ZIMBABWE

MINISTRY OF PRIMARY AND SECONDARY EDUCATION

TECHNICAL GRAPHICS AND DESIGN SYLLABUS

FORMS 5 - 6

2015 - 2022

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- United Nations Educational, Scientific and Cultural Organisation (UNESCO)

CONTENTS

1.0 PREAMBLE

1.1 Introduction

The Technical Graphics and Design Syllabus is designed for Forms 5 - 6learners. Design, drawing and problem solving will be used as learner centred approaches in implementing this syllabus. It promotes access to learning and teaching of Technical Graphics and Design regardless of gender and diverse needs.

The syllabus promotes learners' development of psychomotor skills and ensures that they develop socially, physically, emotionally and cognitively. It serves as a concrete foundation for entry into tertiary institutions, construction, mining, industrial and manufacturing industries. In addition to developing intellectual and manual skills, the syllabus should stimulate innovation, creativity, enterprising skills, scientific and technological awareness and the ability to solve
real life problems.

1.2 Rationale

This syllabus seeks to develop design and drawing skills which will make learners useful members of their community/society. The syllabus structure is designed to allow progression from the corresponding Technical Graphics and Design Forms 1 - 4 syllabus and will allow learners to develop their skills and acquired knowledge. The learning area sets out to promote desirable enterprising and other life skills relevant to the 21st century.

The learning area will enable learners to appreciate the dignity of labour, integrity (Unhu/Ubuntu/Vumunhu), patriotism, draughtsmanship, innovativeness, self-realization and aesthetic flair. This would allow greater flexibility in solving practical problems encountered in real life projects. An integral part of the learning area will be the appreciation of the raw materials used in the design and manufacturing of products. The learners will be equipped with the ability to shape and develop their communities.

1.3 Summary of Content

This syllabus is intended to cover theory and practical activities in Technical Graphics and Design,
focusing on Design process, Graphic communication, Geometrical drawing, Building drawing, Mechanical drawing, Enterprising skills and Computer Aided Design (CAD).

1.4 Methodology and Time Allocation

Methodology

The syllabus is based on a learner-centred approach hinged on inclusivityin the learning of Technical Graphics and Design. Design and drawing will be an integral part of every practical exercise, enhancing problem-solving in learners. The learners are expected to take part in community projects and twin with related industries. The use of Information Communication Technology(ICT) in drawing is essential.

Suggested Methods

- Discussions
- Project work
- Group work
- Discovery
- Problem - solving
- Demonstrations
- Field trips

Time Allocation

A minimum of 10 x 35 minute periods per week.At least one Field trip per term is recommended.

1.5 Assumptions

The syllabus assumes that learners have:

- Knowledge of requisite mechanical, building and geometrical constructions
- Elements of design and model making
- Numeracy and scientific skills
- Information and Communication Technology (ICT) skills
- Ability touse different media
- Knowledge of drawing standards

1.6 Cross-cutting themes

In order to foster competency development in life and work, the following cross-cutting themes will be considered in the learning of Technical Graphics and Design:

- Gender
- Human rights and responsibilities
- Financial Literacy
- Sexuality, HIV and AIDS

- Heritage Studies
- Collaboration
- Environmental Issues

2.0 PRESENTATION OF THE SYLLABUS

The Technical Graphics and Design Syllabus is a single document covering Forms 5 - 6. It contains the Preamble, Aims, Objectives, Syllabus Topics, Methodology, Scope and Sequence Chart and Assessment.

3.0 AIMS

The syllabus aims to help learners to:

3.1 apply Technical Graphics and Design as a means of sustainable development for the individual, industry and society
3.2 appreciate the importance of health and safety in the working environment
3.3 promote the development of curiosity, enquiry, initiative, ingenuity, resourcefulness and discrimination
3.4 encourage technological awareness, foster attitudes of co-operation and social responsibility, and develop abilities to improve the quality of the environment
3.5 apply the general principles of graphical communication with sensitivity to refinement and accuracy
3.6 promote the development of indigenous engineering tools and building forms (shapes) in design work.

