

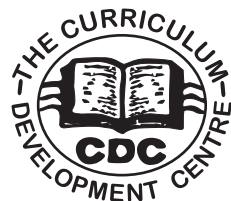


Republic of Zambia

MINISTRY OF EDUCATION, SCIENCE, VOCATIONAL TRAINING AND EARLY EDUCATION

DESIGN & TECHNOLOGY SYLLABUS

GRADE 10 - 12



Prepared and Published by Curriculum Development Centre
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2013

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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, 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 learners through the acquisition of knowledge, skills, 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 10 to 12 as defined and recommended in various policy documents including Educating Our Future` 1996 and the `Zambia Education Curriculum Framework `2013.



Chishimba Nkosha
Permanent Secretary
MINISTRY OF EDUCATION, SCIENCE, VOCATIONAL TRAINING AND EARLY EDUCATION

ACKNOWLEDGEMENTS

The Design and Technology syllabus review exercise would not have been accomplished without the involvement, participation and commitment of many people. We want to thank all the people who took part in the review at different stages. Most importantly we must thank Zambia Association for Technology Education - ZATE (formerly Zambia Industrial Arts Teachers Association – ZIATA) for initiating the change from Industrial Arts To Design and Technology.

We also wish to thank government departments and institutions of learning that were involved in the development and production of this syllabus in many varied ways.

We are greatly indebted to institutions such as: Luanshya Technical and Vocational Teachers' College, Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA) and the Examinations Council of Zambia that participated in the revision workshops.

Finally, we wish to acknowledge our indebtedness to the former Director Standards and Curriculum Mrs Florence C. Mfula, the former Chief Curriculum Specialist Ms Georgina Hamaimbo and the late Principal Curriculum Specialist of Natural Sciences Ms Mary M. Lungu for their valuable contributions in guiding the review exercise before they retired from the service.



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INTRODUCTION

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

Therefore, 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.

COMPONENT	DESCRIPTION
GRAPHIC COMMUNICATION	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. This includes an awareness of how the use of computers can assist in the design of products. However, practical experience of Computer Aided Drawing (CAD) is not expected.
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: <i>availability, cost</i> and <i>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.
TECHNOLOGY	Technology will focus on developing skills used in <i>Structures, Mechanisms</i> and <i>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.
ENTREPRENEURSHIP	The purpose of teaching entrepreneurship education is to prepare learners for an entrepreneurial career in life. Design and Technology offers learners an opportunity to 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 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:

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

ASSESSMENT AND CERTIFICATION

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. In this regard, assessment is meant to help the learners *improve*. It should, however, be recognized that learners are different and thus will achieve the outcomes according to their *abilities*. Thus, 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.

All vocational training and learning achievements will be assessed and certified by the TEVETA. This means that learners taking Design and Technology at Senior Secondary School will acquire a level I Trade Test Certificate in any of the following: *Carpentry and Joinery, Metal Fabrication and Welding, Electrical Engineering and Bricklaying and Plastering* signifying attainment of vocational skills and competencies. Additionally, they will obtain a Grade 12 School Certificate from the Examinations Council of Zambia as a proof of academic achievement.

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 school with 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
- Resource Person
- 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.

TIME ALLOCATION

The standard period allocation has been prescribed in the Zambia Education Curriculum Framework (ZECF) 2013. At Senior Secondary School level, Design and Technology will have **twelve (12)** periods per week and each period will be **one hundred and twenty (120)** minutes each.

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 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.

ASSESSMENTS AND CERTIFICATION

All vocational training and learning achievements will be assessed and certified by the Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA). This means that learners taking Design and Technology at Senior Secondary School will acquire a level I Trade Test Certificate in any of the following: *Carpentry and Joinery, Metal Fabrication and Welding, Electrical Engineering and Bricklaying and Plastering* alongside a Grade 12 School Certificate from the Examinations Council of Zambia, signifying attainment of vocational skills and competencies and academic achievement.

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 learners 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 Design and Technology is the Project Work, which has three key stages: *Designing*, *Realising* and *Evaluating*.

<i>COMPONENT</i>	<i>DESCRIPTION</i>
<i>DESIGNING</i>	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 them as a final solution. In planning, it is essential to check and consider materials, components and equipment available as well as the cost.
<i>REALISATION</i>	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.
<i>EVALUATION</i>	On completion of the project, an evaluation must be carried out. Learners can ask themselves questions such as: “Does it work?” “What does it look like?” Does it satisfy the original brief? Thus, it is important to evaluate the whole process from beginning to completion, so that lessons can be learnt and improvements suggested.

In view of the above, it is very evident that the project work will have two parts:

- (i) The portfolio
- (ii) The project realisation

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 be made on **A3** paper.

Details regarding the assessment format, content and presentation of the portfolio will be provided in the Design and Technology Practical Guidelines. Teachers will be expected to follow the instructions in the Guidelines so that learners achieve the required competences before they sit for examinations set either by Examination Council of Zambia or TEVETA

GRADE 10

GENERAL OUTCOMES AND KEY COMPETENCIES

GENERAL OUTCOMES	KEY COMPETENCIES
<ul style="list-style-type: none">• Generate design ideas and develop proposals that meet the needs• Apply principles of energy and mechanisms in problem solving situations• Demonstrate knowledge and values of entrepreneurship	<ul style="list-style-type: none">▪ Show knowledge and skills of working with materials using hand tools.▪ Demonstrate ability to apply geometrical constructions to determine shapes.▪ Demonstrate ability and skill of producing a portfolio▪ Design logos and symbols

WORKSHOP PRACTICE

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
10.1 SAFETY	10.1.1 Safety in the Work room	10.1.1.1 Apply safety precautions in the workroom	<ul style="list-style-type: none"> • Orientation to workrooms: working and marking areas, emergency buttons • Safety precautions: safe working habits, protective attire, daily routine, safety signs and colours, safety equipment 	<ul style="list-style-type: none"> • Identification of areas for specific activities in the workroom • Application of safety precautions in the workroom 	<ul style="list-style-type: none"> • Awareness of safety precautions in the workroom • Appreciating safety precautions to prevent accidents
	10.1.2 First Aid	10.1.2.1 Apply basic first aid techniques in the workroom	<ul style="list-style-type: none"> • First Aid Box and techniques applied in First Aid. 	<ul style="list-style-type: none"> • Application of First Aid in emergency situations 	<ul style="list-style-type: none"> • Participating in emergency cases
	10.1.3 Fire Protection	10.1.3.1 Describe methods of fire fighting	<ul style="list-style-type: none"> • Methods of fire fighting: Water, Chemical foam, Carbon dioxide, sand, extinguishing powder 	<ul style="list-style-type: none"> • Identification of methods of fire fighting 	<ul style="list-style-type: none"> • Awareness of fire fighting techniques
	10.1.4 Ventilation and Lighting	10.1.4.1 Describe the importance of ventilation and lighting	<ul style="list-style-type: none"> • Importance of ventilation: Reduction of suffocation, Extraction of fumes and dust, free flow of air • Types of ventilation: Air conditioners, windows, air extractors • Various types of lighting Artificial (Electric) and natural (sun) 	<ul style="list-style-type: none"> • Identification of methods of improving ventilation and lighting 	<ul style="list-style-type: none"> • Awareness of ways of improving ventilation and lighting to prevent accidents

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	10.1.5 Protection of the Environment	10.1.5.1 Describe ways of managing waste from work rooms	<ul style="list-style-type: none"> • Ways of managing waste disposal (subsoil water, water coarse, solid waste disposal) • Types of waste management: Waste management (solid waste management, sewer water management) • Importance of waste management improved sanitation and health : environment 	<ul style="list-style-type: none"> • Identification of types of waste management • Application of methods of managing waste • Classification of waste management 	<ul style="list-style-type: none"> • Awareness of ways of managing waste • Care for the environment

MANUFACTURING MATERIALS

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
10.2 MATERIALS	10.2.1 Wood	10.2.1.1 Outline the timber processes before use	<ul style="list-style-type: none"> Timber Processes: Conversion (plain, tangential, quarter sawing) - advantages and disadvantages of conversion Seasoning: (natural and artificial, advantages and disadvantages) Properties of timber 	<ul style="list-style-type: none"> Identification of stages of timber processes before use. Interpretation of methods of timber processing before use 	<ul style="list-style-type: none"> Awareness of timber processes Appreciation of the use of well-seasoned timber on projects.
		10.2.1.2 Describe common timber defects	<ul style="list-style-type: none"> Defects: (Natural and artificial defects) Shrinkage – warping, cupping, bowing, twisting, knots, splits, shakes 	<ul style="list-style-type: none"> Identification of natural and artificial defects in timber. 	<ul style="list-style-type: none"> Awareness of effects of timber defects.
		10.2.1.3 Classify types and uses of manufactured boards	<ul style="list-style-type: none"> Manufactured Boards: Plywood, lamin, batten, block board, chip board, hard and soft boards Medium Density Fibre board (MDF) or Supawood; Storage and uses of different types of manufactured boards 	<ul style="list-style-type: none"> Classification of manufactured boards Application of manufactured boards on various artefacts 	<ul style="list-style-type: none"> Investigation of different types of artificial boards used on the market. Appreciation of manufactured boards
		10.2.1.4 Apply edge treatment on manufactured boards	<ul style="list-style-type: none"> Methods of treating edges: Lipping, tongue and groove, plastic, aluminium, veneering 	<ul style="list-style-type: none"> Application of methods of edge treatment on manufactured boards 	<ul style="list-style-type: none"> Appreciation of beauty on neat edge treated piece.

