



ZIMBABWE

MINISTRY OF PRIMARY AND SECONDARY EDUCATION

DESIGN AND TECHNOLOGY SYLLABUS

FORMS 1 - 4

2015 - 2022

Curriculum Development and Technical Services
P. O. Box MP 133
Mount Pleasant
Harare

© All Rights Reserved
2015



ACKNOWLEDGEMENTS

The Ministry of Primary and Secondary Education would like to acknowledge the following for their valued contribution in the production of this syllabus:

- The National Design and Technology Syllabus Panel
- Zimbabwe School Examinations Council (ZIMSEC)
- Belvedere Technical Teachers' College
- University of Zimbabwe (UZ), Department of Technical Education
- National University of Science and Technology (NUST)
- Captains of Industry
- United Nations Children's Fund (UNICEF)
- United Nations Education, Scientific and Cultural Organisation (UNESCO)

CONTENTS

ACKNOWLEDGEMENTS	i
CONTENT	ii
1.0 PREAMBLE	1
2.0 PRESENTATION OF SYLLABUS	1
4.0 OBJECTIVES.....	2
5.0 METHODOLOGY AND TIME ALLOCATION.....	2
6.0 TOPICS	2
7.0 SCOPE AND SEQUENCE	4
FORM 1	6
FORM 2.....	13
FORM 3.....	19
FORM 4.....	25
9.0ASSESSMENT.....	31
CONTINUOUS AND SUMMATIVE ASSESSMENT.....	32

1.0 PREAMBLE

1.1 INTRODUCTION

The Design and Technology syllabus is designed for Forms 1-4 learners. It uses scientific, technological, engineering, mathematical (STEM) principles and design processes in solving problems through creativity, innovation and invention for cultural and economic well-being of society. This approach encourages the acquisition of competency based technological skills, knowledge and attitudes which are relevant to the requirements of trade and industry, further studies and self-reliance. The syllabus embraces inclusivity in the learning and teaching of Design and Technology.

1.2 RATIONALE

The educational philosophy of the syllabus is concerned with the development of skills and ethical attributes (Unhu/Ubuntu/Vumunhu) which will emphasize the learners' role in making and shaping the environment whilst adding value to it. This will encourage the learner to employ problem solving skills to produce functional products using appropriate tools and materials for the community, nation and global markets. The syllabus sets out to promote desirable enterprise, recreational and other life skills relevant to the contemporary society. The syllabus will enable learners to explore numerous Design and Technology career opportunities. This will also encourage learners to value the use of multi- materials, Science, Mathematics and other related learning areas in a sustainable manner.

The Design and Technology syllabus enables learners to develop skills in:

- Design thinking
- Problem solving
- Leadership
- Enterprising
- Communication
- Creativity
- Invention
- Innovation
- Value judgment
- Sustainability

1.3 SUMMARY OF CONTENT

This syllabus covers theory and practical activities in

Design and Technology . It focuses on:

- Health and safety
- Product design
- Material science
- Systems and control
- Engineering science
- Use and maintenance of tools and equipment
- Manufacturing
- Design drawing and realization
- Enterprise skills

1.4 ASSUMPTIONS

The syllabus assumes 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 issues have been taken into consideration:

- Gender
- Inclusivity
- Environmental issues
- Information Communication Technology (ICT) Tools
- Disaster Risk Management
- Life Skills
- Collaboration
- Sexuality, HIV and AIDS
- Respect for life
- Heritage studies
- Children's rights and Responsibilities

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 and Assessment.

3.0 AIMS

The syllabus helps learners to:

- 3.1 develop confidence, creativity, competency 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
- 3.3 foster a range of transferable skills and attitudes
- 3.4 make aesthetic, economic, moral and technological value judgement in design
- 3.5 develop enterprising skills through problem solving
- 3.6 develop an awareness of design in the areas of social, culture and environment

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
- 4.7 make aesthetic, economic, moral (ethical) and technological value judgement
- 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 maintenance culture
- 4.11 recognise the work of designers, craftsmen, scientists and technologists in industry and society
- 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

5.0 METHODOLOGY AND TIME ALLOCATION

METHODOLOGY

This syllabus is based on learner-centred and multi-sensory approaches in the learning and teaching of Design and Technology. Material Science, Engineering Science, Mathematics and Drawing should be integral part of every exercise. The approaches should also create awareness of the issues of sustainability by involving learners in waste management. The use of ICT (Computer Aided Design and Computer Aided Manufacturing -CAD/CAM) is a requirement.

