list-style-type: none"> <li>Enterprising</li> </ul>
	10.6.2 MARKETING	10.6.2.1 Identify target market for the product 10.6.2.2 Conduct a market research for the product 10.6.2.3 Interpret information from the research		<ul style="list-style-type: none"> <li>Identifying market opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>Marketing products.</li> </ul>

## Unit 6.0 Design and Communication

*Design Process*

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>10.7 DESIGNING</b>	10.7.1 DESIGN PROCESS	10.7.1.1 Apply the design process cycle in situational problem solving.	<ul style="list-style-type: none"> <li>• Theme                             <ul style="list-style-type: none"> <li>- Theme Analysis</li> </ul> </li> <li>• Situation</li> <li>• Problem identification</li> <li>• Formulation of a Design brief</li> <li>• Specification</li> <li>• Research,                             <ul style="list-style-type: none"> <li>- Cuts and Paste ups</li> </ul> </li> <li>• Generation of ideas                             <ul style="list-style-type: none"> <li>- Selection of best Solution.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Communicating the design process sequentially.</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciating the importance of design stages in problem solving.</li> <li>• Designing.</li> </ul>
		10.7.1.2 Develop detailed design proposal to realise the final product.	<ul style="list-style-type: none"> <li>• Development of the chosen idea</li> <li>• Portfolio production</li> </ul>	<ul style="list-style-type: none"> <li>• Interpreting working drawings</li> </ul>	<ul style="list-style-type: none"> <li>• Portfolio making</li> </ul>

## GRADE 11

### KEY COMPETENCIES AT GRADE 11 LEVEL

- Demonstrate knowledge and ability to use common fastenings and fittings applicable to holding materials.
- Design and construct simple electrical and electronic circuits
- Show knowledge to communicate ideas in pictorial or orthographic mode

### GENERAL OUTCOMES:

- Demonstrate correct methods and techniques when joining materials.
- Demonstrate correct use of driving tools when joining materials.
- Demonstrate ability in the treatment of materials
- Employ concepts and principles of hydraulics and pneumatics in problem solving situations
- Reinforce structures due to the effects of forces
- Apply concepts and principles of electricity and electronics in problem solving situations
- Employ concepts and principles of hydraulics and pneumatics in problem solving situations
- Reinforce structures due to the effects of forces
  - Produce and read working drawings.
- Demonstrate ability to produce the designed artefact
- Evaluate the product and make recommendations.
  - Demonstrate ability to evaluate and cost artifacts
- Apply concepts and principles of electricity and electronics in problem solving situations



## Unit 1.0 Resistant Materials

Materials

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
11.1 MATERIALS	11.1.1 FIXINGS	11.1.1.1 Identify and describe types of fixings.	<ul style="list-style-type: none"> <li>• Nails: (Wire nail, Oval nail, Clout, Panel pin, Cut tack), methods of nailing, Screws: (Roundhead, Countersunk, Raised head, Self-tapping)</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying different nails.</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciating the use of nails on different works.</li> </ul>
			<ul style="list-style-type: none"> <li>• Rivets: (Countersunk, Round/Snap head, Raised head, Flat head, Pop rivets, Solid rivets, Bifurcated)</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying rivets used on work.</li> </ul>	<ul style="list-style-type: none"> <li>• Applying rivets on projects.</li> </ul>
		11.1.1.2 Outline the stages of preparing materials before applying fixings	<ul style="list-style-type: none"> <li>• Safety precautions</li> <li>• Preparation of material                             <ul style="list-style-type: none"> <li>- Boring/drilling</li> <li>- Pilot/clearance holes</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Communicating knowledge on correct fittings.</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciating the importance of correct fitting of articles.</li> </ul>
	11.1.4 FITTINGS	11.1.4.1 Identify and describe types of fittings	<ul style="list-style-type: none"> <li>• <b>Hinges:</b> Butt, Tee, Back flap, Piano, Flush, Rising butt.</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying hinges.</li> </ul>	<ul style="list-style-type: none"> <li>• Fit hinges correctly.</li> </ul>
			<ul style="list-style-type: none"> <li>• <b>Locks:</b> Cylinder, Cupboard, Cupboard or drawer, Mortice and Pad.</li> <li>• <b>Catches:</b> Magnetic, Ball and spring.</li> <li>• <b>Latches:</b> Night, Barrel bolt, Hasp and Staples</li> <li>• <b>Other Fittings:</b> Handles and Knobs, castor wheels.</li> </ul>	<ul style="list-style-type: none"> <li>• Classifying locks acc</li> <li>• Applying locks on cabinets, trolleys and doors.</li> </ul>	<ul style="list-style-type: none"> <li>• Observing safety when fitting locks.</li> <li>• Securing property within environment.</li> </ul>