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	10.2.2 Metal	10.2.2.1 Describe the production process of metals	<ul style="list-style-type: none"> • Production process: Iron and Steel: (Open hearth, Bessemer process, Electric furnace process). • Ferrous and Non-ferrous: (Mild steel, cast Iron, Carbon steel, Stainless steel, Galvanised steel, Aluminium, Copper and bronze, brass) 	<ul style="list-style-type: none"> • Identification of different types of metals. • Classification of different types of metals 	<ul style="list-style-type: none"> • Awareness of the production processes of different metals • Appreciation of the use of different materials on projects. • Curiosity in different types of metals
		10.2.2.2 Classify metals	<ul style="list-style-type: none"> • Mild steels, medium carbon steels, high carbon steel High speed steels, Spring steels, stainless steels 		
		10.2.2.3 Describe types of steel sections	<ul style="list-style-type: none"> • Types of steel section: Plates (sheets), Pipe, Channel, Angle Iron, Universal beam, Universal column, joists. 	<ul style="list-style-type: none"> • Identification of different sections of metals. 	<ul style="list-style-type: none"> • Awareness of different types of steel sections
	10.2.3 Metal Forming Processes	10.2.3.1 Describe different metal forming processes and machines used	<ul style="list-style-type: none"> • Metal forming processes: Folding and bending: (Bench mounted, standard folder). Rolling operations: Pyramid and parallel rolling machine. Fullering: Forming tools Forging process: Tongs, fullers Jigs and fixtures: Fabrication templates, simple frames. Machines: Guillotine, Nibblers, Grinding machine. 	<ul style="list-style-type: none"> • Identification of different metal forming machines • Application of metal forming processes in making artefacts 	<ul style="list-style-type: none"> • Awareness of different metal forming processes • Appreciation of different metal forming processes • Observation of safety precautions when forming metals

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	10.2.4 Plastics	10.2.4.1 Describe the common structure and chemistry of plastics	<ul style="list-style-type: none"> Structure and chemistry of: Thermoplastics, Thermosets, Elastomers Polymerization 	<ul style="list-style-type: none"> Classification of different types of plastics 	<ul style="list-style-type: none"> Awareness of different types of plastics Appreciation of different ways of working with plastics
		10.2.4.2 Describe the various processes involving plastics	<ul style="list-style-type: none"> Processes involving plastics: Forming, moulding, deforming, joining and finishing plastics, shaping plastics using heat 	<ul style="list-style-type: none"> Application of various processes involving plastics 	
		10.2.4.3 Apply safety precautions when machining plastics	<ul style="list-style-type: none"> Safety precautions: goggles, mask, apron, dust coat 	<ul style="list-style-type: none"> Application of safety precautions when using plastics 	<ul style="list-style-type: none"> Observation of safety precautions when using plastics
	10.2.5 Other Materials	10.2.5.1 Describe the uses of other locally available materials	<ul style="list-style-type: none"> Other materials: Leather, rubber, glass, grass, foam, rexin, clay, paper, canvas, concrete, ceramics and any local materials 	<ul style="list-style-type: none"> Application of local materials in artefact making 	<ul style="list-style-type: none"> Appreciation of local materials in artefact making
		10.2.5.2 Explain the factors to consider when selecting materials to ensure suitability for purpose	<ul style="list-style-type: none"> Factors to consider: Properties: attraction, Functional, strength 	<ul style="list-style-type: none"> Interpretation of factors when choosing material 	<ul style="list-style-type: none"> Awareness of factors required when choosing materials

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	10.2.6 Wasting of Materials	10.2.6.1 Apply correct techniques when wasting materials	<ul style="list-style-type: none"> • Wasting tools used on Wood, Metal, Plastics, concrete, ceramics glass • Cutting on waste side 	<ul style="list-style-type: none"> • Application of correct techniques when wasting materials • Accuracy when wasting materials 	<ul style="list-style-type: none"> • Appreciation of the use of different tools when working.
	10.2.7 Joining Materials	10.2.7.1 Apply different methods of joining materials	<ul style="list-style-type: none"> • Permanent and Temporary joints: • Wood: Haunched Mortice and tenon, Common Dovetail, Stopped Bridle • Metal: Riveting, Soldering, Welding (Arc and Gas), Brazing, Force fitting and tolerance • Plastic: Laminating, Screwing. Precautions to protect work pieces and humans 	<ul style="list-style-type: none"> • Identification of correct joints to be used on different materials. • Application of different methods of joining of different materials using • Classification of methods to use on different material 	<ul style="list-style-type: none"> • Awareness of different methods of joining different materials • Appreciation of different methods of joining materials • Observation of safety precautions when joining materials

GRAPHIC COMMUNICATION

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
10.3 GRAPHIC COMMUNICATION	10.3.1 Drafting Aids	10.3.1.1 Apply varied effects to lettering work	<ul style="list-style-type: none"> • Effects to lettering. French, fillet, flex curves, use of stencils 	<ul style="list-style-type: none"> • Application of effects to lettering work 	<ul style="list-style-type: none"> • Appreciation of effects on lettering work.
	10.3.2 Freehand Sketching	10.3.2.1 Sketch three dimensional objects	<ul style="list-style-type: none"> • Free hand sketching techniques • Oblique, Perspective, isometric 	<ul style="list-style-type: none"> • Freehand sketching of objects 	<ul style="list-style-type: none"> • Appreciation of communication through sketches • Appreciation of enhancement to drawings
		10.3.2.2 Apply enhancement on freehand sketches	<ul style="list-style-type: none"> • Enhancements: Texture, use of colours, shape and form, line and shadow. 	<ul style="list-style-type: none"> • Application of enhancements to freehand sketches 	
		10.3.2.3 Communicate ideas through freehand sketches	<ul style="list-style-type: none"> • Free hand sketches in Isometric, perspective and Oblique drawing 	<ul style="list-style-type: none"> • Freehand sketching of sketches 	
	10.3.3 Symbols	10.3.3.1 Design symbols	<ul style="list-style-type: none"> • Description of a symbol: • Symbols used in: building construction, welding, electrical, mechanical, pneumatics, hydraulics (IBS EN 60617 symbols) Designing of symbols 	<ul style="list-style-type: none"> • Application of information when designing symbols and logos • Communication through symbols and logos 	<ul style="list-style-type: none"> • Awareness of symbols and logos • Appreciation of symbols and logos
10.3.4 Logos	10.3.4.1 Design logos	<ul style="list-style-type: none"> • Description of a logo: Logos used in various institutions • Designing of logos 	<ul style="list-style-type: none"> • Interpretation of symbols and logos 		

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	10.3.5 Plane Figures	10.3.5.1 Produce figures of equal area.	<ul style="list-style-type: none"> Figures of equal area: (Triangles, quadrilaterals, regular and irregular polygons) Linear and area ratios 	<ul style="list-style-type: none"> Accuracy in enlarging and reducing plane figures Interpretation of linear and area ratios Application of linear and area ratios 	<ul style="list-style-type: none"> Appreciation of reduction and enlargement of plane figures in designing. Awareness on enlargement and reduction of figures
		10.3.5.2 Reduce and enlarge plane figures	<ul style="list-style-type: none"> Enlargement and reduction of plane figures by linear and area ratios. 		
	10.3.6 Tangents and Circles in Contact	10.3.6.1 Construct internal and external tangents	<ul style="list-style-type: none"> Tangents: External and Internal to equal and unequal circles 	<ul style="list-style-type: none"> Accuracy when constructing tangents and circles in contact Application of tangents in design work Inscribing and circumscribing plane figures 	<ul style="list-style-type: none"> Appreciation of tangents and circles in contact in designing Awareness of methods of constructing circles in contact
		10.3.6.2 Construct circles in contact	<ul style="list-style-type: none"> Circles in contact: External and Internal to equal and unequal circles 		
		10.3.6.3 Circumscribe and Inscribe plane figures	<ul style="list-style-type: none"> Inscribing and circumscribing circles to plane figures 		
	10.3.7 Loci	10.3.7.1 Construct paths traced by moving points	<ul style="list-style-type: none"> Paths of simple mechanisms (maximum of three linkages) 	<ul style="list-style-type: none"> Tracing paths of moving points on a mechanism Tracing paths of special curves Application of special curves in construction 	<ul style="list-style-type: none"> Appreciation of loci in design work Awareness of the construction of special curves
		10.3.7.2 Construct special curves	<ul style="list-style-type: none"> Special Curves: Involute, ellipse, helix, Archimedean spiral, cycloid, parabola, hyperbola 		

DESIGN AND COMMUNICATION

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
10.4 DESIGNING	10.4.1 Design Process	10.4.1.1 Apply design process in problem solving situations	<ul style="list-style-type: none"> Design Process: (Theme and theme analysis, Situation – <i>outlining the situation and situation analysis</i>; Problem identification, Formulation of a Design brief, Specification – <i>detailed specifications of requirements</i>, Research – <i>gathering information relevant to the solution, (what, why, where, when, who)</i> including Cuts and Paste ups) Generation of ideas – <i>formulation of detailed design proposals for the production of the final product</i>, Selection of best solution 	<ul style="list-style-type: none"> Application of research methods in solution formulation Evaluation of the generated possible solutions to the situation Interpretation of researched information in graphic form 	<ul style="list-style-type: none"> Awareness of the stages in the design process Appreciation of the importance of design stages in problem solving. Justification of the reasons for choosing the option as the best solution Resourcefulness in coming up with suitable solutions
		10.4.1.2 Develop design proposals	<ul style="list-style-type: none"> Produce a work plan (sequencing of the work) Development of the chosen idea 	<ul style="list-style-type: none"> Planning to work within a given time 	<ul style="list-style-type: none"> Producing a portfolio within the scheduled time frame
		10.4.1.3 Produce a portfolio	<ul style="list-style-type: none"> Portfolio production: content (drawings, data), sequencing, binding 	<ul style="list-style-type: none"> Communicating information graphically and in writing 	<ul style="list-style-type: none"> Appreciation of a portfolio in artefact making

