



ZIMBABWE

MINISTRY OF PRIMARY AND SECONDARY EDUCATION

DESIGN AND TECHNOLOGY SYLLABUS

FORMS 1-4

2024 - 2030

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1.0 PREAMBLE

1.1 INTRODUCTION

The Heritage Based Design and Technology syllabus is designed for Forms 1-4 learners. It uses Scientific, Technological, Engineering and Mathematical (STEM) principles and design process in solving problems through creativity, innovation and invention. The syllabus fosters the acquisition of 21st century competences for socio - economic wellbeing of society. The syllabus embraces inclusivity and gender equality in the learning of Design and Technology.

1.1 RATIONALE

The educational philosophy of the syllabus is concerned with the development of competences that enable learners in making and shaping their environment whilst adding value to it. The syllabus encourages the learner to employ problem solving skills to produce functional products using appropriate tools and materials for the community, nation and global markets. It also promotes desirable enterprise, recreational and life skills relevant to the contemporary society. The syllabus enables learners to explore numerous Design and Technology career opportunities. It also encourages learners to value the use of multi- materials, Science, Mathematics and other related learning areas in a sustainable manner. The syllabus advocates for the acquisition of knowledge, skills, values and attitudes as learners exploit the tangible and intangible heritage of Zimbabwe to produce goods and services as a means to socio – economic transformation.

1.2 SUMMARY OF CONTENT

This syllabus covers theory and practical activities in Design and Technology. The content shall enable learners to acquire competences, namely; knowledge, skills, values and attitudes. The syllabus shall focus on learner's health and safety, designing, materials and maintenance of tools and equipment among others.

1.4 ASSUMPTIONS

It is assumed that learners have:

- drawing and measuring skills
- knowledge of materials and equipment
- numeracy, technological and scientific literacy
- knowledge of safety, health and environment(SHE)
- Information Communication Technology (ICT) skills

1.5 CROSS- CUTTING THEMES

In order to foster competency development for further studies, life and work, the following cross-cutting priorities have been taken into consideration:

- Health and wellbeing
- Children's rights and responsibilities
- Environmental Management
- Information Communication Technology (ICT)
- Disaster Risk Management
- Climate Change
- Entrepreneurship

2.0 PRESENTATION OF SYLLABUS

The Design and Technology syllabus is a single document covering Forms 1-4. It contains the preamble, aims, objectives, syllabus topics, methodology, scope and sequence, competency matrix and assessment.

3.0 AIMS

The aims are to help learners to:

- 3.1 develop confidence, creativity, innovation and responsibility in designing products to solve local problems and engage in inventions for the community, nation and the ever-changing technological world
- 3.2 acquire design thinking skills to produce goods and services
- 3.3 foster a range of transferable skills and attitudes
- 3.4 make aesthetic, economic, moral and technological value judgment in design
- 3.5 develop enterprising skills through problem - solving

4.0 OBJECTIVES

Learners should be able to:

- 4.1 apply appropriate communication techniques to inform and justify design ideas
- 4.2 experiment with design ideas to solve community based problems
- 4.3 undertake market research for design decision making
- 4.4 apply ICT knowledge to monitor and control product development
- 4.5 plan steps in making artefacts
- 4.6 demonstrate awareness of societal and technological influences in design

make aesthetic, economic, moral (ethical) and technological value judgment

4.8 identify natural, indigenous and artificial materials to make and modify artefacts

4.9 use appropriate materials and tools to attain quality products

4.10 develop a culture of maintenance

4.11 recognise the work of designers, craftsmen, scientists and technologists in society and industry

4.12 apply scientific and technological knowledge and skills in solving problems in the environment

4.13 exhibit enterprise skills by recognising opportunities and constraints in design

4.14 identify situations in communities for which design solutions are required

4.15 follow the correct patenting procedures for intellectual property rights

5.0 METHODOLOGY AND TIME ALLOCATION

5.1 METHODOLOGY

This syllabus is based on learner-centred and sensory approaches in the teaching and learning of Design and Technology heritage and Design. The principle of individualised teaching should impact on the use of any of the suggested methods. Material Science, Engineering Science, Engineering Mathematics and Engineering Drawing should be an integral part of every practical exercise. The approaches create awareness of the issues of sustainability by involving learners in the collection of waste materials for reusing, recycling and upcycling. The use of 21st century digital/ ICT (CAD/CAM) skills is encouraged.

Suggested Methods

- Discussion
- Project work
- Group work
- Experimentation
- Problem solving
- Demonstration
- Educational tours
- Observation
- Team teaching

5.2 Time Allocation

At least **8x40** minute periods per week. **One** (1) exhibition per term

6.0 TOPICS

The syllabus consists of nine compulsory topics listed below:

- 6.1 Health and safety
- 6.2 Product design
- 6.3 Material science
- 6.4 Systems and control
- 6.5 Engineering science
- 6.6 tools and equipment
- 6.7 Manufacturing
- 6.8 Design drawings
- 6.9 Enterprise skills

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7.0 SCOPE AND SEQUENCE

TOPIC	FORM 1	FORM 2	FORM 3	FORM 4
7.1 HEALTH AND SAFETY	<ul style="list-style-type: none"> Rules and regulations in the working environment Safety precautions Protective clothing First Aid 	<ul style="list-style-type: none"> Safe use of tools and equipment Safe handling of materials Safety consideration for power sources First Aid 	<ul style="list-style-type: none"> Safe and protective clothing Practical use of tools and equipment First Aid 	<ul style="list-style-type: none"> Hazardous substances Safety in the workshop First Aid
7.2 PRODUCT DESIGN	<ul style="list-style-type: none"> History of design Introduction to the design process Related learning areas and careers 	<ul style="list-style-type: none"> Design projects 	<ul style="list-style-type: none"> The design process Design project Cultural and technological influences on designed products Design tools 	<ul style="list-style-type: none"> The design process The Design Project management
7.3 MATERIAL SCIENCE	<ul style="list-style-type: none"> Types of materials Uses of materials 	<ul style="list-style-type: none"> Properties of materials 	<ul style="list-style-type: none"> Production of materials Properties and uses of materials 	<ul style="list-style-type: none"> Shapes, forms and uses of materials Properties of materials Finishing
7.4 SYSTEMS AND CONTROL	<ul style="list-style-type: none"> Design and making Electronics Energy 	<ul style="list-style-type: none"> Joining and assembly Visual communication 	<ul style="list-style-type: none"> Energy Testing and evaluation 	<ul style="list-style-type: none"> Levers Gear mechanisms Drivers: Belts and Chains