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	11.1.2 ADHESIVES	11.1.2.1 Describe the characteristics of prescribed adhesives.	<ul style="list-style-type: none"> <li>• Characteristics of: Casein, Animal, PVA, Contact Glues, Urea formaldehyde and other Synthetic glues and uses Pot and shelf life</li> <li>• Safety precautions and surface preparation.</li> </ul>	<ul style="list-style-type: none"> <li>• Applying different types of glues on a project.</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciating the use of different glues on products.</li> </ul>
	11.1.3 DRIVING TOOLS	11.1.3.1 Describe different types and uses of driving tools.	<ul style="list-style-type: none"> <li>• Hammers, Mallets, screwdrivers, Pincers.</li> <li>• Pop rivet gun, Soldering gun, Rivet set/snap.</li> <li>• Spanners: (Socket, ring, Shifting spanners...) Allen keys.</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying driving tools.</li> <li>• Observing safety.</li> </ul>	<ul style="list-style-type: none"> <li>• Applying driving tools correctly</li> </ul>
	11.1.5 MATERIAL TREATMENT AND PROCESSES	11.1.5.1 Demonstrate and apply different methods of materials treatment.	<ul style="list-style-type: none"> <li>• <b>Metal:</b> Hardening Annealing, Casting, Normalising Tempering Casehardening, Bending, Blueing Forming</li> <li>• <b>Wood:</b> Chemical treatment</li> <li>• <b>Plastic:</b> Plastic memory Bending Press forming Cold casting Embedding, Moulding Vacuum forming.</li> </ul>	<ul style="list-style-type: none"> <li>• Investigating properties of materials before treatment.</li> </ul>	<ul style="list-style-type: none"> <li>• Applying correct treatment on materials before use.</li> </ul>

## UNIT 2. Systems Technology

Technology

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
11.2 TECHNOLOGY	11.2.1 ELETRICITY	11.2.1.1 Draw circuit diagrams using conventional symbols	<ul style="list-style-type: none"> <li>Electrical circuit diagrams.</li> </ul>	<ul style="list-style-type: none"> <li>Interpret conventional symbols correctly.</li> </ul>	<ul style="list-style-type: none"> <li>Apply conventional symbols to design and flow electricity.</li> </ul>
		11.2.1.2 Design and construct simple electrical circuits.	<ul style="list-style-type: none"> <li>Use of: transistors and circuits in electricity.</li> <li>Safety precautions</li> </ul>	<ul style="list-style-type: none"> <li>Designing and assembling circuits.</li> </ul>	<ul style="list-style-type: none"> <li>Making electrical circuits.</li> </ul>
		11.2.1.5 Demonstrate awareness of potential hazards when working with electrical equipment.	<ul style="list-style-type: none"> <li>Naked wires, safety attire, handling so many instruments at once, water...</li> </ul>	<ul style="list-style-type: none"> <li>Working with electricity.</li> </ul>	<ul style="list-style-type: none"> <li>Applying safety while working.</li> </ul>
	11.2.2 ELECTRONICS	11.2.1. 3 Draw electronic circuit diagrams using conventional symbols  11.2.1.4 Design and construct simple electronic circuits	<ul style="list-style-type: none"> <li>Hydraulic systems, Transmission of forces</li> <li>Symbols used in basic Pneumatic and hydraulic Circuits,</li> <li>Advantages and disadvantages of Pneumatics and Hydraulics</li> <li>Use of: Magnets and electromagnetism, buzzer, diodes, 555 timers, bread boards, matrix board, strip board.</li> </ul>	<ul style="list-style-type: none"> <li>Designing and connecting electronic circuits.</li> </ul>	<ul style="list-style-type: none"> <li>Discovering the use of different conventional symbols.</li> </ul>