SYSTEMS TECHNOLOGY

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
10.5 BASIC TECHNOLOGY	10.5.1 Energy	10.5.1.1 Describe different forms and sources of energy	<ul style="list-style-type: none"> • Different forms of energy: Heat, mechanical, electrical, chemical, sound, light, Kinetic and potential, renewable and non-renewable • Different sources of energy: Sun (Solar) tidal, wind. Hydro, nuclear, Geothermal, Fossil fuels, Bio fuels (Baggase) • Effects and dangers of energy sources 	<ul style="list-style-type: none"> • Classification of different forms of energy • Application of suitable form of energy in artefacts. 	<ul style="list-style-type: none"> • Awareness of different forms of energy • Appreciation of different forms of energy
	10.5.2 Mechanisms	10.5.2.1 Describe various types of mechanisms	<ul style="list-style-type: none"> • Types of mechanisms: Levers, pulleys, linkages, cams and follower, gears, screws, ramps, wedges, crank mechanisms, chain and sprocket 	<ul style="list-style-type: none"> • Identification of different types of mechanisms • Application of mechanisms in artefact making 	<ul style="list-style-type: none"> • Awareness of different types of mechanisms • Appreciation of mechanisms in artefact making • Creative thinking in artefact making
		10.5.2.2 Describe various types of motions	<ul style="list-style-type: none"> • Types of motions: Linear, Reciprocating, Rotary, Oscillating, Transmission and Transformation of motion • Application of motions in artefact making. 	<ul style="list-style-type: none"> • Identification of types of motions • Application of motions in artefact making 	

ELECTRICAL ENGINEERING

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
10.6 ELECTRICAL PRINCIPLES	10.6.1 Nature of Electricity	10.6.1.1 Describe electrical quantities	<ul style="list-style-type: none"> • Electrical quantities: Current, Resistance, Voltage EMF Charge • Units of electrical quantities: Current, Voltage, Resistance • Power, Energy 	<ul style="list-style-type: none"> • Interpretation of units of electrical quantities • Application of units of electrical quantities 	<ul style="list-style-type: none"> • Awareness of units of electrical quantities
		10.6.1.2 Connect resistors	<ul style="list-style-type: none"> • Stating ohms law • Connect resistors in series and parallel • Behaviour of current and voltage in each case • Determine the total resistance in each case 	<ul style="list-style-type: none"> • Application of methods of connecting resistors in series and parallel 	<ul style="list-style-type: none"> • Awareness of connecting resistors in series and parallel
	10.6.2 Measuring Electrical Quantities	10.6.2.1 Measure electrical quantities	<ul style="list-style-type: none"> • Measuring :resistance: (Using the ohmmeter and the multimeter) • Voltage: Using the voltmeter and the multimeter • Current: Using the ammeter, a clamp on meter and a multimeter • Power: Using a wattmeter • Energy: Using an energy meter 	<ul style="list-style-type: none"> • Measuring electrical quantities • Application of correct equipment when measuring electrical quantities 	<ul style="list-style-type: none"> • Awareness measuring electrical quantities • Precision in measuring electrical quantities

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	10.6.3 Calculating Electrical Quantities	10.6.3.1 Calculate basic electrical quantities	<ul style="list-style-type: none"> • Calculating resistance: Ohms law, Factors affecting resistance Power equations, Using the voltage and current, divider rule Series/parallel circuits <i>Solving for current</i> Ohms law, Power equations Current divider rule, Series/parallel circuits <i>Calculating voltage</i> Ohms law Series/parallel circuits Power equations <i>Solving for power</i> Series/parallel circuits <i>Calculating for Electrical energy</i> Series/parallel circuits 	<ul style="list-style-type: none"> • Calculation of basic electrical quantities • Interpretation of equations when calculating basic electrical quantities 	<ul style="list-style-type: none"> • Awareness of methods of conducting basic electrical calculations • Accuracy when making calculations

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	10.6.4 Principles of Magnetism	10.6.4.1 Explain the principles of magnetism	<ul style="list-style-type: none"> Principles of magnetism Molecular theory of magnetism Methods of magnetising substances Types of magnets Magnetic materials Ferromagnetic substances Diamagnetic substances Paramagnetic substances Magnetic terms: Magnetic field, Magnetic flux, Reluctance, Flux density, Magnetic field strength, Permeability, Magneto motive force 	<ul style="list-style-type: none"> Interpretation of the theories of magnetism Investigation of induced magnetism 	<ul style="list-style-type: none"> Curiosity of the operations of magnets Appreciation of the principles of magnetism in artefact making
		10.6.4.2 Apply the laws of electromagnetic induction	<ul style="list-style-type: none"> Laws of electromagnetic induction Faraday's first law Faraday's second law Lenz's law Fleming's left hand rule Fleming's right hand rule 	<ul style="list-style-type: none"> Experimenting on magnetization and demagnetization 	<ul style="list-style-type: none"> Participation in group activities
		10.6.4.3 Describe the operation of cells and batteries	<ul style="list-style-type: none"> Operation of batteries and cells Rating of cells 	<ul style="list-style-type: none"> Communicating the operation of cells and batteries 	<ul style="list-style-type: none"> Appreciation of cells and batteries

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	10.6.5 Cells and Batteries	10.6.5.1 State the types of cells	<ul style="list-style-type: none"> • Primary cells – Simple cell, Daniel cell, Wet and dry cells • Secondary cells – lead acid battery, alkaline battery 	<ul style="list-style-type: none"> • Classification of various types of cells 	<ul style="list-style-type: none"> • Awareness of various types of cells
		10.6.5.2 Connect cells in series and parallel	<ul style="list-style-type: none"> • Condition for series and parallel connections • The emf for cells in series and parallel. 	<ul style="list-style-type: none"> • Application of methods of connecting cells in series and parallel 	<ul style="list-style-type: none"> • Awareness of connecting cells in series and parallel
		10.6.5.3 Apply methods of battery charging	<ul style="list-style-type: none"> • Methods of charging: Constant current charging, Constant Voltage charging, Trickle charging, Boost Charging 	<ul style="list-style-type: none"> • Application of various methods of charging batteries • Identification of methods of charging batteries 	<ul style="list-style-type: none"> • Awareness of various methods of charging batteries
	10.6.6 Domestic Installations	10.6.6.1 Read layout drawing or site plans for electrical installation	<ul style="list-style-type: none"> • Installation symbols: Supply mains, Sockets, Switches, Lamps, Signalling devices, Cooker Schematic, Wiring diagrams Circuit diagrams Block diagrams 	<ul style="list-style-type: none"> • Reading installation electrical drawings • Interpreting electrical symbols 	<ul style="list-style-type: none"> • Awareness of installation symbols • Appreciation of drawings in during electrical installation

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
		10.6.6.2 Describe the distribution system	<ul style="list-style-type: none"> The distribution system: phase supply, Single phase supply, Distribution voltages 3 Service mains/cable 	<ul style="list-style-type: none"> Application of distribution system 	<ul style="list-style-type: none"> Awareness of the distribution system
		10.6.6.3 Fix domestic electrical installations	<ul style="list-style-type: none"> Socket outlets: Cable size, MCB rating Radial circuit, Ring circuit Spur Air conditioning unit Cable size, MCB rating Electric fence :MCB rating, Cable size 	<ul style="list-style-type: none"> Application of methods of fixing domestic electrical installations Identification of materials to use making installations 	<ul style="list-style-type: none"> Awareness of making domestic electrical installations Observation of safety precautions when fixing installations
		10.6.6.4 Describe the methods of earthing	<ul style="list-style-type: none"> Purpose of earthing: Lowering of soil resistance Earth electrode test Types of earth electrodes Rod, Plate, Tape or strip, Pipe Methods of earthing TT, IT, TNS, TNC, TNCS or protective multiple earthing 	<ul style="list-style-type: none"> Identification of methods of earthing Classification of the types of earthing Application of methods of earthing 	<ul style="list-style-type: none"> Awareness of methods of earthing Appreciation of earthing for protective purposes

BRICKLAYING AND PLASTERING

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
10.7 BUILDING SUB STRUCTURE	10.7.1 Foundation	10.7.1.1 Dig foundation	<ul style="list-style-type: none"> • Site clearance, setting out the foundation, marking, trench excavation • Methods of excavation, trench levelling, cast foundation, footing concrete, build foundation box, timbering methods to create structure stability • Safety precautions in trenches Battering, Timbering • Importance of trench excavation • Base for foundation, Receive footing, Create structure stability Place hard core, Compact hard core 	<ul style="list-style-type: none"> • Accuracy when setting out and marking foundation • Application of methods of trench excavations 	<ul style="list-style-type: none"> • Awareness of methods of trench excavations • Precision when setting the foundation • Observation of safety precaution in trench excavation
		10.7.1.2 Build the foundation box	<ul style="list-style-type: none"> • Setting out the foundation box Mark out, Dry bond • Build foundation box Lay the bricks, square the first course only, gauge the brick, Plumb the corners, Level the courses 	<ul style="list-style-type: none"> • Accuracy in setting and building the foundation box 	<ul style="list-style-type: none"> • Awareness of the stages when setting and building the foundation box