Suggested Methods

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

Time Allocation

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

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"> Rules and regulations in the working environment Safety precautions Protective clothing First Aid 	<ul style="list-style-type: none"> Protective clothing 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"> The design process Design projects 	<ul style="list-style-type: none"> The design process Design projects Cultural and technological influences on design products Design tools 	<ul style="list-style-type: none"> The design process 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 Groups of systems and control 	<ul style="list-style-type: none"> Joining and assembly Visual communication Structures and mechanisms 	<ul style="list-style-type: none"> Energy Testing and evaluation Structures and mechanisms 	<ul style="list-style-type: none"> Levers Gear mechanisms Drivers: Belts and Chains
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 Tools and equipment	<ul style="list-style-type: none"> Classification: <ul style="list-style-type: none"> - measuring and marking out tools - holding and supporting tools - Precision and impelling tools 	<ul style="list-style-type: none"> Handling and maintenance of tools and equipment 	<ul style="list-style-type: none"> Use and maintenance of tools, equipment and machines 	<ul style="list-style-type: none"> Maintenance of tools and equipment

TOPIC	FORM 1	FORM 2	FORM 3	FORM 4
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 Ddesign 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

FORM 1

8.0 COMPETENCY MATRIX

8.1 TOPIC 1 HEALTH AND SAFETY

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.1.1 Workshop safety		Health and Safety - 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 • Print Media • Fire- fighting equipment • Resource persons • ICT tools • Educational tours
8.1.2 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 of a First Aid kit • Simulating of first aid operations and activities 	<ul style="list-style-type: none"> • First Aid Kit, ICT tools • Resource persons • Print media

8.2 TOPIC 2 PRODUCT DESIGN

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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"> Museums ICT tools
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 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 specifications Generating possible solutions Producing artefacts Testing and evaluating the final product Compiling design folios 	<ul style="list-style-type: none"> ICT tools Educational tours
8.2.3 Related learning areas	<ul style="list-style-type: none"> discuss the relationship between Design and Technology and other learning areas outline career opportunities 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"> ICT tools Exhibitions

8.3 TOPIC 3 MATERIAL SCIENCE

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.3.1 Types of materials	<ul style="list-style-type: none"> state the physical and working properties of materials compare the different types of materials state the different uses of materials 	<ul style="list-style-type: none"> indigenous and modern materials such as: <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 comparing 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 Samples of materials Testing equipment and chemicals Finished products

8.4 TOPIC 4 SYSTEMS AND CONTROL

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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 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 Circuit board Requisite tools and equipment

8.4 TOPIC 4 SYSTEMS AND CONTROL

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.4.3 Energy	<ul style="list-style-type: none"> name the sources of energy discuss 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 Print media

8.5 TOPIC 5 ENGINEERING SCIENCE

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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"> ICT tools

8.6 TOPIC 6 TOOLS AND EQUIPMENT

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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 - 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"> • ICT tools • Educational tours

8.7 TOPIC 7 MANUFACTURING

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.7.1 Manufacturing process	<ul style="list-style-type: none"> • name types of manufacturing processes • explain types of manufacturing processes 	<ul style="list-style-type: none"> • Types of manufacturing processes such as: <ul style="list-style-type: none"> - Casting - Moulding - Forming - Machining - Fabrication - Spinning - Weaving - Shaping 	<ul style="list-style-type: none"> • Discussing 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

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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 - imaginative drawings 	<ul style="list-style-type: none"> • Drawing conventions <ul style="list-style-type: none"> - Types of lines - Tone - Colour - Texture - Patterns - Lettering - Freehand sketching - Computer sketching and painting 	<ul style="list-style-type: none"> • Applying different types of conventions when producing observational and imaginative sketches • Producing free hand and computer sketches 	<ul style="list-style-type: none"> • ICT tools • Print media • Drawing paper such as: <ul style="list-style-type: none"> - Grid - Graph - Tracing • Water colours
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

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.9.1 Environment and social responsibility	<ul style="list-style-type: none"> • select materials based on environmental and sustainable considerations • recognise 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 based on environmental and sustainable considerations • Identifying the different sources of energy, • Conducting educational tours 	<ul style="list-style-type: none"> • ICT tools • Resource persons

8.9 TOPIC 9 ENTERPRISE SKILLS

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.9.2Aes- thetics	<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

FORM 2

8.0 COMPETENCY MATRIX

8.1 TOPIC 1 HEALTH AND SAFETY

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.1.1 safety consideration 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 • 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 tool • Resource persons

8.1 TOPIC 1 HEALTH AND SAFETY

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
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 of tools and equipment use tools and equipment safely 	<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 of tools and equipment Watching videos on safe use of tools and equipment Visiting relevant industries 	<ul style="list-style-type: none"> ICT tools Resource persons
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 materials safely Storing materials properly 	<ul style="list-style-type: none"> ICT tools Print media

8.2 TOPIC 2 PRODUCT DESIGN

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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 Design situation Research Generation of ideas Development Realization Testing and evaluation 	<ul style="list-style-type: none"> Identifying situations which need a solutions Applying the design process in making artefacts to solve community based problems 	<ul style="list-style-type: none"> ICT tools Resource persons Educational tours