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
			<ul style="list-style-type: none"> <li>• Systems approach</li> <li>• Safety precautions</li> </ul>		
<b>11.2 TECHNOLOGY</b>	11.2.2 HYDRAULICS	11.2.2.1 Identify symbols used in hydraulic circuits	<ul style="list-style-type: none"> <li>• Symbols used in basic hydraulic Circuits</li> </ul>	<ul style="list-style-type: none"> <li>• Designing hydraulics</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciating the function of hydraulics in technology.</li> </ul>
		11.2.2.2 Design and draw hydraulic circuits	<ul style="list-style-type: none"> <li>• Hydraulic circuits</li> </ul>		
		11.2.2.3 Describe the basic operation principles and cycles of hydraulic systems	<ul style="list-style-type: none"> <li>• Hydraulic systems, Transmission of forces</li> </ul>		
		11.2.2.4 Demonstrate the use of hydraulics in machines	<ul style="list-style-type: none"> <li>• Syringes, fluids, tints, elastic tubes, clips</li> </ul>		
		11.2.2.5 Apply concepts and principles regarding hydraulic systems to solve simple design problems	<ul style="list-style-type: none"> <li>• Application of hydraulics</li> </ul>		
	11.2.2 PNEUMATICS	11.2.2.1 Identify symbols used in pneumatic circuits 11.2.2.2 Design and draw pneumatic circuits 11.2.2.3 Describe the basic operation principles and cycles of pneumatic systems 11.2.2.2 Demonstrate the use of pneumatic in machines 11.2.2.3 Apply concepts and principles regarding pneumatic systems to solve simple design problems.	<ul style="list-style-type: none"> <li>• Symbols used in basic pneumatic circuits</li> <li>• Pneumatic circuits</li> <li>• Advantages and disadvantages of Pneumatics and Hydraulics</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying pneumatic symbols correctly.</li> </ul>	<ul style="list-style-type: none"> <li>• Applying pneumatics in simple designs.</li> </ul>

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>11.3 TECHNOLOGY</b>	11.3.1 STRUCTURES	11.3.1.1 Explain the properties of material used in the construction of structures	<ul style="list-style-type: none"> <li>• Properties of (wood, metal, stone, plastics, concrete, composites and other locally available materials)</li> </ul>	<ul style="list-style-type: none"> <li>• Classifying materials used in construction.</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciation</li> <li>• Awareness</li> <li>• Application</li> <li>• Logical thinking</li> <li>• Critical thinking</li> <li>• Safety consciousness</li> </ul>
		11.3.1.2 Describe forces in structures	<ul style="list-style-type: none"> <li>• Forces: static and dynamic</li> </ul>		
		11.3.1.3 Describe the principles of moments	<ul style="list-style-type: none"> <li>• Strength, stability, rigidity, Tension, Compression, Shear, Torsion</li> <li>• Principles of moments (equilibrium)</li> </ul>		
		11.3.1.4 Design and construct structures to meet the demands of design situations	<ul style="list-style-type: none"> <li>• Construction (testing)</li> <li>• Safety factors (reinforcements, ergonomics)</li> </ul>	<ul style="list-style-type: none"> <li>• Designing according to the situation.</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciating the value of designing in construction.</li> <li>• Observing safety when constructing.</li> </ul>