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	10.7.2 Concreting	10.7.2.1 Cast concrete	<ul style="list-style-type: none"> • Concreting materials: River sand, cement, conforce wire, reinforcement bars; mixing ratios Types of concrete: Plain and reinforced concrete Control of ants and weeds Casting concrete: Batching, mixing, placing, compacting Place damp proof membrane (DPM, PVC), Placement of concrete, Procedures of placing concrete 	<ul style="list-style-type: none"> • Placing damp proofing material on a substructure • Identification of damp proofing materials 	<ul style="list-style-type: none"> • Appreciation of placing damp proofing material on the sub structure • Awareness of procedure when casting concrete
		10.7.2.2 Cure concrete	<ul style="list-style-type: none"> • Methods of curing concrete: Wet sacking, Sand spray, Chemical spray, Ponding • Importance of curing: Achieve strength and durability density 	<ul style="list-style-type: none"> • Application of methods of curing concrete 	<ul style="list-style-type: none"> • Appreciation of curing concrete
	10.7.3 Reinforcements	10.7.3.1 Place reinforcements	<ul style="list-style-type: none"> • Types of reinforcements: Plain round bar, High bond and twisted bars Mesh fabric, Round mild steel • Place reinforcement in slab, footing, Beams columns 	<ul style="list-style-type: none"> • Identification damp reinforcement materials 	<ul style="list-style-type: none"> • Appreciation of placing reinforcements in the sub structure
	10.7.4 Building Units	10.7.4.1 Construct Complex Building units	<ul style="list-style-type: none"> • Building principles Types of bonds and walls, Construction, Corners and curves 	<ul style="list-style-type: none"> • Identification of walls and bonds • Application of building principles 	<ul style="list-style-type: none"> • Perseverance when building units • Awareness of building principles

ENTREPRENEURSHIP

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
10.8 ENTREPRENEURSHIP	10.8.1 Entrepreneurial Activities in Design and Technology	10.8.1.1 Identify an entrepreneurial activity in Design and Technology.	<ul style="list-style-type: none"> Identify and select entrepreneurial activity in Design and Technology Ways of mobilising resources for the selected entrepreneurial activity in a team 	<ul style="list-style-type: none"> Identifying entrepreneurial activity Evaluating entrepreneurial viable activities in the community 	<ul style="list-style-type: none"> Justifying the reason for choosing a particular entrepreneurial activity Cooperation in the entrepreneurial group
		10.8.1.2 Make business plans for an entrepreneurial activity	<ul style="list-style-type: none"> Identification of entrepreneurial activities, Start-up costs, fixed costs, marketing, advertising 	<ul style="list-style-type: none"> Identification of the components of the business plan Application of the business plans for an entrepreneurial activity 	<ul style="list-style-type: none"> Appreciation of the importance of in making business plans Appreciation of teamwork when making a business plan
	10.8.2 Marketing	10.8.2.1 Conduct a market research for the product	<ul style="list-style-type: none"> Identify target market for the product Interpret information from the research 	<ul style="list-style-type: none"> Identifying market opportunities Designing research instruments 	<ul style="list-style-type: none"> Awareness of ways to conduct a market research Being courteous when conducting a market research

GRADE 11

GENERAL OUTCOMES AND KEY COMPETENCES

GENERAL OUTCOMES	KEY COMPETENCIES
<ul style="list-style-type: none">▪ Produce working drawings.• Demonstrate ability to produce the designed artefact• Apply concepts of electricity and electronics in problem solving situations	<ul style="list-style-type: none">• Demonstrate ability to fix fastenings and fittings to hold materials.• Design and construct simple electrical and electronic circuits• Show knowledge to communicate ideas in pictorial or orthographic mode• Employ principles of the design process in problem solving situations• Demonstrate ability to evaluate and cost artifacts

MANUFACTURING MATERIALS AND EQUIPMENT

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
11.1 MATERIALS	11.1.1 Fixings	11.1.1.1 Join materials with fixings	<ul style="list-style-type: none"> Types of fixings: Nails: (Wire nail, Oval nail, Clout, Panel pin, Cut tack), methods of nailing Screws: (Roundhead, Countersunk, Raised head, Self-tapping) Rivets: (Countersunk, Round/Snap head, Raised head, Flat head, Pop rivets, Solid rivets, Bifurcated) Stages of preparing material before applying fixings: boring clearance and pilot holes Safety precautions when applying fixings 	<ul style="list-style-type: none"> Applying different fixings to join materials Identification of fixings according to use and material Preparation of materials before applying fixings Identification the correct fixing to use in a particular situation 	<ul style="list-style-type: none"> Observation of safety precautions when applying fixings Appreciation of the use of fixings on different works. Precision in joining materials with fixings
	11.1.2 Fittings	11.1.2.1 Fix fittings	<ul style="list-style-type: none"> Types of fittings: Hinges: Tee, Back flap, Piano, Flush, Rising butt. Locks: Mortice locks Cylinder, Cupboard, Cupboard or drawer, Pad. Catches: Magnetic, Ball and spring. Latches: Night, Barrel bolt, Hasp and Staples Other Fittings: Handles and Knobs, castor wheels. 	<ul style="list-style-type: none"> Fix fittings on doors and trolleys Identification of fittings according to purpose Application of locks on cabinets, trolleys and doors. 	<ul style="list-style-type: none"> Awareness of correct use of fixings in a given situation Observation of safety precautions when applying fittings

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	11.1.3 Adhesives	11.1.3.1 Apply adhesives when joining materials	<ul style="list-style-type: none"> Types of adhesives and their characteristics: Casein, Animal, PVA , Contact Glues, Urea formaldehyde and other Synthetic glues. Correct application of adhesives, pot and shelf life Safety precautions when applying adhesives 	<ul style="list-style-type: none"> Application of adhesives on a project Classification of adhesives according to characteristics 	<ul style="list-style-type: none"> Appreciation of the use of different adhesives on products Observation of safety precautions when gluing
	11.1.4 Driving Tools	11.1.4.1 Demonstrate correct use of driving tools when working on materials	<ul style="list-style-type: none"> Driving Tools: Hammers, Mallets, screwdrivers, Pincers. Pop rivet gun, Rivet set/snap. Spanners: (Socket, ring, Shifting spanners) Allen keys. 	<ul style="list-style-type: none"> Application of correct techniques of handling of driving tools Identification of driving tools 	<ul style="list-style-type: none"> Observation of safety precautions when using driving tools Awareness of the use of driving tools
	11.1.5 Material Treatment and Processes	11.1.5.1 Apply different methods of treating materials	<ul style="list-style-type: none"> Metal: Hardening Annealing, Casting, Normalising Tempering Casehardening, Bending, Blueing, Forming Wood: Chemical treatment Plastic: Bending Press forming Cold casting, Embedding, Moulding, Vacuum forming 	<ul style="list-style-type: none"> Interpretation of methods of treating materials in various ways Application of methods of treating materials. 	<ul style="list-style-type: none"> Appreciation of material treatment Awareness of processes and methods of material treatment Observation of safety precautions when treating materials

GRAPHIC COMMUNICATION

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
11.2 SOLID GEOMETRY	11.2.1 Intersections of Solids	11.2.1.1 Construct the intersections of solids	<ul style="list-style-type: none"> Intersection of: Prisms, cylinders joining at 90°, 45°, 30° and 60° angles with the axes line 	<ul style="list-style-type: none"> Accuracy when drafting prisms and cylinders Application of intersection in artefact making. 	<ul style="list-style-type: none"> Awareness of methods of surface development Solving design problems through logical thinking.
		11.2.2 Surface Development	11.2.2.1 Construct surface developments of solids	<ul style="list-style-type: none"> Surface development of: Cones, (plain and truncated), pyramids (plain and truncated - hexagonal, square, rectangular), packages 	<ul style="list-style-type: none"> Interpretation of methods of intersection
	11.2.2.2 Construct surface developments of intersecting solids		<ul style="list-style-type: none"> Surface development of intersecting solids: Prisms and cylinders 	<ul style="list-style-type: none"> Application of surface development in artefact making 	
	11.2.2.3 Apply surface development in artefact making		<ul style="list-style-type: none"> Artefact making using paper or sheet metal 		
11.3 ORTHOGRAPHIC PROJECTION	11.3.1 Orthographic Projection	11.3.1.1 Produce sectional elevations	<ul style="list-style-type: none"> Sectional elevations: Front, Plan, End Cutting plane Dimensioning Section subtitle 	<ul style="list-style-type: none"> Correct positioning of elevations. Interpretation of spacing and elevations 	<ul style="list-style-type: none"> Imaginative in the drawing of elevations Analytical thinking when obtaining missing elevations
		11.3.1.2 Sketch graphic representation of materials	<ul style="list-style-type: none"> Graphic representation of: wood, metal, glass, plastic, concrete 		