4.0 OBJECTIVES

Learners should be able to:

4.1 use a variety of graphical methods in designing and drawing
4.2 apply design and drawing skills through problem solving methods in community development
4.3 use CAD in solving real life problems
4.4 communicate ideas by means of pictorial and orthographic sketches, drawings and models
4.5 use different media to communicate graphically
4.6 use available resources sustainably while protecting the environment
4.7 apply creativity, inquiry and ingenuity in solving technical problems
4.8 apply internationally recognized standards in the production of accurate geometrical, mechanical and building drawings

5.0 TOPICS

5.1 Health and Safety
5.2 Drawing Conventions
5.3 Design Process
5.4 Plane Geometry
5.5 Solid Geometry
5.6 Building Drawing
5.7 Mechanical Drawing
5.8 Computer Aided Design

6.0 SCOPE AND SEQUENCE CHART

TOPIC	FORM 5	FORM 6
6.1 HEALTH AND SAFETY	• Environmental issues in relation to designing • Safety precautions in handling equipment and chemicals • Use of appropriate materials in design	• Disposal of chemicals and the environment
6.2 DRAWING CONVENTIONS	• Engineering components and building details	• Application of the conventional representations
6.3 DESIGN PROCESS	• Design process stages • Projects - two storey buildings - functional mechanisms • Model making	• Solution of community problems incorporating traditional forms (shapes) and tools

TOPIC	FORM 5	FORM 6
	• Enterprise education	
6.4 PLANE GEOMETRY		
6.4.1 Loci	• Link mechanisms in cranks and ratchets with at least 2 simultaneous movements • Special curves: cycloidal, spirals, helices, involutes, parabola, hyperbola, ellipse	• Application of loci and cams in designs of buildings and mechanical systems
6.4.2 Cams	• Types of cams • Types of followers • Performance graphs • Cam profiles	
6.4.3 Area of irregular shapes	• Graphical Integration	
6.4.4 Points, Lines and Planes	• True angles between intersecting -straight line and plane -planes • Traces of lines and planes	• Oblique plane and its inclination to the planes of reference • Determination of perpendiculars to oblique planes from given points • The shortest distance and shortest horizontal and vertical distance between two non-parallel and non-intersecting straight lines
6.4.5 Forces	• Triangle and parallelogram of forces, space and polar diagram, funicular polygons	• Construction of bending moment and shear force diagrams • Determinations of forces in members of statistical determinant plane, pin jointed structures and 3

TOPIC	FORM 5	FORM 6
		Dimensional (3D) pin jointed structures
6.5 SOLID GEOMETRY	• Oblique drawing • Isometric projections - use of isometric scale • Auxiliary drawing - first and second auxiliary views	• Planometric drawing • Two point perspective drawing – involving circles and curves • Sections of geometrical solids - cut by inclined plane and oblique plane - true shapes of such sections using first and second auxiliary planes • Intersections of geometrical solids • Surface developments
6.6 BUILDING DRAWING	• Historical developments of indigenous and modern architectural designs • Foundations • Floors • Walls • Roofs • Waste disposal systems • Bill of quantities • Block and site plans • Working drawings up to two storey	• Stairs and staircases • Basement, mezzanine and upper floors • Plumbing design –cold and hot water supply • Electricity supply • Decoration and Preservation of buildings • Working drawings up to two storey
6.7 MECHANICAL DRAWING	• Properties and uses of materials • Fastening and locking devices • Rotating and reciprocating shafts seals - lubrication - bearings • Machine tools • Sections - revolved - aligned - removed - part sections • Assembly drawings	• Means of transmitting motion and power - gears - pulleys - couplings • Hydraulics and Pneumatics - pumps - valves - cylinders • Engine components - rotating and reciprocating parts - cylinder blocks - cylinder heads - carburetors and injectors • Machine tools • Assembly drawings

TOPIC	FORM 5	FORM 6
6.8 COMPUTER AIDED DESIGN	• User interface - commands - drawing tools • Modify tools - dimensioning - visual styles • Geometric shapes • Building drawings • CAD project	• Modify tools - array - mirror - rotate • Mass properties • 2Dimensional (2D) and 3Dimensional (3D):- wire frame, region, extrude and revolve • Engineering drawing • CAD project