TOPIC	FORM 1	FORM 2	FORM 3	FORM 4
	<ul style="list-style-type: none"> Groups of systems and control 	<ul style="list-style-type: none"> Structures and mechanisms 	<ul style="list-style-type: none"> Structures and mechanisms 	
7.5 ENGINEERING SCIENCE	<ul style="list-style-type: none"> Engineering communication 	<ul style="list-style-type: none"> Calculations on machines 	<ul style="list-style-type: none"> Calculations on advanced machines 	<ul style="list-style-type: none"> Calculations on advanced machines
7.6 USE AND MAINTENANCE OF TOOLS AND EQUIPMENT	<ul style="list-style-type: none"> Classification: Measuring and marking out tools Holding and supporting tools Precision and impelling tools 	<ul style="list-style-type: none"> Tools and equipment 	<ul style="list-style-type: none"> Classifications of machines 	<ul style="list-style-type: none"> Maintenance of tools and equipment
7.7 MANUFACTURING	<ul style="list-style-type: none"> Manufacturing processes 	<ul style="list-style-type: none"> Manufacturing processes 	<ul style="list-style-type: none"> Industrial plant layout 	<ul style="list-style-type: none"> Manufacturing systems
7.8 DESIGN DRAWINGS	<ul style="list-style-type: none"> Drawing principles Geometrical constructions 	<ul style="list-style-type: none"> Geometrical constructions Types of projections 	<ul style="list-style-type: none"> Production drawings Introduction to Computer Aided Drawing 	<ul style="list-style-type: none"> Production drawings Computer Aided Drawing
7.9 ENTERPRISE SKILLS	<ul style="list-style-type: none"> Environment and social responsibility Aesthetics 	<ul style="list-style-type: none"> Ergonomics and anthropometry Design project 	<ul style="list-style-type: none"> Marketing strategies Design project 	<ul style="list-style-type: none"> Market influences Design project Quality assurance and control

8.0 COMPETENCY MATRIX

FORM 1

8.1 TOPIC 1 SAFETY AND HEALTH

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.1.1 WORKSHOP SAFETY	<ul style="list-style-type: none"> state personal safety rules observe personal safety rules when using tools and machines explain the importance of safety in the workshop perform fire drills dispose of waste material in an environmentally friendly way apply first aid skills interpret hazard warning signs 	<ul style="list-style-type: none"> Health and Safety <ul style="list-style-type: none"> Personal Workshop Tools Basic machines Fire drills First aid Waste disposal Hazard warning signs 	<ul style="list-style-type: none"> Conducting fire drills regularly Simulating first aid operations Constructing waste bunkers and disposing waste appropriately Demonstrating the safe use of tools and machines 	<ul style="list-style-type: none"> First Aid Kit Recommended textbooks Safety posters Fire- fighting equipment Resource persons ICT tools Hazard warning signs Educational tours

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.1.2 PROTECTIVE CLOTHING	<ul style="list-style-type: none"> state the importance of protective clothing explain the use of protective clothing state types of protective clothing identify appropriate protective clothing accordingly 	<ul style="list-style-type: none"> Importance of protective clothing Types of protective clothing such as: <ul style="list-style-type: none"> Hand gloves Work suit Safety shoes Helmet Apron Dustcoats 	<ul style="list-style-type: none"> Identifying appropriate clothing accordingly Stating types of protective clothing Wearing of protective clothing in the work place Explaining use of protective clothing 	<ul style="list-style-type: none"> ICT tools Recommended textbooks Samples of safety attire
8.1.3 FIRST AID	<ul style="list-style-type: none"> name the contents of a First Aid Kit administer first aid in the working environment 	<ul style="list-style-type: none"> Cuts Burns Electric shocks First Aid Kit 	<ul style="list-style-type: none"> Naming contents in a First Aid Simulating of first aid operations and activities 	<ul style="list-style-type: none"> First Aid Kit ICT tools Resource persons Recommended textbooks Print media

8.2 TOPIC 2 PRODUCT DESIGN

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.2.1 HISTORY OF DESIGN AND TECHNOLOGY	<ul style="list-style-type: none"> • outline historical developments of Design and Technology • relate the developments to current Design and Technology situations 	<ul style="list-style-type: none"> • Indigenous architecture and inventions • Gothic architecture • Stone age designs and inventions • Industrial revolution inventions 	<ul style="list-style-type: none"> • Outlining historical developments of Design and Technology • Relating the developments to the current Design and Technology situations • Conducting educational tours 	<ul style="list-style-type: none"> • Recommended textbooks • ICT tools • Museums •
8.2.2 INTRODUCTION TO THE DESIGN PROCESS	<ul style="list-style-type: none"> • identify needs and opportunities for design • produce design specifications for problems identified • generate ideas as potential solutions to problems • produce an artefact based on their design solution • test and evaluate the final product 	<ul style="list-style-type: none"> • Design process cycle <ul style="list-style-type: none"> - Design situation - Research - Generation of ideas - Development - Realization - Testing and evaluation 	<ul style="list-style-type: none"> • Identifying and describing needs and opportunities for design • Formulating design specification • Generating possible solutions • Producing artefacts • Testing and evaluating the final product • Compiling design folios 	<ul style="list-style-type: none"> • Recommended textbooks • ICT tools • Educational tours

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.2.3 RELATED LEARNING AREAS	<ul style="list-style-type: none"> • discuss the relationship between Design and Technology and other learning areas • outline careers related to Design and Technology 	<ul style="list-style-type: none"> • Related learning areas (Science, Technology, Engineering and Mathematics: STEM) • Career opportunities 	<ul style="list-style-type: none"> • Discussing the relationship between Design and Technology and other learning areas • Outlining career opportunities • Undertaking educational tours 	<ul style="list-style-type: none"> • Recommended textbooks • ICT tools • Exhibitions