## Unit 3.0 Graphic Communication

Graphic Communication

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>11.4 SOLID GEOMETRY</b>	<b>11.4.1 INTERSECTION OF SOLIDS</b>	11.4.1.1 Draw intersection of solids. 11.4.1.2 Design and apply the principles of intersection of basic solids in an artefact	<ul style="list-style-type: none"> <li>Prisms, cylinders joining at 90°, 45°, 30° and 60° angles with the axes line</li> </ul>	<ul style="list-style-type: none"> <li>Drafting prisms and cylinders on plane sheets accurately.</li> </ul>	<ul style="list-style-type: none"> <li>Solving problems in designs through logical thinking.</li> <li>Appreciating the value of truncation and intersection in the production of artefacts.</li> </ul>
	<b>11.4.2 SURFACE DEVELOPMENT</b>	11.4.2.1 Construct surface development of solids. 11.4.2.2 Construct surface developments of basic intersecting solids 11.4.2.3 Apply the principles of surface development in an artefact	<ul style="list-style-type: none"> <li>Cones, pyramids (plain and truncated), packages</li> <li>Intersecting solids Prisms and cylinders</li> <li>Artefact making</li> </ul>		
<b>11.5 ORTHOGRAPHIC PROJECTION</b>	<b>11.5.1 ORTHOGRAPHIC PROJECTION</b>	11.5.1.1 Produce sectional elevations in the required projection given the cutting plane 11.5.1.2 Apply correct graphic representation of materials	<ul style="list-style-type: none"> <li>Sectional elevations                             <ul style="list-style-type: none"> <li>Cutting plane</li> <li>Dimensioning</li> <li>Section subtitle</li> </ul> </li> <li>Representation of wood, metal, glass, plastic, concrete</li> </ul>	<ul style="list-style-type: none"> <li>Drafting and positioning elevations on paper with accuracy.</li> </ul>	<ul style="list-style-type: none"> <li>Developing the power of visualisation.</li> <li>Appreciating the use of traditional materials in artefacts.</li> </ul>

# Graphic Communication

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	11.5.2 ASSEMBLY DRAWING	11.5.2.1 Assemble exploded isometric views to the required scale. 11.5.2.2 Assemble given component parts into a single drawing	<ul style="list-style-type: none"> <li>Numbered parts list</li> <li>Scale</li> <li>Exploded views</li> <li>Assembling</li> </ul>	<ul style="list-style-type: none"> <li>Drafting exploded views of components clearly.</li> </ul>	<ul style="list-style-type: none"> <li>Appreciating the importance of correct assembly of components to solve a problem.</li> </ul>
	11.5.3 WORKING DRAWING	11.5.3.1 Produce presentation and working drawings for an artefact	<ul style="list-style-type: none"> <li>Working drawings</li> <li>Sketches</li> <li>Pictorial</li> <li>Exploded</li> <li>Orthographic</li> <li>Presentation</li> </ul>	<ul style="list-style-type: none"> <li>Rendering drawings</li> <li>Dimensioning drawings accurately.</li> </ul>	<ul style="list-style-type: none"> <li>Presentation of finished artefacts.</li> </ul>
	11.5.4 BASIC BUILDING DRAWING	11.5.4.1 Identify and interpret building Symbols	<ul style="list-style-type: none"> <li>Abbreviations, symbols of fittings and materials and structural features.</li> </ul>	<ul style="list-style-type: none"> <li>Identifying building symbols.</li> <li>Drawing simple building plans.</li> </ul>	<ul style="list-style-type: none"> <li>Interpreting building plans correctly.</li> <li>Apply recommended building regulations and standards.</li> </ul>
	11.5.4.2 Read and interpret elementary site and building plans	<ul style="list-style-type: none"> <li>Features of site and building plans</li> </ul>			
	11.5.4.3 Design and draw elementary site and building plans.	<ul style="list-style-type: none"> <li>Regulations and standards</li> <li>Drawing elementary plans</li> </ul>			