FORM 5

7.0 COMPETENCY MATRIX

7.1 TOPIC 1: HEALTH AND SAFETY

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.1.1 Environmental issues in relation to design	• identify environmentally friendly materials for use in design	• Environmentally friendly materials	• Identifying environmentally friendly materials for use in design	• ICT tools • Print media
7.1.2 Safety precautions in handling equipment and tools	• identify hazardous substances • practise safe ways of handling workshop equipment	• Hazardous substances • Safety precautions in the use of tools and equipment in the working area	• Classifying the substances	• Realiasuch as tools and equipment • Print media
7.1.3 Use of appropriate materials in design	• justify the choice of materials in design	• Properties of materials	• Using appropriate tools and equipment in design • Analyzing properties of materials in relation to design	• Realia • Print media

7.2 TOPIC 2: DRAWING CONVENTIONS

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.2.1 Drawing conventions	• apply conventions to building and engineering drawings	• Conventional representations - building details - engineering components	• Applying the conventions to building and engineering drawings	Model Building By-laws handbook • ICT tools • PD7308

7.3 TOPIC 3: DESIGN PROCESS

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.3.1 Design Process Stages	• apply the design process stages to problem solving • design mechanisms and two storey buildings	• Design - design stages - building and machine designs	• Applying the design process stages to problem solving • Designing mechanisms and two storey buildings	• ICT tools • Print media • Resource person • Field trips
7.3.2 Model Making	• make models of designed buildings and mechanisms	• Model making	• Making models of designed buildings and mechanisms	
7.3.3 Projects	• formulate design theme from school/community situations - apply design skills to make products for income generation	• Design themes	• Formulating design themes from school/community situations	
7.3.4 Enterprise Education	• patent their designs	• Enterprise and intellectual property rights	• Applying design skills to make products for income generation • Registering ownership of designs	

7.4 TOPIC 4: PLANE GEOMETRY

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.4.1 Link mechanisms	• construct loci of links with 2 or more simultaneous movements	• Cranks and ratchets with at least 2 simultaneous movements	• Constructing loci of links with 2 or more simultaneous movements • Conducting field trips to observe mechanisms at work	• ICT tools • Realia such as cranking mechanisms
7.4.2 Special curves	• construct special curves to satisfy stated conditions	• Cycloidal curves, spirals, helices, helicoids, involutes, parabola, hyperbola, ellipse	• Constructing the special curves to satisfy the given conditions • Conducting field trips	• Realia such as stair cases, arches, helical springs
7.4.3 Cams	• identify different types of cams • construct radial plate cams to support specified motions on specific followers	• Functions of cams • Types of cams and followers • Performance graphs on different types of motion • Cam profiles	• Describing the functions of cams in mechanical systems • Identifying different types of cams • Constructing radial plate cams	• ICT tools • Realia such as mechanisms with cams • Print media
7.4.4 Points, lines and planes	• determine by construction the shortest distance between a point and a line • locate traces of lines and planes	• Traces of lines • Shortest distance between: - a line and a point: - a point and a plane • Dihedral angles - lines and plane	• Determining the shortest distance betweena point and a line, a point and a plane • Locating traces of lines and planes	• Models of the lines, points and planes • Print media
7.4.5 Area of irregular shapes	• determine the area of irregular shapes by construction	• Graphical integration	• Using graphical integration to determine area of irregular shapes	• Print media • ICT tools

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.4.6 Forces	• determine the resultant and equilibrant of a set of concurrent and non-concurrent co-planar forces	• Resolution of forces: - concurrent and non-concurrent co-planar forces	• Determining the resultant and equilibrant forces using graphical methods	• Print media • ICT tools

7.5 TOPIC 5: SOLID GEOMETRY

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.5.1 Pictorial drawing	• convert orthographic views to oblique drawing • produce oblique circles and arcs • construct an isometric scale • convert orthographic views to isometric projection	• Oblique drawing - cabinet - cavalier • Isometric projection - isometric scale	• Converting to oblique drawings • Constructing an isometric scale • Converting orthographic views to isometric projection using the isometric scale	• Print media • ICT tools
7.5.2 Auxiliary drawing	• project first and second auxiliary views from given orthographic views	• First and second auxiliary drawing	• Projecting first and second auxiliary views from given orthographic views	• Print media • ICT tools