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	11.3.2 Assembly Drawing	11.3.2.1 Assemble exploded isometric views	<ul style="list-style-type: none"> Assembling of components in orthographic: Numbered parts list, Scale Exploded views <i>NB Exploded isometric views of up to 5 parts</i> 	<ul style="list-style-type: none"> Assembling of components in orthographic Interpretation of parts list Identification of components in a parts list 	<ul style="list-style-type: none"> Awareness of assembly of parts Critical thinking when assembling parts. Appreciation of layout and spacing of views
		11.3.2.2 Assemble components into a single drawing	<ul style="list-style-type: none"> Assembling parts <i>NB Exploded orthographic views of up to 5 parts</i> 		
	11.3.3 Working Drawings	11.3.3.1 Produce working drawings	<ul style="list-style-type: none"> Working drawings Sketches, Pictorial Exploded, Orthographic Presentation 	<ul style="list-style-type: none"> Preparation of working drawings Dimensioning of working drawings 	<ul style="list-style-type: none"> Confidence in tabulating stages when making an artefact.
	11.3.4 Basic Trade Drawing	11.3.4.1 Read and interpret drawing symbols	<ul style="list-style-type: none"> Elementary site and building plans: (Plans, elevations, sections, units of measurements) Basic electrical drawings Abbreviations and symbols of fittings and materials Regulations and standards of trade drawing 	<ul style="list-style-type: none"> Identification of building and electrical symbols. Drawing simple building plans. Interpretation of basic building and electrical drawings 	<ul style="list-style-type: none"> Awareness of symbols used in building Inventiveness in producing drawings. Appreciation of recommended building regulations and standards.
		11.3.4.2 Produce drawings of a simple conventional house	<ul style="list-style-type: none"> Views of a conventional house: FE, Plan, EE 		

DESIGN AND COMMUNICATION

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
11.4 DESIGN PROCESS	11.4.1 Realisation and Evaluation.	11.4.1.1 Make the artefact	<ul style="list-style-type: none"> • Making the artifact:: Use a variety of materials Select appropriate processes Apply safety precautions 	<ul style="list-style-type: none"> • Application of correct materials and finishes • Identification of equipment to use in artifact making 	<ul style="list-style-type: none"> • Resourcefulness in organizing material for the project. • Time management in artifact making
		11.4.1.2 Evaluate the artefact	<ul style="list-style-type: none"> • Evaluation of the artifact: Check performance of artifact against design brief and specification. 	<ul style="list-style-type: none"> • Preparation of the project management plan • Analysis of artefact and the contents of the portfolio in meeting the intended needs 	<ul style="list-style-type: none"> • Adaptability in the handling of challenges while making the artifact • Creative thinking in artifact production
11.5 DESIGNING	11.5.1 Designing Concepts	11.5.1.1 Apply concepts of universal designing	<ul style="list-style-type: none"> • Concepts of designing: Functionality, aesthetics (elements and principles of visual design), ergonomics, anthropometrics. 	<ul style="list-style-type: none"> • Application of designing concepts 	<ul style="list-style-type: none"> • Awareness of design principles • Display ingenuity when designing an artifact

SYSTEMS TECHNOLOGY

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
11.6 BASIC TECHNOLOGY	11.6.1 Electronics	11.6.1.1 Identify conventional symbols used to draw electronic circuit diagrams	<ul style="list-style-type: none"> Simple electronic circuits: Magnets and electromagnetism, buzzer, diodes, 555 timers, bread boards, matrix board, strip board, nails, boards, screws and screw caps 	<ul style="list-style-type: none"> Interpretation of conventional symbols Application of symbols when drawing circuit diagrams 	<ul style="list-style-type: none"> Awareness of conventional symbols used in circuit diagrams Inventiveness in producing electronic circuit diagrams
		11.6.1.2 Construct simple electronic circuits	<ul style="list-style-type: none"> Design and construct simple electric circuits Systems approach Safety precautions when constructing circuits 	<ul style="list-style-type: none"> Application of electronic symbols when designing 	<ul style="list-style-type: none"> Creative thinking when designing electronic circuits. Observation safety precautions while working.
	11.6.2 Hydraulics	11.6.2.1 Describe the basic principles and cycles of hydraulic systems	<ul style="list-style-type: none"> Principles of hydraulic systems: hydraulic transmission of forces (Syringes, fluids, tints, elastic tubes, clips) Advantages and disadvantages of hydraulics 	<ul style="list-style-type: none"> Identification of basic operations of hydraulic systems Application of hydraulic principles when designing 	<ul style="list-style-type: none"> Awareness of principles of hydraulic systems Appreciation of hydraulics in technology

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	11.6.3 Pneumatics	11.6.3.1 Describe the basic operation and principles of pneumatic systems	<ul style="list-style-type: none"> Principles of pneumatic systems: pneumatic circuits (bicycle pumps) Advantages and disadvantages of Pneumatics 	<ul style="list-style-type: none"> Application of operations and principles when designing pneumatic circuits Interpretation of pneumatic principles and operations 	<ul style="list-style-type: none"> Creative thinking in designing pneumatic circuits Appreciation of the importance of pneumatics in technology Awareness of principles and operations of pneumatics
	11.6.4 Structures	11.6.4.1 Explain the properties of materials used in the construction of structures	<ul style="list-style-type: none"> Properties of (wood, metal, stone, plastics, concrete, composites and other locally available materials) 	<ul style="list-style-type: none"> Analysis of materials used in construction. 	<ul style="list-style-type: none"> Awareness of forces in structures Observation of safety precautions when designing structures Resourcefulness in designing structures to meet demands Creative thinking when constructing structures
11.6.4.2 Describe forces in structures		<ul style="list-style-type: none"> Forces: static and dynamic 	<ul style="list-style-type: none"> Classification of forces in structures 		
11.6.4.3 Describe the principles of moments		<ul style="list-style-type: none"> Strength, stability, rigidity, Tension, Compression, Shear, Torsion Principles of moments (equilibrium) 	<ul style="list-style-type: none"> Identification of moments Application of moments in structures 		
11.6.4.4 Construct structures		<ul style="list-style-type: none"> Construction and testing of structures Safety factors (reinforcements, ergonomics) 	<ul style="list-style-type: none"> Application of structure to meet the required situation. 		

ELECTRICAL ENGINEERING

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
11.5 ELECTRICAL PRINCIPLES	11.5.1 Measurement and Testing	11.5.1.1 Conduct electrical tests	<ul style="list-style-type: none"> • Continuity test: Test instrument, Procedure, Expected reading • Polarity test: Test instrument, Procedure, Expected reading, Test on a live circuit, Test on a dead circuit • Insulation resistance test Test instrument, Procedure, Expected reading • Earth electrode test. Test instrument, Procedure, Expected reading 	<ul style="list-style-type: none"> • Conducting continuity, polarity and insulation tests • Accuracy when reading measurements • Application of procedures when conducting electrical tests 	<ul style="list-style-type: none"> • Awareness of the testing equipment • Exercising patience when conducting tests
	11.5.2 Repairing Domestic Appliances	11.5.2.1 Repair and maintain domestic appliances	<ul style="list-style-type: none"> • Repair and maintain stoves, pressing irons, geysers, electric kettles, hair driers, toasters, two plate cookers, four plate cookers 	<ul style="list-style-type: none"> • Repairing domestic appliances 	<ul style="list-style-type: none"> • Observing safety rules when repairing appliances
	11.5.3 Alternating Voltages and Current	11.5.3.1 Explain the production of sinusoidal waveforms	<ul style="list-style-type: none"> • The a.c. generator, waveforms, a.c. values, the equation of sinusoidal waveforms, combination of waveforms, basic calculations of voltages and current, single phase series arc circuits 	<ul style="list-style-type: none"> • Calculations of alternating voltages and currents 	<ul style="list-style-type: none"> • Appreciation of calculations when combining arc circuits
	11.5.4 Static Machine	11.5.4.1 Describe the principle of operation of a transformer	<ul style="list-style-type: none"> • Principle operation of transformers: Construction Principle on mutual induction Types of transformer cores • Types of transformers, Single phase and 3 phase, Step up and step down • Basic calculations: Transformation ratio, Emf equation 	<ul style="list-style-type: none"> • Identification of physical features of a transformer • Calculation of transformation ratios 	<ul style="list-style-type: none"> • Awareness of construction of transformers • Curiosity in learning about the principles of transformers

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	11.5.5 Transformer Servicing	11.5.5.1 Maintain transformers	<ul style="list-style-type: none"> • Routine maintenance Dielectric strength of oil Insulation resistance of windings Insulation resistance to earth. • Monthly or bimonthly inspections Temperature checks Drying with internal heat Cooling of transformer operation • Installation and repair spare parts 	<ul style="list-style-type: none"> • Troubleshooting of transformers • Application of the repair procedure when servicing transformers 	<ul style="list-style-type: none"> • Observation of safety precautions when repairing transformers • Appreciation of scheduling routine checks of transformers
11.6 INDUCTION MOTORS	11.6.1 Types of Induction Motors	11.6.1.1 Describe the operation of induction motors	<ul style="list-style-type: none"> • Types of induction motors: Single phase motors, 3 phase motors Wound rotor induction motor Squirrel cage rotor induction motor • Operation of induction motors Production of a rotating flux Mutual induction 	<ul style="list-style-type: none"> • Identification of physical features of induction motors • Application of the methods of determining the speed of a motor 	<ul style="list-style-type: none"> • Observation of safety precautions when repairing appliances • Appreciation of calculations when operating induction motors
		11.6.1.2 Carry out basic calculations	<ul style="list-style-type: none"> • Synchronous speed Rotor speed Rotor current frequency frequency 		
		11.6.1.3 Explain the application of induction motors	<ul style="list-style-type: none"> • Need for starters • Types of starters – Squirrel cage induction motor • Wound rotor induction motor 	<ul style="list-style-type: none"> • Application of procedure of Starting to run the motor 	<ul style="list-style-type: none"> • Awareness of the application of induction motors