8.3 TOPIC 3 MATERIAL SCIENCE

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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 Sample materials

8.4 TOPIC 4 SYSTEMS AND CONTROL

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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 Assembled Joints
8.4.2 Visual communication	<ul style="list-style-type: none"> interpret meanings of different colour codes explain the range and purpose of signs and symbols 	<ul style="list-style-type: none"> Graphic communication Graphic design Colour systems 	<ul style="list-style-type: none"> Interpreting colour codes Designing and drawing signs, symbols and logos 	<ul style="list-style-type: none"> ICT tools Colour wheel

8.5 TOPIC 5 ENGINEERING SCIENCE

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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"> • ICT tools • Sample gears

8.7 TOPIC 7 MANUFACTURING

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.7.1 Manufacturing processes	<ul style="list-style-type: none"> • name types of manufacturing processes • 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 - Inputs, Outputs - Transformation • Role of planning in manufacturing 	<ul style="list-style-type: none"> • Discussing types of manufacturing processes • Explaining steps in different manufacturing processes • Drawing diagrams illustrating various manufacturing processes • Discussing the role of planning in manufacturing • Conducting educational tours • Watching videos 	<ul style="list-style-type: none"> • ICT tools • Educational tours

8.6 TOPIC 6 TOOLS AND EQUIPMENT

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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"> Tools ICT tools

8.8 TOPIC 8 DESIGN DRAWINGS

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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
8.8.2 Types of projections	<ul style="list-style-type: none"> identify types of projections produce drawings using the projections 	<ul style="list-style-type: none"> Different types of projection <ul style="list-style-type: none"> Perspective Isometric Oblique Orthographic 	<ul style="list-style-type: none"> Producing drawings using different types of projections 	<ul style="list-style-type: none"> ICT tools Print media

8.9 TOPIC 8 ENTERPRISE SKILLS

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.9.1 Ergonomics and anthropometry	<ul style="list-style-type: none"> explain the application of ergonomics and anthropometrics in design 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 Models
8.9.2 Design projects	<ul style="list-style-type: none"> Carry out design projects analyse the relevance of function and aesthetics 	<ul style="list-style-type: none"> The design process Principles and elements of design 	<ul style="list-style-type: none"> Designing and modelling Analyzing the relevance of function and aesthetics 	<ul style="list-style-type: none"> ICT tools Models

FORM 3

8.0 COMPETENCY MATRIX

8.1 TOPIC 1 HEALTH AND SAFETY

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.1.1 safety 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 • Hazard warning signs • Fire fighting equipment

8.1 TOPIC 1 HEALTH AND SAFETY

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
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 to 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 Fire extinguishers

8.2 TOPIC 2 PRODUCT DESIGN

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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 tool 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 prototype types, Testing and evaluating Compiling design folios 	<ul style="list-style-type: none"> ICT tools Educational tours

8.3 TOPIC 3 MATERIAL SCIENCE

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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 such as <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 Educational tours

8.4 TOPIC 4 SYSTEMS AND CONTROL

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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 Print Media
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 stress and strain Evaluating projects Exhibiting finished products 	<ul style="list-style-type: none"> ICT tools Print media Exhibitions at School Annual Science Sports and Arts Festival (SASSAF)

8.5 TOPIC 5 ENGINEERING SCIENCE

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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"> • ICT tools • Machines

8.6 TOPIC 6: TOOLS AND EQUIPMENT

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.6.1 Use and maintenance of tools and equipment 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 - 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"> • ICT tools

8.7 TOPIC 7 MANUFACTURING

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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 • Resource persons • Educational tours

8.8 TOPIC 8 DESIGN DRAWINGS

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.8.1 Production drawings	<ul style="list-style-type: none"> • produce 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 • Print Media
8.8.2 Introduction to computer aided drawings	<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 software • Resource persons • ICT tools • Manuals

8.9 TOPIC 9 ENTERPRISE SKILLS

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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"> • Exhibitions • ICT tools • Print Media

FORM 4

8.0 COMPETENCY MATRIX

8.1 TOPIC 1 HEALTH AND SAFETY

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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 • Print media • Samples of hazardous substances

8.2 TOPIC 2 PRODUCT DESIGN

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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 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 Print media Educational tours

8.3 TOPIC 3 MATERIAL SCIENCE

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.3.1 Shapes-forms 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 Print media

8.3 TOPIC 3 MATERIAL SCIENCE

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
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"> - Electroplating - 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 • Educational tours • Requisite equipment