7.6 TOPIC 6: BUILDING DRAWING

7.6 TOPIC 6: BUILDING DRAWING

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.6.1 Indigenous and modern architectural designs	• identify architectural designs • outline development of indigenous architectural designs • applying indigenous designs to modern architecture	• Indigenous architectural designs • Modern architectural designs	• Identifying indigenous and modern architectural designs • Distinguishing between indigenous and modern architectural designs • Applying the indigenous designs to the modern architecture • Conducting field trips	• Print media • ICT tools • Resource person
7.6.2 Foundations	• outline the types of foundations • draw the different types of foundations • select suitable foundations for different types of soils	• Types of foundations	• Identifying types of foundations • Drawing the different types of foundations • Selecting suitable foundation for different soil types	• Print media • ICT tools • Field trips
7.6.3 Floors	• identify types of floors • draw a section through a floor • select appropriate floor finishes	• Types of floors • Floor construction • Floor finishes	• Identifying types of floors • Drawing sectional views of floors • Selecting appropriate floor finishes	• Print media • ICT tools • Realia such as floor finishing materials • Field trips
7.6.4 Walls	• classify types of walls • select suitable materials for wall construction	• Walls • types • materials • openings	• Classifying walls • Selecting suitable material for wall construction	• Print media • ICT tools • Realia such as walls

	• justify the position of wall openings • illustrate suitable wall finishes	• finishes	• Justifying the positions of wall openings • Recommending suitable wall finishes	• Field trips
7.6.5 Roofs	• identify types of roofs • outline roof coverings • draw different types of roofs	• Types of roofs • Roof coverings	• Identifying types of roofs • Outlining roof coverings • Drawing different types of roofs	• Print media • ICT tools • Realia such as different types of roof coverings • Field trips
7.6.6 Waste disposal systems	• outline the elements of the drainage system • draw the disposal waste systems • select suitable materials for the drainage system	• Drainage system	• Outlining the elements of the drainage system • Drawing the waste disposal systems • Selecting the suitable materials for the drainage system • Conducting field trips to observe drainage systems	• Print media • ICT tools • Realia such as drainage pipes, septic tanks, manholes
7.6.7 Block and site plans	• draw block plans • draw site plans • position the proposed buildings on site plans	• Block plans • Site plans	• Drawing block plans • Drawing site plans • Positioning the proposed buildings on site plans	• Print media • ICT tools • Realia such as block and site plans
7.6.8 Working drawings	• draw detailed floor plans of buildings up to 2 storey • draw elevations as viewed from different directions	• Floor plans • Elevations • Sectional views	• Drawing detailed floor plans of buildings up to 2 storey • Drawing elevations as viewed from different directions	• Print media • ICT tools

	• draw sectional views to show details of substructure and superstructure • calculate quantities of building materials	• Bill of quantities	• Drawing sectional views to show details of substructure and super structure • Calculating quantities of building materials • Conducting field trips construction sites	

7.7 TOPIC 7:MECHANICAL DRAWING

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.7.1 Properties and uses of materials	• identify different types of engineering materials • analyse properties of engineering materials	• Engineering materials	• Identifying different types of engineering materials • Analysing the properties of engineering materials	• Print media • ICT tools • Realia such as engineering materials
7.7.2 Fastening and locking devices	• identify types of fasteners and locking devices • recommend suitable fasteners and locking devices to assembling engineering components	• Fasteners and locking devices	• Identifying types of fasteners and locking devices • Illustrating fasteners and locking devices in use	• Print media • ICT tools • Realia such as fasteners and locking devices
7.7.3 Rotating and reciprocating shafts	• identify types of seals and bearings • = • illustrate shafts, seals, lubrication methods and bearings as design features in use • draw shafts, seals and bearings conventionally	• Shafts • Seals • Lubrication • Bearings	• Illustrating conventionally ; - shafts, seals, lubrication methods and bearings as design features in use	• Print media • ICT tools • Realia such as bearings, seals and shafts
7.7.4 Machine tools	• identify parts of machines • draw parts of the machines	• Drilling machines • Lathes • Milling machines • Shaping machines	• Identifying parts of machines • Drawing parts of the machines	• Print media • ICT tools • Realia such as machine tools • Field trips
7.7.5 Sections	• describe the different types of sections • Illustrate the types of sections	• Types of sections	• Illustrating different types of sections	• Print media • ICT tools
7.7.6 Assembly drawing	• assemble components of a given machine	• Assembly drawing • Sections	• Assembling components of a given	• ICT tools • Print media