## Unit 4.0 Design and Communication

Design Process

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>11.6 DESIGN PROCESS</b>	<b>11.6.1 REALISATION AND EVALUATION.</b>	11.6.1.1 Make the artefact	<ul style="list-style-type: none"> <li>• Realization: Use a variety of materials Select appropriate processes Apply safety precautions</li> <li>• Evaluation: Check performance of artifact against design brief and specification.</li> </ul>	<ul style="list-style-type: none"> <li>• Manipulating of available materials</li> <li>• Inspecting the end product.</li> </ul>	<ul style="list-style-type: none"> <li>• Designing to solve a problem.</li> <li>• Appreciating the purpose of evaluation to a product.</li> </ul>
		11.6.1.2 Evaluate the artefact			
<b>11.7 DESIGNING</b>	<b>11.7.1 DESIGNING CONCEPTS</b>	11.7.1.1 Identify and apply concepts of universal designing	<ul style="list-style-type: none"> <li>• Functionality, aesthetics (elements and principles of visual design), ergonomics, anthropometrics.</li> </ul>	<ul style="list-style-type: none"> <li>• Designing</li> </ul>	<ul style="list-style-type: none"> <li>• Promoting resourcefulness and creative thinking.</li> </ul>

## Unit 5.0 Entrepreneurship

Technology

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>11.7 ENTREPRENEURSHIP</b>	<b>11.7.1 COSTING AND PRICING</b>	11.7.1.1 Determine production costs of items.	<ul style="list-style-type: none"> <li>• Start-up costs, fixed costs, marketing, advertising</li> <li>• Pricing</li> </ul>	<ul style="list-style-type: none"> <li>• Costing products.</li> </ul>	<ul style="list-style-type: none"> <li>• Promote genuineness</li> </ul>
		11.7.1.2 Price the items.			
		11.7.1.3 Prepare final accounts for the Business.	<ul style="list-style-type: none"> <li>• Income and expenditure</li> </ul>	<ul style="list-style-type: none"> <li>• Preparing accounts books.</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciate the value of record keeping.</li> </ul>



**GRADE 12 - DESIGN AND TECHNOLOGY**

**KEY COMPETENCIES AT GRADE 12 LEVEL**

- Demonstrate ability to apply finishes to products in a variety of ways
- Show knowledge and ability to use control logic in designing problems
- Produce a portfolio and an artifact from a given theme

**GENERAL OUTCOME:**

- Select and apply appropriate finishes on materials
- Demonstrate ability to draw true lengths and shapes