8.4 TOPIC 4 SYSTEMS AND CONTROL

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.4.1 Levers cranks and linkages	<ul style="list-style-type: none"> • classify levers • identify types of motions • apply hydraulics and pneumatics in design 	<ul style="list-style-type: none"> • Classes of levers • Types of motions • Hydraulics and pneumatics 	<ul style="list-style-type: none"> • Classifying levers • Identifying types of motions • Sketching types of levers and linkages • applying hydraulics and pneumatics in designs 	<ul style="list-style-type: none"> • ICT tools • Educational tours
8.4.2 Gear mechanisms	<ul style="list-style-type: none"> • Identify types of gears • calculate gear ratios and transmission speed • apply gear systems in design 	<ul style="list-style-type: none"> • Types of gears - Rack and pinion - Worm drives - Bevel gears - Spur gears 	<ul style="list-style-type: none"> • Identifying types of gears • Calculating gear ratios • Applying gear systems in design 	<ul style="list-style-type: none"> • ICT tools • types of gears

8.4 TOPIC 4 SYSTEMS AND CONTROL

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.4.3 Drivers belts and chains	<ul style="list-style-type: none"> • identify 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 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 • Belts, chairs, sprockets, pulleys • Educational tour

8.5 TOPIC 5 ENGINEERING SCIENCE

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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"> • ICT tools • Machines

8.6 TOPIC 6 : TOOLS, EQUIPMENT AND MACHINES

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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

8.7 TOPIC 7 MANUFACTURING

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.7.1 Manufacturing systems	<ul style="list-style-type: none"> name types of manufacturing systems explain the advantages and disadvantages of manufacturing systems 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 types of manufacturing systems explaining the advantages and disadvantages of manufacturing systems stating uses of manufacturing systems 	<ul style="list-style-type: none"> ICT tools Print media Educational tours Resource persons

8.8 TOPIC 8 DESIGN DRAWINGS

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	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 Assembly Representation 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
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

8.9 TOPIC 9 ENTERPRISE SKILLS

TOPIC	LEARNING OBJECTIVES: learners should be able to:	CONTENT	SUGGESTED ACTIVITIES AND NOTES	RESOURCES
8.9.1 Marketing 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 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 patent by laws

9.0 ASSESSMENT

9.1 Scheme of Assessment

Forms 1-4 Design and Technology will be assessed through continuous and summative assessment methods. The syllabus scheme of assessment is based on the principle of inclusivity. Arrangements, learning conditions and modifications must be transparent in both continuous and summative assessment methods to allow access and receipt of accurate performance measurement of abilities by candidates with special needs.

Learners will be required to write one timed test per term which should be recorded as continuous assessment in March, July and November. The subject teacher will set, mark and record the test marks using a marking guide provided by ZIMSEC. ZIMSEC will also provide a template for the assessment of soft skills. Teachers will be required to provide a file for each learner where each of the test items and marked scripts will be kept. In addition, teachers will also be required to create a file where test question papers and marking guides for each test administered as well as recorded marks will be kept. ZIMSEC and Ministry of Primary and Secondary Education personnel will monitor the process.

At the end of each school term, school heads will submit continuous assessment marks for all their learners to ZIMSEC for data capture update. Candidates will work on a project yearly (Form 1-4) from the month of February to end of October and the marks submitted at the end of year. This will be done in tandem with guidelines provided by ZIMSEC. The projects will be marked by ZIMSEC.

9.2 ASSESSMENT OBJECTIVES

By the end of the learning phase, learners will be assessed on:

9.2.1 Design appreciation

- demonstrate awareness of societal and technological influences in design
- demonstrate the ability to apply knowledge in design, materials, processes and basic technology

9.2.2 Designing

- define a need by considering appropriate human, functional and aesthetic factors
- gather and use relevant information for design decision making
- generate and develop ideas using appropriate methods
- test and evaluate their design ideas, making appropriate modifications
- apply appropriate communication techniques to inform and defend ideas

9.2.3 Making

- plan the steps in making artefact
- realise artefact in appropriate material(s) using suitable techniques
- make appropriate modifications to enhance artefact

Summative Assessment	40%
Continuous Assessment	60%

CONTINUOUS AND SUMMATIVE ASSESSMENT

Continuous and summative assessment will be carried out in the Theory, Practical and Design components of the syllabus. The weighting of the components are as follows:

Assessment mode	Written Examination	Design Project
Summative	40	-
Continuous	10	50

SUMMATIVE ASSESSMENT

Paper 1: Written examination

The paper consists of 2 sections i.e.

Section A and Section B

SECTION A

Six compulsory structured questions on design processes and design contents

SECTION B

Three questions will be answered out of 8 questions on Systems Control, Material Science, Engineering Science and Design Drawing (Not more than one question from each section)

TIME: 3 hours

WEIGHTING: 40%

DESIGN PROJECTS

Projects undertaken from Forms 1 – 3 constitute 20% and Form 4 constitutes 30%.

Form 1 5%

Form 2 5%

Form 3 10%

Form 4 30%

Weighting 50%

DESIGN AND TECHNOLOGY ASSESSMENT MODEL