	• draw elevations of assembled parts • draw sectional views of assembled parts • use mechanical drawing conventions and design features on assembly drawings • draw up parts list	• Mechanical drawing conventions • Design features • Parts list	machine • Drawing elevations of assembled parts • Drawing sectional views of assembled parts • Using mechanical drawing conventions and design features in producing assembly drawings • Drawing a parts list	• Realia such as components of machines

7.8 TOPIC 8: COMPUTER AIDED DESIGN

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KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.8.1 User interface	• select appropriate drawing, commands and tools • use drawing commands and tools in drawing of building details and components	• Commands • Drawing tools	• Selecting appropriate drawing commands and tools • Using drawing commands and tools in drawing of building details and components	• Print media • ICT tools
7.8.2 Modify tools	• apply text, dimensions and visual styles to drawings	• Text • Dimensions • Visual styles	• Applying text, dimensions and visual styles to drawings	• Print media • ICT tools
7.8.3 Building Drawing	• draw detailed working drawings using CAD software	• Floor plans • Elevations • Sectional views	• Using CAD software to draw detailed working drawings	• Print media • ICT tools
7.8.4 CAD project	• identify the need within the school/community • design graphic product to solve the need	• School/community based projects	• Producing graphic products for the school and the community using CAD	• Print mrdia • ICT tools

FORM 6

7.0 COMPETENCY MATRIX

7.1 TOPIC 1: HEALTH AND SAFETY

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KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.1.1 Disposal of chemicals and the environment	• practise safe disposal of waste materials and chemicals	• Disposal of chemicals and waste materials	• Discussing methods of disposing of waste materials and chemicals • Practising methods of waste and chemical disposal • Engaging in clean up campaigns • Designing waste disposal awareness posters	• ICT tools • Print media • Resource person

7.2 TOPIC 2: DRAWING CONVENTIONS

7.2 TOPIC 2: DRAWING CONVENTIONS

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.2.1 Drawing conventions	• represent building and engineering conventions on drawings	• Application of conventional representations	• Representing building and engineering conventions on drawings	• Print media • Model Building • By-laws handbook • ICT tools • PD 7308

7.3 TOPIC 3: DESIGN PROCESS

7.3 TOPIC 3: DESIGN PROCESS

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.3.1 Design Process	• identify situations in the community that require technological design solutions • incorporate indigenous forms in design • use materials that conserve natural resources in design	• Practical design solutions to community situations • Indigenous forms • Environmental conservation	• Identifying situations in the community that require technological design solutions • Incorporating indigenous forms in their solutions • Using materials that conserve natural resources in design	• Print media • ICT tools • Resource persons • Realia such as thatched and doomed structures

7.4 TOPIC 4: PLANE GEOMETRY

7.4 TOPIC 4: PLANE GEOMETRY

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.4.1 Oblique planes	• draw traces of inclined planes • determine by construction the true angle of inclination of an oblique plane to the horizontal and vertical planes • locate views of points, lines and planes lying on oblique planes • determine by construction true lengths and true shapes of lines and laminae lying on the oblique plane	• Traces of planes • True angles of inclination • Points, lines and planes on the oblique planes • True lengths of lines on the oblique plane • True shapes of laminae lying on the oblique plane	• Drawing traces of inclined planes • Determining by construction the true angle of inclination of an oblique plane to the horizontal and vertical planes • Drawing views of points, lines and planes lying on oblique planes • Determining by construction true lengths and true shapes of lines and laminae lying on the oblique plane	• Print media • Models of inclined and oblique planes • ICT tools
7.4.2 Points, lines and planes	• Determine by construction the: - shortest distance - shortest horizontal - vertical distances between non parallel and non- intersecting straight lines	• Skew lines: - shortest distances - shortest horizontal - vertical distances	• Determining by construction the distances	• Print media • Models of skew lines • ICT tools
7.4.3 Forces	• Determine graphically, reactions on: - loaded continuous - hinged beams - • Determine forces in members of statically determinate plane, pin-	• Loaded beams: - concentrated loads - distributed loads - hinged beams - cantilever beams • Reactions on loaded beams	• Determining reactions on: - loaded, continuous-hinged beams graphically • Determining forces in members of statically	• Print media • ICT tools • Field trips

	jointed structures and 3 dimensional pin jointed structures	• Shear force and bending moment diagrams • Structures, reactions and forces in members	determinate plane, pin-joined structures and 3 dimensional pin jointed structures	
7.4.4 Loci	• produce accurate cams and helices in engineering and building designs	• Loci and cams in designs of building and mechanical systems	• Producing accurate cams and helices in engineering and building designs • Conducting field trips	• Print media • Realia such as helical stair cases and screw threads