8.3 TOPIC 3 MATERIAL SCIENCE

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.3.1 TYPES OF MATERIALS	<ul style="list-style-type: none"> • state the physical and working properties of materials • explain the different types of materials • state the different uses of materials 	<ul style="list-style-type: none"> • Traditional and modern materials <ul style="list-style-type: none"> - Plastics - Wood - Metals - Composites - Textiles - Food - Clay 	<ul style="list-style-type: none"> • Stating the physical and working properties of materials • Explaining the different types of materials • Experimenting with different types of materials • Stating the uses of different types of materials 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Samples of materials • Testing equipment and chemicals • Finished products

8.4 TOPIC 4 SYSTEMS AND CONTROL

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.4.1 DESIGN AND MAKING	<ul style="list-style-type: none"> design and make systems explain the meaning of related terms in mechanisms, structures, electronic and services 	<ul style="list-style-type: none"> Systems: <ul style="list-style-type: none"> Mechanisms Structures Electronic Services (food, health, sports, electricity, telephone) 	<ul style="list-style-type: none"> Designing and making systems Explaining related terms Visiting relevant systems 	<ul style="list-style-type: none"> ICT tools Recommended textbooks Samples of systems Educational tours
8.4.2 ELECTRONICS	<ul style="list-style-type: none"> use correct symbols and conventions to draw circuit diagrams describe the operation of a circuit design circuits 	<ul style="list-style-type: none"> Sources of power Electronic components and circuits Electric circuits 	<ul style="list-style-type: none"> Using symbols and conventions Describing operations of circuits 	<ul style="list-style-type: none"> ICT tools Recommended textbooks Circuit board Requisite tools and equipment
8.4.3 ENERGY	<ul style="list-style-type: none"> Name the sources of energy state safety precautions for power sources design and make a product that is powered by at least one of the sources of energy 	<ul style="list-style-type: none"> Sources of energy <ul style="list-style-type: none"> Solar Hydro Wind Batteries Fuels Safety precautions 	<ul style="list-style-type: none"> Describing power sources Stating safety precautions for power sources Designing and making products 	<ul style="list-style-type: none"> ICT tools Recommended textbooks Posters

8.5 TOPIC 5 ENGINEERING SCIENCE

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.5.1 ENGINEERING CALCULATIONS	<ul style="list-style-type: none"> •convert units from one form to the other •calculate the quantities of materials required to complete a project •solve problems involving moments of forces 	<ul style="list-style-type: none"> • Units of measurement: <ul style="list-style-type: none"> - length, mass and volume • Bill of quantities • Moments of forces 	<ul style="list-style-type: none"> • Solving problems involving calculations with different units • Calculating the quantities of materials required to complete a project • Solving problems involving moments of forces 	<ul style="list-style-type: none"> • Recommended textbooks • ICT tools

8.6 TOPIC 6 USE AND MAINTENANCE OF TOOLS AND EQUIPMENT

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.6.1 CLASSIFICATION AND USES OF TOOLS	<ul style="list-style-type: none"> •identify measuring and marking out tools •use basic tools 	<ul style="list-style-type: none"> • Tools <ul style="list-style-type: none"> - Marking out - Measuring 	<ul style="list-style-type: none"> •Listing marking out and measuring tools •Discussing functions of measuring and marking out tools •Using basic tools 	<ul style="list-style-type: none"> • Recommended textbooks • ICT tools • Print media • Educational tours

8.7 TOPIC 7 MANUFACTURING

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.7.1 MANUFACTURING PROCESS	<ul style="list-style-type: none"> • name different types of manufacturing processes • explain manufacturing processes 	<ul style="list-style-type: none"> • Types of manufacturing processes such as: <ul style="list-style-type: none"> - Casting - Molding - Forming - Machining - Fabrication - Spinning - Weaving - Shaping 	<ul style="list-style-type: none"> • Discussing different types of manufacturing processes • Visiting manufacturing industries 	<ul style="list-style-type: none"> • ICT tools • Educational tours • Print media

8.8 TOPIC 8 DESIGN DRAWINGS

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.8.1 DRAWING PRINCIPLES	<ul style="list-style-type: none"> • apply different types of conventions to produce: <ul style="list-style-type: none"> - Observation drawings 	<ul style="list-style-type: none"> • Drawing conventions <ul style="list-style-type: none"> - Types of lines - Tone - Colour - Texture 	<ul style="list-style-type: none"> • Applying different types of conventions when producing observational and imaginative sketches 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Drawing paper such as:

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
	<ul style="list-style-type: none"> - Imaginative drawings 	<ul style="list-style-type: none"> - Patterns - Lettering - Freehand sketching - Computer sketching and painting 	<ul style="list-style-type: none"> • Producing free hand and computer sketches 	<ul style="list-style-type: none"> - Grid - Graph - Tracing - Water colour
8.8.2 GEOMETRICAL CONSTRUCTIONS	<ul style="list-style-type: none"> • state different types of drawing materials and equipment • construct angles, triangles, quadrilaterals and circles 	<ul style="list-style-type: none"> • Drawing tools and equipment • Construction of: <ul style="list-style-type: none"> - Angles - Triangles - Quadrilaterals - Circles 	<ul style="list-style-type: none"> • Stating different types of drawing materials and equipment • Constructing angles, triangles, quadrilaterals and circles 	<ul style="list-style-type: none"> • ICT tools • Drawing materials and equipment

8.9 TOPIC 9 ENTERPRISE SKILLS

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.9.1 ENVIRONMENT AND SOCIAL RESPONSIBILITY	<ul style="list-style-type: none"> •select materials based on environmental and sustainable considerations •recognize the different sources of energy 	<ul style="list-style-type: none"> •The environment <ul style="list-style-type: none"> - Deforestation - Reforestation - Recycling • Forms of energy 	<ul style="list-style-type: none"> •Selecting materials basing on environmental and sustainable considerations •Identifying the different sources of energy •Going on educational tours 	<ul style="list-style-type: none"> •ICT tools •Recommended textbooks •Resource persons
8.9.2 AESTHETICS	<ul style="list-style-type: none"> • apply appropriate finishing to products • select appropriate materials for product manufacture 	<ul style="list-style-type: none"> • Appearance of materials • Finishes 	<ul style="list-style-type: none"> • Applying appropriate finishes to products • Selecting appropriate materials for product manufacture 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Print media