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
		11.6.1.4 Maintain induction motors	<ul style="list-style-type: none"> Planned and scheduled maintenance Availability of spare parts Troubleshooting: Motor failing to start, Overload, Open in a phase, Low voltage, Motor runs hot, Motor runs fast and slow, Motor vibrates Repair procedure for a shorted coil Installation procedure: Cleaning stator, winding and drying, Insulation resistance level 	<ul style="list-style-type: none"> Application of the repair procedure when servicing induction motors Servicing induction motors Troubleshooting induction motors 	<ul style="list-style-type: none"> Observation of safety precautions when maintaining induction motors Patience when troubleshooting and conducting installing procedure
11.7 DIRECT CURRENT MOTORS	11.7.1 Running d c motors	11.7.1.1 Operate d.c motors	<ul style="list-style-type: none"> Construction, Motor action Back emf equation Types of d.c motors Separately excited d.c motor Series Motor, Shunt motor, Compound motor Application of d.c motors Domestic drives, Industrial drives Motor starters, Face plate starters, Electronic starters 	<ul style="list-style-type: none"> Identification of the physical features of motors Application of procedure to start running d c motors 	<ul style="list-style-type: none"> Observation of safety precautions when running d. c. motors Curiosity in learning more about the operations of d.c. motors

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
11.8 DIRECT CURRENT GENERATORS	11.8.1 D C Generators	11.8.1.1 Operate d.c generators	<ul style="list-style-type: none"> • Construction, Generator action, emf equation • Types of d.c generators: Series, shunt and Compound • Maintain d.c generators: Planned and scheduled maintenance Slip-ring and brush maintenance Availability of spare parts • Troubleshooting: Generator failing to start, Overload, Open in a phase, Low voltage, Generator runs hot, Generator runs fast and slow, Generator vibrates Repair procedure for a shorted coil Installation procedure, Cleaning stator, winding and drying, Insulation resistance level 	<ul style="list-style-type: none"> • Identification of physical features of d c generators • Troubleshooting d c generators • Application of the repair procedure when servicing d c generators • Classification of dc generators 	<ul style="list-style-type: none"> • Observation of safety precautions when operating d c generators • Patience when trouble shooting and conducting installing procedure • Awareness of dc generators
	11.9 ELECTRICAL MACHINES	11.9.1 Synchronous Motors	11.9.1.1 Describe the operation of synchronous motors	<ul style="list-style-type: none"> • Construction of synchronous motors Methods of starting • Types of synchronous motors Single phase, 3 phase • Application of synchronous motors: Industrial drives, Power factor improvement 	<ul style="list-style-type: none"> • Identification of synchronous motors • Application of synchronous motors in power improvement
	11.9.2 Synchronous Generators	11.9.2.1 Describe the operation of synchronous generators	<ul style="list-style-type: none"> • Construction and principles of operation • Types and application of synchronous generators 	<ul style="list-style-type: none"> • Application of synchronous generators in power improvement 	<ul style="list-style-type: none"> • Awareness of operations of synchronous generators

BRICKLAYING AND PLASTERING

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
11.10 FLOOR FINISHES	11.10.1 Tools and Materials	11.10.1.1 Finish the floor	<ul style="list-style-type: none"> • Floor finishing tools: Wooden float, steel float, drought edge, floor jointer • Floor finishing materials Granolithic, cement • Qualities of floor finishing materials: silt free, durable, organic free, clean (Mix ratios 1:3, 1:4) 	<ul style="list-style-type: none"> • Application of methods of finishing the floor • Mixing materials to the required ratios • Identification of floor finishing tools 	<ul style="list-style-type: none"> • Appreciation of obtaining a qualitative floor finish • Awareness of floor finishing tools and materials
	11.10.2 Floor Finishing	11.10.2.1 Apply monolithic finish	<ul style="list-style-type: none"> • Fresh concrete: Mixes, Laying fresh concrete Monolithic floor finish preparation Finishing with topping screed Finishing over site • Advantages of Monolithic Homogenous qualities Good bondage obtained 	<ul style="list-style-type: none"> • Application of monolithic floor finish • Mixing materials for a monolithic floor finish 	<ul style="list-style-type: none"> • Awareness of monolithic floor finish • Appreciation of obtaining a qualitative monolithic floor finish
		11.10.2.2 Lay floor tiles	<ul style="list-style-type: none"> • Types of floor tiles: Quarry, wood block, PVC, rubber • Laying floor tiles Surface preparation Treating floor tiles, Fixing tiles • Tile adhesives Epoxy, contact adhesive mortar 	<ul style="list-style-type: none"> • Identification of types of floor tiles • Application of contact adhesives to the floor tiles • Laying of floor tiles 	<ul style="list-style-type: none"> • Awareness of types of floor tiles • Observing safety precautions when tiling

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	11.10.3 Wall Finishing	11.10.3.1 Finish the wall	<ul style="list-style-type: none"> • Wall finishing tools: Steel float, straight edge trowel • Quantities of wall finishing material Organic free durable silt free • Wall finishing materials: Wall tiles • Surface preparation: Slush method, Plaster key method, Hacking method • Importance of surface preparation: Bond creation, Prevention of defects 	<ul style="list-style-type: none"> • Identification of tools and materials for wall finishing • Application of methods of finishing walls 	<ul style="list-style-type: none"> • Awareness of methods of wall preparation • Appreciation of a neat wall finish • Observation of safety precautions when finishing walls
		11.10.3.2 Plaster the wall	<ul style="list-style-type: none"> • Plastering materials: Cement, building sand, water, Composition and ratios, types of plaster • Rules of plastering Methods of application, Curing • Importance of plastering: Thermal, sound weather, fire insulation, appearance • Wall plastering: Surface preparation, Screeding, Flaking and finishing 	<ul style="list-style-type: none"> • Identification of wall plastering materials • Application of rules and methods of plastering 	<ul style="list-style-type: none"> • Awareness of wall preparation for plastering • Appreciation of a neat plastered wall
		11.10.3.3 Fix wall tiles	<ul style="list-style-type: none"> • Types of wall tiles: Quarry, ceramic, rubber • Fixing wall tiles: Surface preparation, Treating wall tiles, Fixing tiles • Types of tile adhesive: Epoxy, contact adhesive mortar • Materials for surface: Bonding liquid solution • Surface defects: Cracks, blisters Grinning, sweat outs flaking 	<ul style="list-style-type: none"> • Identification of types of wall tiles and adhesives • Wall preparation and fixing wall of tiles • Application of correct procedure when fixing wall tiles 	<ul style="list-style-type: none"> • Awareness of types of wall tiles and adhesives • Appreciation of a neat wall tile finish • Observation of safety precautions when tiling

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
		11.10.3.4 Describe defects in wall finishes	<ul style="list-style-type: none"> • Types of defects Glazings, Cracks, Bond failure, Grinning • Importance of defect identification • Apply precaution measures 	<ul style="list-style-type: none"> • Identification of defects of wall finishes • Application of preventive measures of wall defects 	<ul style="list-style-type: none"> • Awareness of defects of wall finishes • Appreciation of neatly finished walls
		11.10.3.5 Apply remedies to walls	<ul style="list-style-type: none"> • Types of remedies Preparation of the surface to receive wall finish Apply wall finish techniques • Application of remedies Curing the wall finish Provision of mechanical keys Application of plastic key 	<ul style="list-style-type: none"> • Application of remedies to cure the wall finish • Identification of wall remedies • Application of correct procedure when preparing wall surface before finishing 	<ul style="list-style-type: none"> • Awareness of remedies to cure the wall finish • Appreciation of wall surface preparation for a wall finish

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
11.11 FITTINGS	11.11.1 Jambs and Reveals	11.11.1.1 Construct jambs and reveals	<ul style="list-style-type: none"> • Description of Jambs and Reveals, Measurements • Types of jambs and reveals • Methods of construction 	<ul style="list-style-type: none"> • Identification of jambs and reveals • Constructing jambs and reveals 	<ul style="list-style-type: none"> • Perseverance in constructing, plastering and in putting fittings • Precision in constructing building units and fittings • Creative thinking in constructing jambs, reveals and fittings • Awareness of fitting window frames and door frames • Observation of safety precautions when plastering and constructing fittings
	11.11.2 Doors and Window Frames	11.11.2.1 Fit door frames	<ul style="list-style-type: none"> • Types of door frames • Measurements • Frames and linings, • Materials Fixing doors frames: Bracing, Levelling, Plumbing, Fill lugs/pillons in concrete • Method of fixing, In-situ or in place, Post fixin 	<ul style="list-style-type: none"> • Identification of types of doors • Application of methods of fitting of door frames 	
		11.11.2.2 Fit window frames	<ul style="list-style-type: none"> • Types of window frames • Fitting principles • Materials • Fixing doors frames: Bracing, Levelling, Plumbing Fill lugs/pillons in concrete • Method of fixing • In-situ or in place, Post fixing 	<ul style="list-style-type: none"> • Identification of window frames • Application of methods of fitting of window frames 	
		11.11.2.3 Joint different types of walls	<ul style="list-style-type: none"> • Types of joints • Factors to consider when joining • Jointing Procedures 	<ul style="list-style-type: none"> • Identification of joints • Application of factors when jointing walls 	