## Unit 1.0 Resistant Materials

Resistant Materials

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>12.1 FINISHING PROCESSES</b>	<b>12.1.1 ABRADING FINISHES</b>	12.1.1.1 Classify different types of Abrasives.	<ul style="list-style-type: none"> <li>• Glass paper, emery cloth, Grades of abrasives, wet and dry paper</li> </ul>	<ul style="list-style-type: none"> <li>• Classifying abrasives.</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciate the use of abrasives in finishing.</li> </ul>
		12.1.1.2 Describe the correct methods of using abrasives in surface finishing.	<ul style="list-style-type: none"> <li>• Using correct abrasives, wrapping on the block, correct motion</li> <li>• Safety precautions</li> </ul>	<ul style="list-style-type: none"> <li>• Scrapping and sanding artefacts.</li> </ul>	<ul style="list-style-type: none"> <li>• Applying abrasives on products.</li> <li>• Observing safety.</li> </ul>
	<b>12.1.2 COATING FINISHES</b>	12.1.2.1 Identify and classify finishes	<ul style="list-style-type: none"> <li>• Varnish, paint, stains, red oxide, polish, blueing, galvanising, tinplating, terneplate, oiling, applying lacquer, plastic coating.</li> </ul>	<ul style="list-style-type: none"> <li>• Applying finishes on products.</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciating the appearance of a correct finish on product.</li> </ul>
		12.1.2.2 Describe the correct methods of applying various finishes	<ul style="list-style-type: none"> <li>• Steps involved when coatings.</li> <li>• Safety precautions.</li> </ul>		<ul style="list-style-type: none"> <li>• Observing safety.</li> </ul>
	<b>12.1.3 BLUING AND BARNISHING</b>	12.1.3.1 Apply heat on material to produce the desired finish	<ul style="list-style-type: none"> <li>• Bluing, Burnishing</li> </ul>	<ul style="list-style-type: none"> <li>• Bluing</li> <li>• Burnishing</li> <li>• Polishing</li> </ul>	<ul style="list-style-type: none"> <li>• Applying heat when finishing.</li> </ul>
			<ul style="list-style-type: none"> <li>• Fillers, Primers.</li> <li>• Safety precautions</li> </ul>		<ul style="list-style-type: none"> <li>• Observing safety.</li> </ul>

## Unit 2.0 Graphic Communication

Graphic Communication

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>12.2 PRINCIPLES OF PROJECTION</b>	<b>12.2.1 LINES IN SPACE</b>	12.2.1.1 Project inclined lines in the given projection.	<ul style="list-style-type: none"> <li>• Lines in the HP, VP and EVP.</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying lines in space.</li> </ul>	<ul style="list-style-type: none"> <li>• Applying the concept of lines in space to find correct measurement to hanging objects.</li> </ul>
		12.2.1.2 Determine the true lengths of lines and angles of inclination.	<ul style="list-style-type: none"> <li>• True lengths in the VP and HP</li> <li>• True angles of inclination to the VP and HP.</li> </ul>	<ul style="list-style-type: none"> <li>• Calculating the true lengths from inclinations.</li> </ul>	
	<b>12.2.2 AUXILIARY VIEWS</b>	12.2.2.1 Project auxiliary views from prescribed angles	<ul style="list-style-type: none"> <li>• Auxiliary Vertical planes, datum lines, auxiliary elevation, auxiliary plan, circles in auxiliary (Restrict to First Auxiliary)</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying auxiliary views.</li> </ul>	<ul style="list-style-type: none"> <li>• Interpreting auxiliary views in different shapes.</li> </ul>
		12.2.2.2 Determine of true shapes of conic sections.	<ul style="list-style-type: none"> <li>• Conic sections: Ellipse, parabola, hyperbola</li> </ul>	<ul style="list-style-type: none"> <li>• Drafting of conical shapes.</li> </ul>	

## Unit 3.0 Design and Communication

Technology

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
<b>12.6 DESIGNING</b>	12.6.1 DESIGN PROCESS	12.6.1.1 Make the artefact	<ul style="list-style-type: none"> <li>• Realisation Use a variety of material Select appropriate processes Apply safety precautions.</li> </ul>	<ul style="list-style-type: none"> <li>• Manipulating selected materials to produce artifacts.</li> </ul>	<ul style="list-style-type: none"> <li>• Solving of situational problems.</li> </ul>
		12.6.1.2 Evaluate the artefact	<ul style="list-style-type: none"> <li>• Evaluation Check performance of artifact against specification.</li> </ul>	<ul style="list-style-type: none"> <li>• Interpreting correct finishing requirements.</li> </ul>	<ul style="list-style-type: none"> <li>• Working as a team.</li> </ul>