7.5 TOPIC 5: SOLID GEOMETRY

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.5.1 Pictorial drawing	• construct planometric drawings from orthographic and pictorial views • construct planometric drawings to show fittings and furniture arrangement in a room • convert orthographic views to two point perspective drawings • draw architectural two point perspective impression of buildings	• Planometric drawing • Two-point perspective - circles and curves	• Constructing planometic drawings from orthographic and pictorial views • Constructing planometric drawings to show fittings and furniture arrangement in a room • Converting orthographic to two point perspective drawings • Drawing architectural two point perspective impression of buildings	• Print media • ICT tools • Realia such as interior of a room with fittings and furniture
7.5.2 Sections of geometrical solids	• draw plans, elevations and true shapes of solids cut by inclined and oblique planes • use first and second auxiliary planes to establish true shapes	• Sections of geometrical solids - plans, elevations and true shapes • Inclined and oblique planes • First and second auxiliary planes	• Drawing plans, elevations and true shapes of solids cut by inclined and oblique planes • Using first and second auxiliary planes to establish true shapes	• Print media • ICT tools • Models of truncated geometric solids
7.5.3 Lines of intersection	• determine lines of intersection between interpenetrating geometrical solids	• Intersection of geometrical solids	• Determining lines of intersection between interpenetrating geometrical solids	• Print media • ICT tools • Realia such as ducts and hoppers
7.5.4 Surface	• apply the concept of parallelism to	• Surface development	• Illustrating the concept	• Print media

developments **- oblique solids** **- transition pieces**	produce development of cylinders and prisms • use radial lines to draw development of cones and pyramids • use the triangulation method to draw the development of transition pieces	- parallel line - radial line - triangulation	of parallelism to produce developments of cylinders and prisms • Using radial lines to drawdevelopments of cones and pyramids • Using triangulation method to draw the developments of transition pieces	• ICT tools • Realia such as models of transition pieces • Field trips

7.6 TOPIC 6: BUILDING DRAWING

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.6.1 Stairs and staircases	• describe different types of stairs and staircases • draw different types of stairs and staircases	• Stairs • Staircases	• Discussing types of stairs and staircases • Drawing different types of stairs and staircases	• Print media • ICT tools • Stairs and staircases • Field trips
7.6.2Basement,mezzanine and upper floor	• examine the types of floors • draw the different types of floors	• Types of floors	• Justifying the differences in the types of floors • Drawing different types of floors • Conducting field trips	• Print media • ICT tools • Construction sites

7.6.3 Plumbing design	• Describe the layout of cold and hot water supply • Illustrate the layout of cold and hot water supply system on a building plan	• Cold water supply • Hot water supply	• Describing the layout of cold and hot water supply • Illustrating the layout of cold and hot water supply system on a building plan	• Print media • ICT tools • Realia such as pipe work, geysers, wash basins
7.6.4 Electricity supply	• describe the layout of electricity wiring in buildings • illustrate the layout of the electricity wiring on building plans	• Electricity wiring layout	• Describing the layout of electricity wiring in buildings • Illustrating the layout of electricity wiring on building plans	• Print media • ICT tools • Realia such as electricity fittings
7.6.5 Decoration and Preservation of buildings	• discuss suitable decorative finishes • outline the preservation of buildings	• Decorative finishes • Preservatives	• Assessing suitable decorative finishes • Outlining the preservation of buildings • Conducting field trips	• Print media • ICT tools • Realia such as decorated walls and preservatives
7.6.6 Working drawings	• draw detailed floor plans of buildings up to 2 storey • draw elevations as viewed from different directions • draw detailed sectional views from substructure to superstructure	• Detailed floor plans • Elevations • Sectional views	• Drawing detailed floor plans of buildings up to 2 storey • Drawing elevations as viewed from different directions • Drawing detailed sectional views from substructure to superstructure • Conducting field trips	• Print media • ICT tools • Building plans • Resource persons