CARPENTRY AND JOINERY

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
11.12 BUILDING UNIT AND FITTINGS	11.12.1 Doors	11.12.1.1 Construct Doors	<ul style="list-style-type: none"> Types of doors Interpreting plans for doors Material selection, Making process Finishing, Fitting and hanging doors Fitting locks to doors 	<ul style="list-style-type: none"> Application of methods of fitting of locking devices to doors 	<ul style="list-style-type: none"> Perseverance in constructing building units and fitting Precision in constructing building units and fittings Creative thinking in constructing building units and fittings Awareness of constructing building units and linings Observation of safety precautions when constructing building units and fittings
	11.12.2 Window Frames	11.12.2.1 Construct Window Frames	<ul style="list-style-type: none"> Types of window frames Interpreting plans for window frames Material selection, Making process Finishing, Fitting door frames 	<ul style="list-style-type: none"> Interpretation of drawing plans for windows Application of methods of fitting of windows frames 	
	11.12.3 Kitchen Units	11.12.3.1 Construct Kitchen Units	<ul style="list-style-type: none"> Types of kitchen units Interpreting plans for kitchen units Material selection, Making process Wood finishes application Fitting kitchen units 	<ul style="list-style-type: none"> Interpretation of drawing plans for kitchen units Application of wood finishes 	
	11.12.4 Ceilings	11.12.4.1 Construct Ceilings	<ul style="list-style-type: none"> Types of ceilings Work plans, materials, ceiling, framing Types of ceiling boards Cover strips and cornices 	<ul style="list-style-type: none"> Construction of ceiling boards Interpretation of working drawings for ceilings 	
	11.12.5 Door Frames and Linings	11.12.5.1 Construct Door Frames and Linings	<ul style="list-style-type: none"> Types of door frames and linings Interpretation of the work drawing for door frames/ linings Material selection and making process Finishing and Fitting methods 	<ul style="list-style-type: none"> Interpretation of work drawings for door frames Application of methods of fitting door frames and linings 	

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	11.12.6 Temporal Timber Structures	11.12.6.1 Erect Centers for arches	<ul style="list-style-type: none"> • Types of centers, Setting out of centers • Assembling and fixing the centers • Striking the centers 	<ul style="list-style-type: none"> • Application of methods of assembling and fixing centres • Classification of types of centres 	<ul style="list-style-type: none"> • Awareness of setting centres • Precision in setting out centres
		11.12.6.2 Erectscaffolding and ladders	<ul style="list-style-type: none"> • Types of scaffolding and ladders • Prepare the ground for scaffolding and ladders • Assemble scaffolds and ladders, Dismantling scaffolds • Cleaning and storing scaffolds and ladders 	<ul style="list-style-type: none"> • Identification of scaffolding and ladders • Assembling of scaffolds and ladders • Application of methods assembling scaffolds and ladders 	<ul style="list-style-type: none"> • Observation of safety precautions when erecting scaffolds and ladders • Patience when erecting scaffolds and ladders • Exhibiting a sense of responsibility in caring for scaffolds
		11.12.6.3 Construct Site Hoardings	<ul style="list-style-type: none"> • Types of site hoardings • Interpreting working plans, selecting materials • Erecting and striking site hoardings • Transporting and storing of hoarding materials 	<ul style="list-style-type: none"> • Interpretation of working plans • Identification of site hoardings • Application of methods of erecting and striking site hoardings 	<ul style="list-style-type: none"> • Awareness of site hoardings • Observation of safety precautions when erecting and striking site hoarding
		11.12.6.4 Construct Form Work For Cast In-Situ	<ul style="list-style-type: none"> • Constructing Form Works For Pre-Cast Sills • Interpret work plan • Material selection • Form work positions • Construct formwork 	<ul style="list-style-type: none"> • Interpretation of work plans • Application of form works for pre-cast sills 	<ul style="list-style-type: none"> • Awareness of constructing form works for pre-cast sills • Observation of safety precautions

ENTREPRENEURSHIP

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
11.13 ENTREPRENEURSHIP	11.13.1 Costing and Pricing	11.13.1.1 Determine production cost of items	<ul style="list-style-type: none"> • Production cost: Start-up costs, fixed costs, marketing, advertising 	<ul style="list-style-type: none"> • Application of principles of costing products • Application of methods of marketing and advertising items. 	<ul style="list-style-type: none"> • Awareness of costing products and services • Appreciation of costing products and services
		11.13.1.2 Price the items	<ul style="list-style-type: none"> • Pricing items and services • Packaging of items 	<ul style="list-style-type: none"> • Application of factors to consider when pricing items and services • Identification of appropriate packaging materials 	<ul style="list-style-type: none"> • Awareness of pricing items and services • Appreciation of packing items in presentable manner
		11.13.1.3 Prepare final accounts	<ul style="list-style-type: none"> • Income and expenditure 	<ul style="list-style-type: none"> • Application of principles of preparing account books 	<ul style="list-style-type: none"> • Appreciation of record keeping when conducting business
	11.13.2 Liquidating	11.13.2 .1 Liquidate business enterprise	<ul style="list-style-type: none"> • Calculating various ratios and percentages (debtors, creditors, liquidity ratios) 	<ul style="list-style-type: none"> • Calculating ratios and percentages of a business enterprise 	<ul style="list-style-type: none"> • Exhibiting interpersonal relationships in business dealings • Appreciation of entrepreneurship as an alternative career path

GRADE 12

GENERAL OUTCOME AND KEY COMPETENCES

GENERAL OUTCOMES:	KEY COMPETENCIES
<ul style="list-style-type: none">• Apply appropriate finishes on materials• Demonstrate ability to draw true lengths and shapes	<ul style="list-style-type: none">• 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

MANUFACTURING MATERIALS AND EQUIPMENT

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
12.1 FINISHING PROCESSES	12.1.1 Abrading Finishes	12.1.1.1 Apply abrasives in surface finishing	<ul style="list-style-type: none"> • Types of abrasives: Glass paper, emery cloth, Grades of abrasives, wet and dry paper • Using abrasives correctly, wrapping on the block, correct motion • Safety precautions when using abrasives 	<ul style="list-style-type: none"> • Identification of abrasives. • Application of abrasives and abrading techniques 	<ul style="list-style-type: none"> • Appreciation of use of abrasives in finishing artefacts • Awareness of different types of abrasives • Observing safety precautions when using abrasives
	12.1.2 Coating Finishes	12.1.2.1 Apply finishes	<ul style="list-style-type: none"> • Types of finishes: Varnish, paint, stains, red oxide, polish, blueing, galvanising, timplating, terneplate, oiling, applying lacquer, plastic coating. • Steps involved when applying finishes • Safety precautions when applying finishes 	<ul style="list-style-type: none"> • Application of finishes on products. • Identification the correct finish for the product • Classification of finishes used on materials 	<ul style="list-style-type: none"> • Appreciation of finish on the product • Awareness of different types of finishes • Observing safety precautions when applying finishes
	12.1.3 Bluing and Burnishing	12.1.3.1 Treat metal	<ul style="list-style-type: none"> • Heat treatment of metal: Bluing, Burnishing Fillers, Primers. • Safety precautions when bluing and burnishing 	<ul style="list-style-type: none"> • Application of heat treating metal 	<ul style="list-style-type: none"> • Appreciation of finishing metal through heat • Observing safety precautions when heating metal

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
	12.1.4 Lathe work	12.1.4.1 Turn materials on the lathe	<ul style="list-style-type: none"> • Turning wood: Main parts of the lathe machine Wood turning tools (gouge, chisel, scraper) Turning between centres and faceplate turning: preparation of wood for turning Safety precautions when using a lathe machine Care and maintenance of the lathe machine • Turning metal: Main parts of the centre lathe Tool profile (roughing, finishing, parting-off, knife edge Turning speed, cutting lubricant, tool setting, drilling, knurling, boring Safety precautions when using a lathe machine Care and maintenance of the centre lathe • Turning plastic: turning speed tools and safety precautions 	<ul style="list-style-type: none"> • Identification of turning tools. • Classification of tools to be used • Interpretation of operations and processes to be followed on the lathe machine • Application of procedures while on the lathe machine 	<ul style="list-style-type: none"> • Appreciation of procedures and regulations to be followed on the lathe machine • Awareness of different types of operations performed on the lathe machine • Observation of safety precautions when working on the lathe machine • Co-operation when working on the lathe machine • Exhibiting a sense of responsibility when working on the lathe machine

GRAPHIC COMMUNICATION

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
12.2 PRINCIPLES OF PROJECTION	12.2.1 Lines In Space	12.2.1.1 Project inclined lines	<ul style="list-style-type: none"> • Projection of inclined lines: in the HP, VP and EVP • Labelling of lines in the HP, VP and EVP 	<ul style="list-style-type: none"> • Applications of methods of drawing lines in space. 	<ul style="list-style-type: none"> • Awareness of projecting line in space • Accuracy in determining true lengths of inclined lines
		12.2.1.2 Project true lengths of inclined lines	<ul style="list-style-type: none"> • True lengths of lines: in the VP, HP and EVP • True angles of inclination: to the VP and HP 	<ul style="list-style-type: none"> • Interpretation of true lengths of lines from inclinations 	
	12.2.2 Auxiliary Views	12.2.2.1 Project auxiliary views	<ul style="list-style-type: none"> • Projection of Auxiliary views: Auxiliary Vertical planes, datum lines, auxiliary elevation, auxiliary plan, circles in auxiliary <i>NB Restrict to First Auxiliary Only</i> 	<ul style="list-style-type: none"> • Applications of methods of projecting auxiliary views from prescribed angles • Application of principles of drawing auxiliary views 	<ul style="list-style-type: none"> • Awareness of projecting auxiliary views • Appreciation of projecting auxiliary views of different shapes • Precision in projecting auxiliary views
		12.2.2.2 Construct true shapes of conic sections	<ul style="list-style-type: none"> • Conic sections: Circle, Ellipse, parabola, hyperbola • Sectioning of conic sections • Determine true shape of conic sections 	<ul style="list-style-type: none"> • Applications of methods of projecting true shapes of truncated conical sections • Interpretation of cutting planes and conic sections 	<ul style="list-style-type: none"> • Patience when drawing curves of conic sections