FORM 2

8.0 COMPETENCY MATRIX

8.1 TOPIC 1 SAFETY AND HEALTH

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.1.1 SAFETY CONSIDERATIONS FOR POWER SOURCES	<ul style="list-style-type: none"> identify power sources explain safety considerations for different power sources 	<ul style="list-style-type: none"> Power sources and safety considerations 	<ul style="list-style-type: none"> Visiting power stations Explaining safety considerations for different power sources 	<ul style="list-style-type: none"> ICT tools Print media Resource persons Hazard warning signs
8.1.2 FIRST AID	<ul style="list-style-type: none"> administer First Aid in a working environment 	<ul style="list-style-type: none"> Electric shocks First Aid Kit 	<ul style="list-style-type: none"> Practicing First Aid operations 	<ul style="list-style-type: none"> First Aid Kit ICT tools Recommended textbooks Resource persons
8.1.3 SAFE USE OF TOOLS AND EQUIPMENT	<ul style="list-style-type: none"> state regulations and precautions to be observed when using different types 	<ul style="list-style-type: none"> Regulations/precautions on use of tools and equipment 	<ul style="list-style-type: none"> Observing regulations and precautions when using different types 	<ul style="list-style-type: none"> ICT tools Recommended textbooks Resource persons

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
	<ul style="list-style-type: none"> of tools and equipment use tools and equipment safely 		<ul style="list-style-type: none"> of tools and equipment Watching videos on safe use of tools and equipment Visiting the industry 	<ul style="list-style-type: none"> Print media
8.1.4 SAFE HANDLING OF MATERIALS	<ul style="list-style-type: none"> explain handling of materials use materials safely store materials properly 	<ul style="list-style-type: none"> Handling materials Correct use of materials Storage of materials 	<ul style="list-style-type: none"> Handling materials properly Using material safely Storing materials properly 	<ul style="list-style-type: none"> ICT tools Recommended textbooks Safety posters and videos

8.2 TOPIC 2 PRODUCT DESIGN

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.2.1 DESIGN PROJECTS	<ul style="list-style-type: none"> apply the design process in making artefacts to solve community based problems 	<ul style="list-style-type: none"> Design process cycle <ul style="list-style-type: none"> Design situation Research Generation of ideas Development Realization Testing and evaluation 	<ul style="list-style-type: none"> Identifying a situation which needs a solution Applying the design process in making artefacts to solve community based problems 	<ul style="list-style-type: none"> ICT tools Recommendation textbooks Resource persons Educational tours

8.3 TOPIC 3 MATERIAL SCIENCE

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.3.1 PROPERTIES OF MATERIALS	<ul style="list-style-type: none"> state properties of various materials 	<ul style="list-style-type: none"> Physical, mechanical and chemical properties of materials 	<ul style="list-style-type: none"> Discussing the various properties of materials Carrying out experiments 	<ul style="list-style-type: none"> ICT tools Recommended textbooks Sample materials

8.4 TOPIC 4 SYSTEMS AND CONTROL

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.4.1 JOINING AND ASSEMBLY	<ul style="list-style-type: none"> identify various methods of joining materials 	<ul style="list-style-type: none"> Types of joints Methods of joining Adhesives Fasteners and fastening 	<ul style="list-style-type: none"> Discussing various methods of joining materials Joining members of structures 	<ul style="list-style-type: none"> ICT tools Recommended textbooks Assembled Joints
8.4.2 VISUAL COMMUNICATION	<ul style="list-style-type: none"> interpret meanings of different colour codes 	<ul style="list-style-type: none"> Graphic communication 	<ul style="list-style-type: none"> Interpreting colour codes 	<ul style="list-style-type: none"> ICT tools

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
	<ul style="list-style-type: none"> explain the range and purpose of signs and symbols 	<ul style="list-style-type: none"> Graphic design Colour systems 	<ul style="list-style-type: none"> Designing drawing signs, symbols and logos 	<ul style="list-style-type: none"> Recommended textbooks Colour wheel
8.4.3 STRUCTURES AND MECHANISMS	<ul style="list-style-type: none"> identify and classify natural and man-made structures types of mechanisms 	<ul style="list-style-type: none"> Types of structures and mechanisms 	<ul style="list-style-type: none"> Identifying structures and mechanisms Designing structures and mechanisms 	<ul style="list-style-type: none"> ICT tools Recommended textbooks Educational tours

8.5 TOPIC 5 ENGINEERING SCIENCE

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.5.1 CALCULATIONS ON MACHINES	<ul style="list-style-type: none"> calculate: <ul style="list-style-type: none"> spindle speed of machines Gear ratio on different machines Mechanical advantage 	<ul style="list-style-type: none"> Ratio and speed on <ul style="list-style-type: none"> Pulleys Gears Velocity Ratio Mechanical Advantage 	<ul style="list-style-type: none"> Calculating spindle speed, ratio, velocity ratio, and mechanical advantage 	<ul style="list-style-type: none"> Recommended textbooks ICT tools Sample gears

8.6 TOPIC 6 USE AND MAINTENANCE OF TOOLS AND EQUIPMENT

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.6.1 TOOLS AND EQUIPMENT	<ul style="list-style-type: none"> • explain the uses of tools and equipment • select a correct tool for a particular job 	<ul style="list-style-type: none"> • Holding and supporting tools and equipment • Impelling and percussion tools 	<ul style="list-style-type: none"> • Discussing the use of tools and equipment • Demonstrating the correct use of tools and equipment 	<ul style="list-style-type: none"> • Textbooks • Tools • ICT tools • Print media

8.7 TOPIC 7 MANUFACTURING

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.7.1 MANUFACTURING PROCESS	<ul style="list-style-type: none"> • name different types of manufacturing • explain various steps involved in manufacturing • draw diagrams illustrating manufacturing processes • explain the importance of planning in manufacturing 	<ul style="list-style-type: none"> • Types of manufacturing processes • Steps involved in manufacturing • Flow diagrams of manufacturing processes <ul style="list-style-type: none"> - Inputs - Transformation - Output - Role of planning in manufacturing 	<ul style="list-style-type: none"> • Discussing different types of manufacturing processes • Explaining steps in different manufacturing processes • Drawing diagrams illustrating various manufacturing processes • Discussing the role of planning in manufacturing 	<ul style="list-style-type: none"> • ICT tools • Educational tours • Print media