7.7 TOPIC 7:MECHANICAL DRAWING

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.7.1 Transmission of motion and power	• draw gears, pulleys and couplings conventionally • apply gears, pulleys and couplings as design features in assembly drawings	• Gears • Pulleys • Couplings	• Drawing gears, pulleys and couplings conventionally • Illustrating gears, pulleys and couplings as design features to assembly drawings • Conducting field trips	• Print media • ICT tools • Gears, pulleys and couplings
7.7.2 Hydraulics and Pneumatics	• draw pumps, valves and cylinders conventionally • illustrate pumps, valves and cylinders in assembly drawings	• Pumps • Valves • Cylinders	• Drawing pumps, valves and cylinders conventionally • Illustrating pumps, valves and cylinders in assembly drawings	• Print media • ICT tools • Realia such as pumps, valves and cylinders • Print media
7.7.3 Engine components	• draw engine components • illustrate engine components in assembly drawing	• Rotating and reciprocating parts • Cylinder blocks • Cylinder heads • Carburetors • Injectors	• Drawing engine components • Illustrating engine components in assembly drawing	• Print media • ICT tools • Realia such as engine components
7.7.4 Machine tools	• Draw machines parts	• Lathe • Machines - Drilling - Milling - Shaping	• Drawing engineering machine parts of the engineering machines	• Print media • ICT tools • Realia such as the parts of the machines
7.7.5 Assembly drawing	• assemble components of given machines • draw elevations of assembled parts	• Assembly drawing - assembling components - sections - mechanical drawing	• Assembling components of a given machine • Drawing elevations of assembled parts	• ICT tools • Realia such as components of machines • Print media

7.8 TOPIC 8: COMPUTER AIDED DESIGN

KEY CONCEPT	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
7.8.1 Modify tools	• apply array, mirror and rotate tools on drawings	• Array • Mirror • Rotate	• Using array, mirror and rotate tools on drawings	• Print media • ICT tools • Resource persons
7.8.2 Mass properties	• determine area, volume, density and mass of geometric solids using CAD	• Area • Volume • Density • Mass	• Determining area, volume, density and mass of the geometrical solids	• ICT tools • Print media
7.8.3 2D and 3D drawings	• use the tools to draw 2D and 3D engineering components	• Wire frame • Region • Extrude • Revolve	• Using the tools to draw 2D and 3D engineering components	• Print media • ICT tools
7.8.4 Engineering drawings	• draw detailed working drawings in 2D and exploded views	• 3D views • 2D views • Exploded views	• Drawing detailed working drawings in 2D and exploded views	• Print media • ICT tools
7.8.5 CAD project	• solve a mechanical school/community based project using design on CAD	• School/community based project	• Solving a mechanical school or community based project using design on CAD	• Print media • ICT tools