DESIGN AND COMMUNICATION

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
12.3 DESIGNING	12.3.1 Screen Printing	12.3.1.1 Produce screen prints	<ul style="list-style-type: none"> • Screen prints tools (screen printing frame, brushes, squeegee, computer) • Materials; screen print film, fabrics, screen printing ink, textile ink • Safety precautions when producing screen prints 	<ul style="list-style-type: none"> • Identification of materials and screen printing tools • Application of screen printing procedures • Interpretation of screen printing techniques 	<ul style="list-style-type: none"> • Awareness of screen printing • Appreciation of screen printing as an entrepreneurial avenue • Observation of safety precautions when screen printing
12.4 GRAPHICS	12.4.1 Computer Drawing.	12.4.1.1 Draw basic 3 dimensional shapes using a computer	<ul style="list-style-type: none"> • By Layer: Line type, line weight, colour, scale • Isometric and oblique drawing (Use of AutoCAD, Corel draw, Sketch up) 	<ul style="list-style-type: none"> • Application of computers in drawing • Interpretation of 3 dimensional drawings 	<ul style="list-style-type: none"> • Awareness of computer drawing • Appreciation of computers in drawing and designing

SYSTEMS TECHNOLOGY

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
12.5 BASIC TECHNOLOGY	12.5.1 Electronics	12.5.1.1 Construct simple Printed Circuit Boards (PCB)	<ul style="list-style-type: none"> • Basic components of a PCB • Copper clad board, etching pens, etching transfers, photo etching, ferric chloride, soldering gun • Designing a simple PCB • Constructing a simple PCB • Procedure of mounting PCBs • Safety precautions when working with chemicals (PCB): Gloves, goggles, acid proof coat or apron, tray, tweezers 	<ul style="list-style-type: none"> • Identification of basic components of a PCB. • Designing conventional circuits. • Application of circuits in artefacts making • Application of methods of soldering circuits. 	<ul style="list-style-type: none"> • Awareness of conventional circuit boards. • Appreciation of circuits in artefacts. • Exhibiting a sense of responsibility when constructing PCBs • Observing safety precautions when working with PCBs
		12.5.1.2 Apply control logic to design circuits	<ul style="list-style-type: none"> • Language of logic: OR gate, TRUTH gate, AND gate, NOT gate. 	<ul style="list-style-type: none"> • Application of control logic in designing circuits. 	<ul style="list-style-type: none"> • Awareness of control logic when designing circuits.

ELECTRICAL ENGINEERING

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
12.6 ELECTRICAL PRINCIPLES	12.6.1 Power Circuits	12.6.1.1 Read control and power circuits	<ul style="list-style-type: none"> • Contactors, Overloads, Push buttons, Timers Indicator, lamps, Bells, sirens • Interpret simple and complex circuits 	<ul style="list-style-type: none"> • Interpretation of symbols in circuits • Application of symbols in drawing circuits 	<ul style="list-style-type: none"> • Awareness of conventional symbols • Curiosity in learning about symbols used in circuits
		12.6.1.2 Design control and power circuits	<ul style="list-style-type: none"> • Preparation of drawing paper • Operation of the circuit 	<ul style="list-style-type: none"> • Application of symbols in drawing circuits 	
	12.6.2 Electrical Installations	12.6.2.1 Install direct on line circuits	<ul style="list-style-type: none"> • Control circuit, Power circuit Connect the motor in star/delta Control circuit, Power circuit • Wire forward and reverse circuits Control circuits, Power circuits • Wire star/delta circuits Incorporating on delay timers Incorporating off delay timers • Wire semi-automatic circuits Control and power circuits • Install sequential circuits Control and power circuits Limited to four motors 	<ul style="list-style-type: none"> • Application of wiring techniques when making installations • Identification of components when making connections in the circuit • Classification of online circuits 	<ul style="list-style-type: none"> • Awareness of making direct on line installations • Inquisitiveness when making installations • Exhibiting confidence when making installations

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
12.7 ELECTRICAL MACHINES	12. 7.1 D C Machines	12.7.1.1 Maintain induction motors	<ul style="list-style-type: none"> • Scheduled maintenance • Availability of spare parts • Troubleshooting: Motor failing to start, overload, open in a phase, low voltage, motor runs hot, motor runs fast and slow, motor vibrates • Repair procedure for a shorted coil • Installation procedure: Cleaning stator, winding and drying • Insulation resistance level 	<ul style="list-style-type: none"> • Identification of physical features of induction motors • Troubleshooting induction motors • Application of the repair procedure when servicing induction motors 	<ul style="list-style-type: none"> • Awareness of installation procedure • Observing safety precautions when operating induction motors • Patience when trouble shooting and conducting installing procedure
		12.7.1.2 Maintain synchronous motors and generators	<ul style="list-style-type: none"> • Planned and scheduled maintenance, Slip-ring and brush maintenance • Availability of spare parts • Troubleshooting: Motor failing to start, overload, open in a phase, low voltage, motor runs hot, motor runs fast and slow, motor pulls and out of synchronism, motor vibrates, motor fail to synchronise • Repair procedure for a shorted coil • Installation procedure: Cleaning stator, winding and drying • Insulation resistance level 	<ul style="list-style-type: none"> • Identification of physical features of synchronous motors • Troubleshooting synchronous motors • Application of the repair procedure when servicing synchronous motors • Interpretation of trouble shooting procedure 	<ul style="list-style-type: none"> • Observation of safety precautions when operating synchronous motors • Patience when trouble shooting and conducting installing procedure • Exhibiting a sense of responsibility in caring for synchronous motors

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
		12.7.1.3 Operate a PLC	<ul style="list-style-type: none"> • Components of a PLC Input module, Output module Central processing units 	<ul style="list-style-type: none"> • Identification of PLC • Application of PLC programming language 	<ul style="list-style-type: none"> • Awareness of PLC programming language
		12.7.1.4 Apply PLC programming language	<ul style="list-style-type: none"> • Programming device • Operators interface Ladder diagram language, Boolean language, Functional chart 	<ul style="list-style-type: none"> • Interpretation of programming language 	<ul style="list-style-type: none"> • Confidence in applying PLC programming language

BRICKLAYING AND PLASTERING

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
12.8 EXTERNAL WORKS	12.8.1 Pavements and Walkways	12.8.1.1 Construct Pavements and walkways	<ul style="list-style-type: none"> • Surface preparation when constructing pavements and walk ways • Types of pavers and kerbs stones • Setting out pavements and walk ways • Laying procedures 	<ul style="list-style-type: none"> • Application of setting and building procedures • Identification of pavers and kerb stones 	<ul style="list-style-type: none"> • Craftsmanship when constructing walkways and pavements • Awareness of different methods of constructing • Appreciation of walkways and pavements

CARPENTRY AND JOINERY

TOPIC	SUB TOPIC	SPECIFIC OUTCOMES	CONTENT		
			KNOWLEDGE	SKILL	VALUES
12.9 FORM WORK	12.9.1 Form work for Slab	12.9.1.1 Erect form work for concrete walls	<ul style="list-style-type: none"> • Work plan • Material selection • Form work positions • Construct formwork 	<ul style="list-style-type: none"> • Interpretation of work plans • Constructing form work 	<ul style="list-style-type: none"> • Perseverance in erecting form work for concrete walls and when constructing roofs • Precision in cutting parts of a hipped roof and fixing roof coverings • Awareness of assembling parts of a hipped and valley roof • Observation of safety precautions when constructing roofs • Appreciation of beauty when finishing construction work
	12.9.2 Roof Construction	12.9.2.1 Interpret plans for a hipped roof	<ul style="list-style-type: none"> • Roof terminologies • Parts of a hipped and valley roof • Interpreting drawings • Developing a material list 	<ul style="list-style-type: none"> • Identification of parts of a hipped roof • Interpretation of roof drawings 	
		12.9.2.2 Construct a hipped and valleys roof	<ul style="list-style-type: none"> • Cutting parts of a hipped roof • Laying out trusses, valley and jack rafters, cripple jack rafter • Assembling the members with purlings 	<ul style="list-style-type: none"> • Application of principles when laying roofs • Cutting various parts of a hipped roof • Assembling of various parts of a hipped roof 	
		12.9.2.3 Fix roof coverings on a hipped roof and valleys	<ul style="list-style-type: none"> • Types of roof coverings • Tools used in roof construction • Laying and fixing gutters, fixing roof sheets and ridges 	<ul style="list-style-type: none"> • Application of coverings of a hipped roof • Identification of roof coverings • Application of methods of fixing of gutters, roofing sheet and ridges 	

APPENDIX I



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

MAKING

Plan of Work

Use of Equipment

Worked with Accuracy

Finished Project

Evaluation

OVERALL GRADE

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
- 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

- 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.....