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
			<ul style="list-style-type: none"> • Conducting educational tours • Watching videos 	

8.8 TOPIC 8 DESIGN DRAWINGS

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.8.1 GEOMETRICAL CONSTRUCTIONS	<ul style="list-style-type: none"> • Construct polygons 	<ul style="list-style-type: none"> • Polygons 	<ul style="list-style-type: none"> • Constructing polygons 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks
8.8.2 TYPES OF PROJECTIONS	<ul style="list-style-type: none"> • list different types of projections • produce drawings using the projections 	<ul style="list-style-type: none"> • Perspective • Isometric • Oblique • Orthographic 	<ul style="list-style-type: none"> • Listing different types of projections • Producing drawings using different types of projections 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks

8.9 TOPIC 9 ENTERPRISE SKILLS

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.9.1 ERGONOMICS AND ANTHROPOMETRY	<ul style="list-style-type: none"> • explain the application of ergonomics and anthropometrics in designs • apply ergonomics and anthropometrics in design 	<ul style="list-style-type: none"> • Human body proportions • Ergonomics and products 	<ul style="list-style-type: none"> • Explaining ergonomics and anthropometrics in design • Applying ergonomics and anthropometrics in design • Modelling 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Models
8.9.2 DESIGN PROJECT	<ul style="list-style-type: none"> • carryout design projects 	<ul style="list-style-type: none"> • The design process • Principles and elements of design 	<ul style="list-style-type: none"> • Designing and modelling 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
	<ul style="list-style-type: none">analyze the relevance of function and aesthetics		<ul style="list-style-type: none">Analyzing the relevance of function and aesthetics	<ul style="list-style-type: none">models

FORM 3

8.0 COMPETENCY MATRIX

8.1 TOPIC 1 SAFETY AND HEALTH

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.1.1 SAFETY AND PROTECTIVE CLOTHING	<ul style="list-style-type: none"> • administer first aid in a work environment • rehearse regular fire drills 	<ul style="list-style-type: none"> • Workshop accidents and treatments • Fire drills 	<ul style="list-style-type: none"> • Administering first aid in a work environment • Rehearsing fire drills regularly 	<ul style="list-style-type: none"> • ICT tools • Print media • Hazard warning signs • Firefighting equipment
8.1.2 PRACTICAL USE OF TOOLS AND EQUIPMENT	<ul style="list-style-type: none"> • use machines, equipment and precision instruments proficiently 	<ul style="list-style-type: none"> • Machines and equipment • Precision instruments 	<ul style="list-style-type: none"> • Using machines, equipment and precision instruments proficiently 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Machines, equipment and precision instruments
8.1.3 FIRST AID	<ul style="list-style-type: none"> • administer First Aid 	<ul style="list-style-type: none"> • First Aid procedures 	<ul style="list-style-type: none"> • Administering First Aid to accident victims 	<ul style="list-style-type: none"> • ICT tools • First Aid Kit • Print media • Fire extinguishers

8.2 TOPIC 2 PRODUCT DESIGN

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.2.1 THE DESIGN PROCESS	<ul style="list-style-type: none"> • apply the design process to solve problems and add value to the community • produce mock-ups as a means of testing feasibility of a solution • produce prototypes 	<ul style="list-style-type: none"> • The design process 	<ul style="list-style-type: none"> • Applying the design process to solve community based problems • Making and testing mock-ups and models • Visiting the community to undertake research 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Tools and equipment
8.2.2 DESIGN PROJECTS	<ul style="list-style-type: none"> • Identify community based situations and apply the design process to develop solutions 	<ul style="list-style-type: none"> • Design process • Cultural, economic and technological influences on design solutions 	<ul style="list-style-type: none"> • Developing solutions • Making mock-ups, models and prototypes • Testing and evaluating • Compiling design folios 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Educational tours

8.3 TOPIC 3 MATERIAL SCIENCE

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.3.1 PRODUCTION OF MATERIALS	<ul style="list-style-type: none"> • outline the production of different materials 	<ul style="list-style-type: none"> • Production of materials <ul style="list-style-type: none"> - Wood - Plastics - Metals - Composites - Textiles - Food 	<ul style="list-style-type: none"> • Outlining the processes involved in producing materials 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Educational tours

8.4 TOPIC 4 SYSTEMS AND CONTROL

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.4.1 ENERGY	<ul style="list-style-type: none"> • describe power sources used to drive mechanical systems • determine costs of powering systems and ways of reducing potential energy 	<ul style="list-style-type: none"> • Power sources • Kinds and forms of energy • Mechanical systems 	<ul style="list-style-type: none"> • Describing sources of power systems • Calculating costs of powering systems • Using energy 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks
8.4.2 TESTING AND EVALUATION	<ul style="list-style-type: none"> • test finished products for stress and strain • evaluate product against set specification 	<ul style="list-style-type: none"> • Strain and stress • Use of testing instruments 	<ul style="list-style-type: none"> • Testing finished products on strain and stress • Evaluating projects • Exhibiting finished products 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Exhibitions at School Annual Science Sports

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
				and Arts Festival (SASSAF)

8.5 TOPIC 5 ENGINEERING SCIENCE

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.5.1 CALCULATIONS ON MACHINES	<ul style="list-style-type: none"> • generate comprehensive bill of quantities for a project • cost different types of projects • solve practical problems involving: <ul style="list-style-type: none"> - Friction - Trigonometry - Pressure - Heat 	<ul style="list-style-type: none"> • Bill of quantities • Costing • Efficiency • Friction • Trigonometry • Transposition of formula • Pressure • Heat 	<ul style="list-style-type: none"> • Generating comprehensive bill of quantities • Costing different types of projects • Solving practical problems involving: <ul style="list-style-type: none"> - Friction - Trigonometry - Pressure - Heat 	<ul style="list-style-type: none"> • Recommended textbooks • ICT tools • Machines