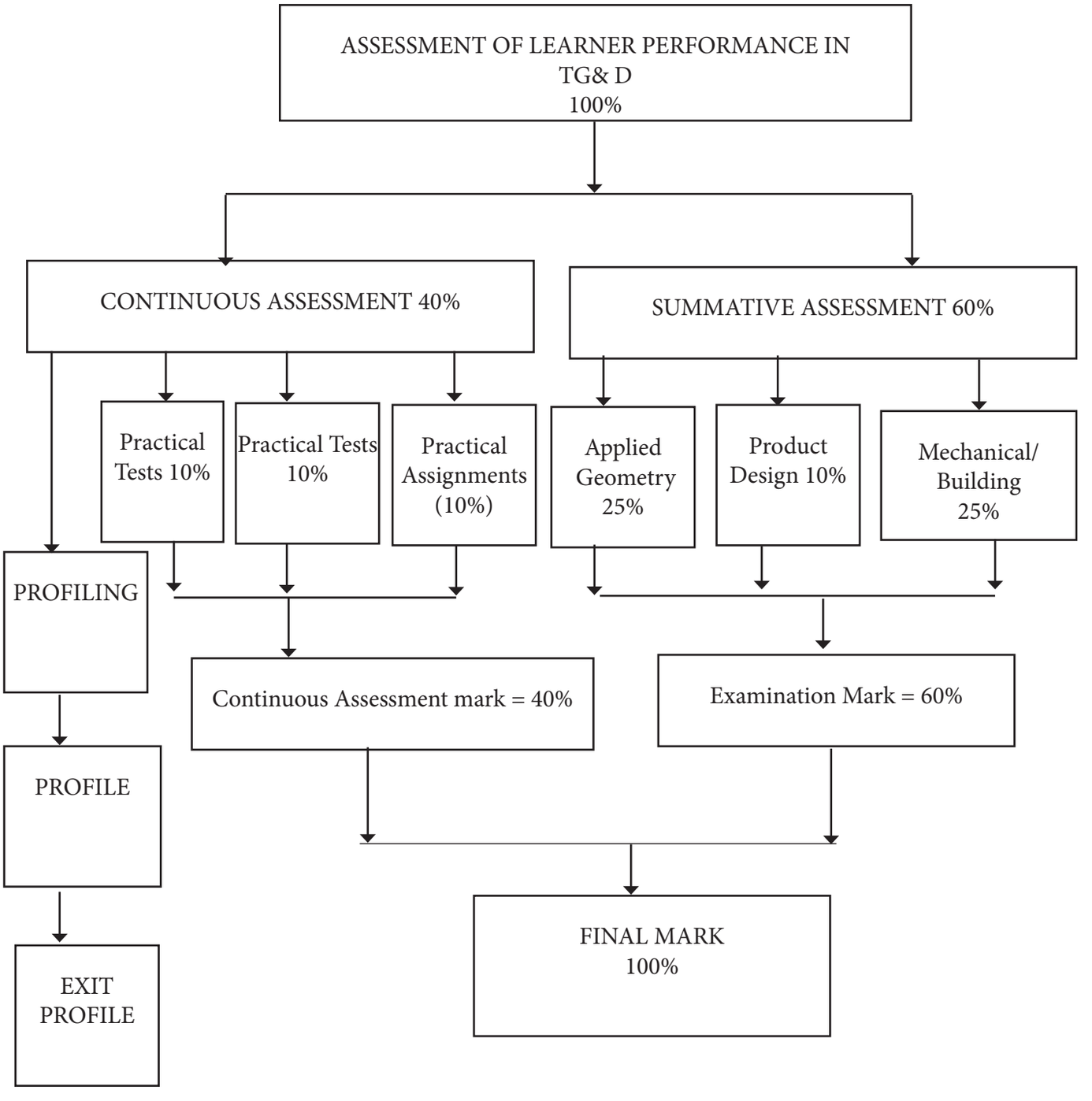
8.0 ASSESSMENT

The syllabus scheme of assessment is grounded on the principle of inclusivity. Arrangements, accommodations on the modifications should bevisible in both continuous and summative assessments to enable learners/candidates with special needs to access assessments.

(a) Assessment Objectives

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

8.1 use a variety of graphical methods in designing and drawing
8.2 use CAD in solving real life problems
8.3 communicate ideas by means of pictorial and orthographic sketches, drawings and models
8.4 use available resources sustainably while protecting the environment
8.5 apply creativity, inquiry and ingenuity in solving technical problems
8.6 apply internationally recognized standards in the production of accurate geometrical, mechanical and building drawings


ASSESSMENT OF LEARNER PERFORMANCE IN TG& D
100%
CONTINUOUS ASSESSMENT 40%
SUMMATIVE ASSESSMENT 60%
Practical Tests 10%
Practical Tests 10%
Practical Assignments (10%)
Applied Geometry 25%
Product Design 10%
Mechanical/ Building 25%
PROFILING
PROFILE
EXIT PROFILE
Continuous Assessment mark = 40%
Examination Mark = 60%
FINAL MARK
100%

(b) Specification grid

Objectives/Components	Paper 1	Paper 2	Paper 3	Continuous Assessment
Knowledge with understanding	50	30	20	20
Practical skills and their application	40	50	40	30
Decision making and judgment	10	20	40	50
Total	**100%**	**100%**	**100%**	**100%**

(c) Scheme of assessment

Continuous Assessment

1 project per year Form 5 – Form 6

Tests – one per term – Form 5
One per term -Form 6(first two terms)

Practical Assignments

1 per term - Form 5
1 per term -Form 6 (first two terms)

Summative Assessment

Paper 1 – Applied Geometry

Section A = 40 marks 4 questions compulsory
Section B = 60 marks 6 questions. Answer 3 questions

Paper 2 – Mechanical and Building Drawing - 4 questions.

2 from Building Drawing and 2 from Mechanical Drawing.
Answer 1 question only – 100 marks

Paper 3 – Product Design- 4 questions.

2 from Building Drawing and 2 from Mechanical Drawing.
Answer 1 question only - 100 marks