## Unit 4.0 Systems Technology

Technology

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
12.3 TECHNOLOGY	12.3.1 ELECTRICITY AND ELECTRONICS	12.3.1.1 Design simple conventional mounting of Printed Circuit Boards (PCB)	<ul style="list-style-type: none"> <li>• Circuit diagrams</li> <li>• Copper clad board, etching pens, etching transfers, photo etching, ferric chloride</li> <li>• Safety: Gloves, goggles, acid proof coat or apron, tray, tweezers</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying conventional circuit boards.</li> </ul>	<ul style="list-style-type: none"> <li>• Designing conventional circuits.</li> <li>• Applying designed circuits in artefacts.</li> </ul>
		12.3.1.2 Construct simple conventional mounting of Printed Circuit Boards (PCB)			
		12.3.1.3 Demonstrate awareness of dangers when working with chemicals in Printed Circuit Boards (PCB) manufacture			
		12.3.1.4 Explain and apply the use of control logic in design circuits	<ul style="list-style-type: none"> <li>• Language of logic: OR gate, TRUTH gate, AND gate, NOT gate.</li> </ul>	<ul style="list-style-type: none"> <li>• Using control logic designs.</li> <li>• Soldering circuits.</li> </ul>	<ul style="list-style-type: none"> <li>• Investigating the use of control logic in systems.</li> </ul>

## Unit 5.0 Entrepreneurship

Technology

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
12.7 ENTREPRENEURSHIP	12.7.1 COSTING AND PRICING	12.7.1.1 Determine production costs of items.	<ul style="list-style-type: none"> <li>• Start-up costs, fixed costs, marketing, advertising</li> <li>• Pricing, Packaging</li> <li>• Income and expenditure</li> </ul>	<ul style="list-style-type: none"> <li>• Investigating requirements before costing.</li> <li>• Costing items.</li> <li>• Record keeping</li> </ul>	<ul style="list-style-type: none"> <li>• Appreciate the value of record keeping.</li> </ul>
		12.7.1.2 Price the items			
		12.7.1.3 Prepare final accounts for the Business.			

**APPENDIX I - LIST OF EQUIPMENT  
GRADE12 DESIGN AND TECHNOLOGY**

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

## APPENDIX II



MINISTRY OF EDUCATION, SCIENCE, VOCATIONAL  
TRAINING AND EARLY EDUCATION

# DESIGN & TECHNOLOGY

## PROJECT ASSESSMENT

NAME: \_\_\_\_\_ CLASS \_\_\_\_\_

## PROJECT TITLE

\_\_\_\_\_

### INSTRUCTIONS

- This assessment/evaluation is in **two** sections.
- The **first** part is to be completed by the Learner.
- The **second** part will be completed by your teacher.
- Please *READ* carefully any comments that are made, as they may help you with your next project.

## LEARNER'S SELF EVALUATION

Read the following statements and place a Grade from 1 – 5 into the boxes next to them.

- 5 = I did this exceptionally well
- 4 = I did this very well
- 3 = I did this satisfactorily
- 2 = I did this poorly
- 1 = I did **NOT** do this
- 0 = I did **NOT** do this

### DESIGNING

Research

Initial Ideas

Presentation of Ideas

Choosing a realistic Idea

Development of chosen Idea

OVERALL GRADE

### MAKING

Plan of Work

Use of Equipment

Worked with Accuracy

Finished Project

Evaluation

Read the following statements and tick (✓) in the appropriate box

My attitude towards this project was positive

And I worked to the best of my ability

I came to lessons with the correct materials

I planned and spent the time on this project efficiently

My Portfolio was neatly presented with titles

Other comments:-

SIGNED \_\_\_\_\_ DATE: \_\_\_\_\_

**TEACHER'S EVALUATION**

Read the following statements and place a Grade from 1 – 5 into the boxes next to them.