8.6 TOPIC 6 USE AND MAINTENANCE OF TOOLS, EQUIPMENT AND MACHINES

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.6.1 USE AND MAINTENANCE OF TOOLS, EQUIPMENT AND MACHINES	<ul style="list-style-type: none"> • use tools, equipment and machines proficiently • maintain tools, equipment and machines 	<ul style="list-style-type: none"> • Use of tools, equipment and machines • Sharpening of tools • Lubrication • Maintenance systems <ul style="list-style-type: none"> - Routine - Preventive 	<ul style="list-style-type: none"> • Using tools, equipment and machines • Demonstrating sharpening of tools • Servicing tools, equipment and machines • Conducting Educational tours 	<ul style="list-style-type: none"> • Print media • ICT tools • Recommended textbooks

8.7 TOPIC 7 MANUFACTURING

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.7.1 INDUSTRIAL PLANT LAYOUT	<ul style="list-style-type: none"> • define plant layout • name different types of plant layout • discuss advantages and disadvantages of each type of layout 	<ul style="list-style-type: none"> • Types of plant layout: <ul style="list-style-type: none"> - Product line - Process or functional - Fixed position - Combination type 	<ul style="list-style-type: none"> • Defining plant layout • Naming different types of layouts • Discussing advantages and disadvantages of each type of layout • Visiting industrial plants 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Resource persons • Educational tours

8.8 TOPIC 8 DESIGN DRAWINGS

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.8.1 PRODUCTION DRAWINGS	<ul style="list-style-type: none"> • produce/generate the following types of drawings: <ul style="list-style-type: none"> - Working - Component - Assembly - Presentation - Exploded views - Developments • produce proportional drawings 	<ul style="list-style-type: none"> • Working drawings <ul style="list-style-type: none"> - Component drawing - Sections - Assembly - Parts lists - Presentation - Exploded views - Developments • Proportion 	<ul style="list-style-type: none"> • Generating different types of drawing • Using ICT for drawing 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks
8.8.2 INTRODUCTION TO COMPUTER AIDED DRAWING	<ul style="list-style-type: none"> • use appropriate software • set out space page on a computer • set page size • identify the drawing commands • use drawing commands to generate shapes 	<ul style="list-style-type: none"> • Drawing software • Space page • Page setting • Drawing commands 	<ul style="list-style-type: none"> • Setting out space page on a computer • Setting page size • Identifying the drawing commands • Using drawing commands to draw shapes • Visiting local exhibition fairs 	<ul style="list-style-type: none"> • Computers and softwares • Resource persons • ICT tools • Manuals

8.9 TOPIC 9 ENTERPRISE SKILLS

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.9.1 MARKETING STRATEGIES	<ul style="list-style-type: none"> • explain marketing strategies • apply marketing strategies in business 	<ul style="list-style-type: none"> • Marketing • Advertising • Branding • Packaging 	<ul style="list-style-type: none"> • Discussing marketing strategies • Applying marketing strategies in business • Conducting promotions such as road shows 	<ul style="list-style-type: none"> • Print media • Exhibitions • ICT tools

FORM 4

8.0 COMPETENCY MATRIX

8.1 TOPIC 1 SAFETY AND HEALTH

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.1.1 HAZARDOUS SUBSTANCES	<ul style="list-style-type: none"> • identify hazardous substances • handle and store hazardous substances safely 	<ul style="list-style-type: none"> • Chemicals • Gases 	<ul style="list-style-type: none"> • Identifying hazardous substances • Handling and storing hazardous substances 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Hazardous substances

8.2 TOPIC 2 PRODUCT DESIGN

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.2.1 THE DESIGN PROCESS	<ul style="list-style-type: none"> • produce and interpret data • organize and plan in detail the production of the selected solution • suggest any possible improvements and modifications • apply the design process in making artefacts to solve community based problems • understand the importance of anthropometrics and ergonomics 	<ul style="list-style-type: none"> • Design process cycle • Design situation • Research • Generation of ideas • Development • Realization • Testing and evaluation • The design project • Design ergonomics and anthropometry • C.A.D/CAM • Costing 	<ul style="list-style-type: none"> • Producing and interpreting data from charts, graphs and experiments • Organizing and planning detailed production drawings • Implementing possible improvements and modification • Working on the project 	<ul style="list-style-type: none"> • ICT tools • Recommended texts • Case studies
8.2.2 DESIGN PROJECT MANAGEMENT	<ul style="list-style-type: none"> • plan for the required resources • plan manufacturing stages • monitor and make necessary adjustments 	<ul style="list-style-type: none"> • Project scheduling • Planning for resources • Project monitoring 	<ul style="list-style-type: none"> • Planning the stages of manufacture • Planning for resources • Monitoring and making necessary adjustments 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Planning charts • Educational tours

8.3 TOPIC 3 MATERIAL SCIENCE

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.3.1 SHAPES, FORM AND USES OF MATERIALS	<ul style="list-style-type: none"> • Identify different forms and shapes of materials • test different properties of materials 	<ul style="list-style-type: none"> • Forms and shapes of materials • Material tests such as malleability, hardness, conductivity, tenacity, moisture content 	<ul style="list-style-type: none"> • Identifying different forms and shapes of materials for production • Testing properties of materials for sustainability 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Print media
8.3.2 FINISHING	<ul style="list-style-type: none"> • prepare surfaces for finishing • apply suitable finishes 	<ul style="list-style-type: none"> • Types of finishes and applications such as: <ul style="list-style-type: none"> - Electro plating - Painting - Polishing - Coating - Garnishing - Vanishing • Choice of finishing for materials 	<ul style="list-style-type: none"> • Preparing surfaces for finishing • Applying suitable finishes 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Educational tours • Requisite equipment

8.4 TOPIC 4 SYSTEMS AND CONTROL

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.4.1 LEVERS, CRANKS AND LINKAGES	<ul style="list-style-type: none"> •classify levers •identify different types of motions •apply hydraulics and pneumatics in designs 	<ul style="list-style-type: none"> •Classes of levers •Types of motions •Hydraulics and pneumatics 	<ul style="list-style-type: none"> •Classifying levers •Identifying different types of motions •Sketching different types of levers and linkages •applying hydraulics and pneumatics in designs 	<ul style="list-style-type: none"> •ICT tools •Recommended textbooks •Educational tours
8.4.2 GEAR MECHANISMS	<ul style="list-style-type: none"> •identify different types of gears •calculate gear ratios and transmission speed •apply gear systems in design 	<ul style="list-style-type: none"> •Types of gears <ul style="list-style-type: none"> - Rack and pinion - Worm drives - Bevel gears - Spur gears 	<ul style="list-style-type: none"> •Identifying different types of gears •Calculating gear ratios •Applying gear systems in design 	<ul style="list-style-type: none"> •ICT tools •Different types of gears •Recommended textbooks
8.4.3 DRIVERS: BELT AND CHAINS	<ul style="list-style-type: none"> •identify different types of drives •discuss the use of belts and chain drive systems 	<ul style="list-style-type: none"> •Transfer of motion and power •Uses of belt and chain drive systems 	<ul style="list-style-type: none"> •Identifying different types of drives •Discussing the uses of belts and chain drive systems •Applying the belt and chain drive system in design 	<ul style="list-style-type: none"> •ICT tools •Recommended textbooks •Belts, chairs, sprockets, pulleys •Educational tour

8.5 TOPIC 5 ENGINEERING SCIENCE

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.5.1 CALCULATIONS ON MACHINES	<ul style="list-style-type: none"> • solve practical problems involving work, power, energy and electricity • produce bill of quantities for projects • cost projects • apply calculations on direct stress and strain to solve practical problems 	<ul style="list-style-type: none"> • Work, power and energy • Electricity • Bill of quantities • Costing • Forces • Stress and strain 	<ul style="list-style-type: none"> • Solving practical problems involving work, power, energy, electricity, stress and strain • Producing bill of quantities for projects • Costing projects 	<ul style="list-style-type: none"> • Recommended textbooks • ICT tools • Machines

8.6 TOPIC 6 USE AND MAINTENANCE OF TOOLS, EQUIPMENT AND MACHINES

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.6.1 USE AND MAINTENANCE OF TOOLS, EQUIPMENT AND MACHINES	<ul style="list-style-type: none"> • use tools, equipment and machines proficiently • maintain tools, equipment and machines 	<ul style="list-style-type: none"> • Use of tools, equipment and machines • Sharpening of tools • Lubrication • Maintenance systems <ul style="list-style-type: none"> - Routine • Preventive 	<ul style="list-style-type: none"> • Using tools, equipment and machines • Demonstrating sharpening of tools • Servicing tools, equipment and machines • Conducting Educational tours 	<ul style="list-style-type: none"> • Print media • ICT tools • Recommended textbooks

8.7 TOPIC 7 MANUFACTURING

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.7.1 MANUFACTURING SYSTEMS	<ul style="list-style-type: none"> • name different types of manufacturing systems • explain the advantages and disadvantages of manufacturing system • state uses of each manufacturing system 	<ul style="list-style-type: none"> • Types of manufacturing systems: <ul style="list-style-type: none"> - Mass production - Batch production - Job shop production - Project • Advantages and disadvantages of each manufacturing system • Uses of each manufacturing system 	<ul style="list-style-type: none"> • Naming different types of manufacturing systems • Explaining the advantages and disadvantages of manufacturing systems • Stating uses of different manufacturing systems 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Educational tours • Resource persons • Print media

8.8 TOPIC 8 DESIGN DRAWINGS

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.8.1 PRODUCTION DRAWINGS	<ul style="list-style-type: none"> • Produce the following types of drawings: <ul style="list-style-type: none"> - Sections - Developments - Presentation and assembly 	<ul style="list-style-type: none"> • Sections • Developments • Presentation • Assembly 	<ul style="list-style-type: none"> • Producing different types of drawings 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Case studies
8.8.2 COMPUTER AIDED DRAWING	<ul style="list-style-type: none"> • set out space page on a computer • set paper sizes • identify the drawing commands to generate shapes 	<ul style="list-style-type: none"> • Space page • Page setting • Drawing commands 	<ul style="list-style-type: none"> • Setting out space page on a computer • Setting paper size • Identifying the drawing commands • Using drawing commands to draw shapes • Visiting local exhibition fairs 	<ul style="list-style-type: none"> • Computers and CAD software • Resource persons • ICT tools

8.9 TOPIC 9 ENTERPRISE SKILLS

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (knowledge, skills, values and attitudes)	SUGGESTED LEARNING ACTIVITIES AND NOTES	SUGGESTED RESOURCES
8.9.1 MARKET INFLUENCES	<ul style="list-style-type: none"> • assess market forces that influence production • explain the role of technology in product design 	<ul style="list-style-type: none"> • Market forces • Role of technology 	<ul style="list-style-type: none"> • Assessing market forces that influence production • Explaining the role of technology in product design 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • Resource persons
8.9.2 QUALITY ASSURANCE AND CONTROL	<ul style="list-style-type: none"> • critique products • test the performance of the product against the original specifications • evaluate finished products • register products for patenting 	<ul style="list-style-type: none"> • Testing and evaluation of products • Patenting and Intellectual Property Rights (IPR) 	<ul style="list-style-type: none"> • Evaluating existing products • Testing performance of products against given specifications • Evaluating finished products • Registering finished products for patenting 	<ul style="list-style-type: none"> • ICT tools • Recommended textbooks • patent by laws

9.0 ASSESSMENT

Learners shall be assessed through School Based Continuous Assessment (SBCA) and Summative Assessment (SA). These assessments shall be guided by the principles of inclusivity, practicability, authenticity, transparency, flexibility, validity and reliability. The principles are crucial for creating a supportive and effective learning environment that fosters growth and development in learners. Arrangements, accommodations and modifications shall be visible to enable candidates with special needs to access assessments.

This section covers the assessment objectives, the assessment model, the scheme of assessment, and the specification grid.

9.1 Assessment Objectives

Learners shall be assessed on their ability to:

- 9.1.1 demonstrate awareness of societal and technological influences in design
- 9.1.2 demonstrate the ability to apply knowledge in design, materials, processes and basic technology
- 9.1.3 define a need by considering appropriate human, functional and aesthetic factors
- 9.1.4 gather and use relevant information for design decision making
- 9.1.5 generate and develop ideas using appropriate methods
- 9.1.6 test and evaluate their design ideas, making appropriate modifications
- 9.1.7 apply appropriate communication techniques to inform and defend ideas
- 9.1.8 plan the steps in making artefact
- 9.1.9 realise artefact in appropriate material(s) using suitable techniques
- 9.1.10 make appropriate modifications to enhance artefact

9.2 Assessment Model

Assessment of learners shall be both Continuous and Summative as illustrated in Figure 1. School Based Continuous Assessment shall include recorded activities from the Design Projects done by the learners. The mark shall be included on learners' end of term and

year reports. Summative assessment at school level shall include terminal examinations which are at the end of the term and year.