- 5 = The learner did this exceptionally well
- 4 = The learner did this very well
- 3 = The learner did this satisfactorily
- 2 = The learner did this poorly
- 1 = The learner did **NOT** do this
- 0 = The learner did **NOT** do this

**DESIGNING**

Research

Initial Ideas

Presentation of Ideas

**MAKING**

Plan of Work

Use of Equipment

Worked with Accuracy

Choosing a realistic Idea

Finished Project

Development of chosen Idea

Evaluation

**OVERALL GRADE**

**Read the following statements and tick (✓) in the appropriate box**

The learner's attitude towards this project was positive

He/She worked to the best of his/her ability

He/She came for lessons with the correct materials

He/She planned the time spent on this project efficiently

His/Her Portfolio was neatly presented with titles

Further comments:-

SIGNED \_\_\_\_\_

DATE: \_\_\_\_\_



### APPENDIX III - SCOPE AND SQUENCE

<b>DESIGN AND TECHNOLOGY</b>			
<b>TOPIC</b>	<b>SUB-TOPIC</b>		
	<b>G10</b>	<b>G11</b>	<b>G12</b>
<b>SAFETY</b>	Safety in the workroom		
	First Aid - first aid techniques to treat minor injuries.		
	Work room management		
<b>MATERIALS</b>	<b>1. WOOD</b>		
	Timber process		
	Common timber defects		
	Manufacturing boards and edge treatment		
	<b>2. METAL</b>		
	Production of iron		
	Plain carbon steels		
	Alloy steels		
	<b>3. PLASTICS</b>		
	Common structure		
	Various processes		
	Safety precautions		
	<b>4. OTHER MATERIALS</b>		
	Uses of various local materials		
	Factors to consider when selecting materials.		

**DESIGN AND TECHNOLOGY**

TOPIC	<i>SUB-TOPIC</i>		
	G10	G11	G12
	<b>PREPERATION OF MATERIALS</b>	Material treatment and processes	
	Tools and correct procedures		
	<b>WASTING OF MATERIALS</b>		
	Wasting tools	Driving tools: Types, uses and safety	
	Techniques applied when wasting materials		
	<b>JOINING MATERIALS</b>	Fixing: Types, Stages and safety	<b>FINISHING PROCESSES</b>
	Methods of joining	Adhesives: Characteristics, Safety	Abrading finishes
Safety when joining materials		Coating finishes	
<b>GRAPHIC COMMUNICATION</b>	Drafting Aids: lettering, drafting equipment, effects by the use of computers.	Intersection of solids - Include basic solids in artifacts.	Bluing and burnishing
	Sketching: freehand, sketches to communicate ideas, three dimensional solids	Surface development: Development of solids, principles of surface development to develop artifacts.	
	Symbols and Logos		
	Plane figures: equal area, linear and ratio, reduction and enlargement.		
	Tangents and circles in contacts: Internal and external, Circles in contact, Circumscribe and Inscribe		
	Loci: Simple machines and special curves		
		<b>Orthographic projection:</b> Sectional elevations, correct graphic representation of materials	<b>Principles of projection:</b> Lines in space: inclined lines, true lengths and angle of inclination.

**DESIGN AND TECHNOLOGY**

TOPIC	SUB-TOPIC		
	G10	G11	G12
		Assembly drawing: Assemble exploded isometric, assemble given component parts.	Auxiliary views: prescribed angles, true shapes.
	Design process cycle	Working drawing: Produce working drawing and presentation pictures of an artefact	
		Basic Building Drawing: symbols, site plan and building plans, building regulations, designing.	
SYSTEM TECHNOLOGY	Energy: forms and energy, converting and conserving, application in design situations	Electricity and Electronics: electric circuit diagrams - conventional symbols, design simple electric circuits, potential hazards	Electricity and electronics: Conventional Printed Circuit Boards (PCB), construction, use of control logic in design situations.
		Hydraulics and pneumatics	
	Mechanisms: Types, application of motion in projects, application of mechanisms in design situations.	Structures: Material properties used in construction, forces and moments in structures, design structures, safety factors	
ENTERPRENEURSHIP	Careers	Costing and pricing	Costing and pricing
	Marketing		Financial records