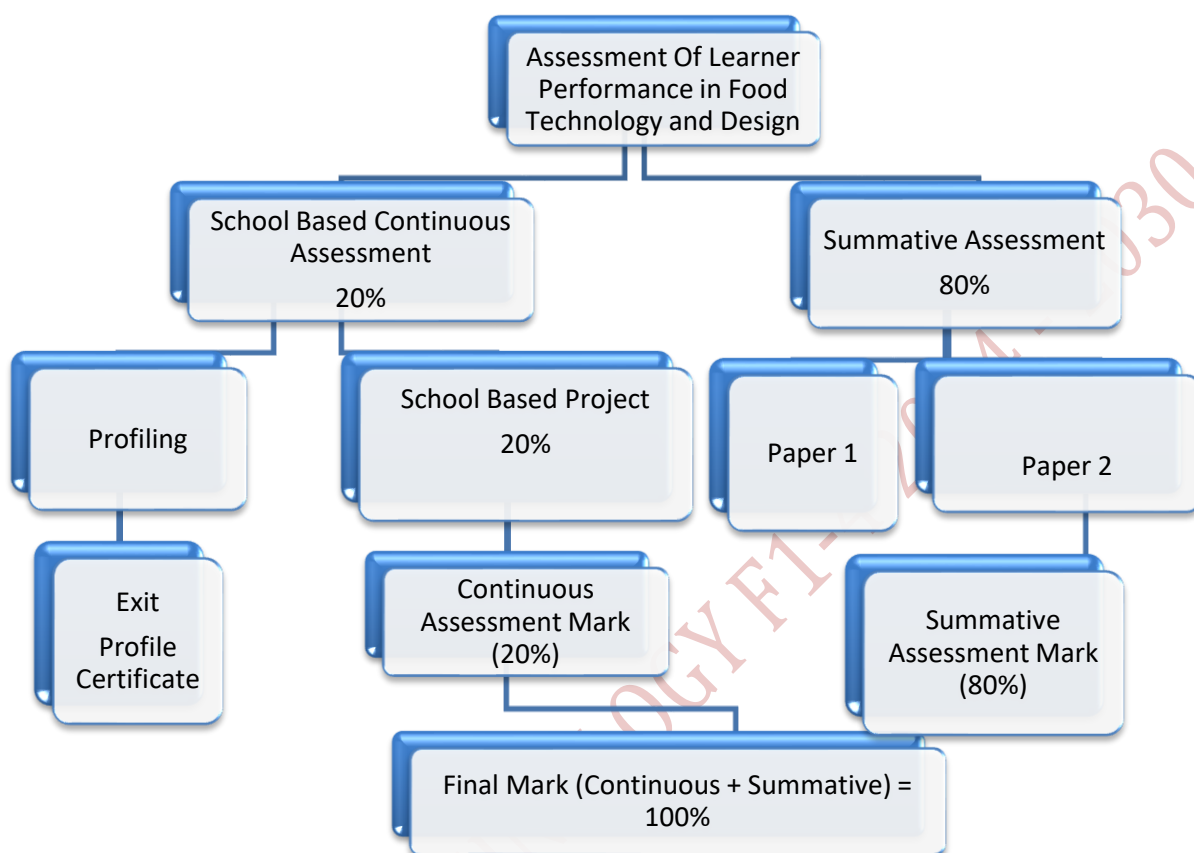


Fig. 1 Assessment Model

In addition, learners shall be profiled and learner profile records established. Learner profile certificates shall be issued for checkpoints assessment in schools as per the dictates of the Teacher's Guide to Learning and Assessment. The aspects to be profiled shall include learner's prior knowledge, values and skills, and subsequently the new competences acquired at any given point.

9.3 Scheme of Assessment

Learners at Lower secondary level will be assessed using both School Based Continuous Assessment and Summative Assessment. From Form 1 -4, learners will do a school-based project per form, per year and per learning area which will contribute 20% to the end of term and year mark. Public examination candidates at secondary level are expected to complete two (2) school-based projects per learning area at form 3 and 4 level, which will contribute 20% to the final mark at Form 4.

FORM OF ASSESSMENT	WEIGHTING
School Based Continuous Assessment	20%
Summative Assessment	80%
Total	100%

9.4: School – Based Design Project: Continuous Assessment Scheme

Project Execution Stages	Project Stage Description	Timelines	Marks
1	Problem Identification	January	5
2	Investigation of related ideas to the problem/innovation	February	10
3	Generation of possible solutions	March	10
4	Selecting the most suitable solution	April-May	5
5	Refinement of selected solution	June	5
6	Presentation of the final solution	July	10
7	Evaluation of the solution and Recommendations	August-September	5
	TOTAL		50

The learning and assessment scheme shows the stages that shall be executed by pupils and the timeline at which each stage shall be carried out. Possible marks, totalling 50, are highlighted to indicate how much can be allocated.

9.5 Description of the ZIMSEC Summative Assessment

Summative assessment consists of two (2) papers of equal weighting.

Paper	Paper type	Marks	Duration	Weighting
1	Structured questions	80	3 hours	40%
2	Practical examinations	80	3 hours	40%
TOTAL				80%

Paper 1: Written examination

The paper consists of 2 sections.

SECTION A

Six compulsory structured questions on design processes and design contents

SECTION B

Four (4) questions will be answered out of 8 questions on Systems Control, Material Science, Engineering Science and Design Drawing

TIME: 3 hours

WEIGHTING: 40%

Paper 2: 3 Hours

This is a practical examination that learners will do insuit.

9.5 SPECIFICATION GRID

Objectives/Components	Paper 1	Paper 2
Knowledge with understanding	40%	20%
Practical Skills and their application	40%	50%
Decision making and judgement	20%	30%
Total	100%	100%

9.7 Assessment Instruments/Tools:

The following are suggested tools

- Check list
- Observation schedules
- Tests
- Rating Scale
- Exercises
- Practical activities
- School based continuous projects