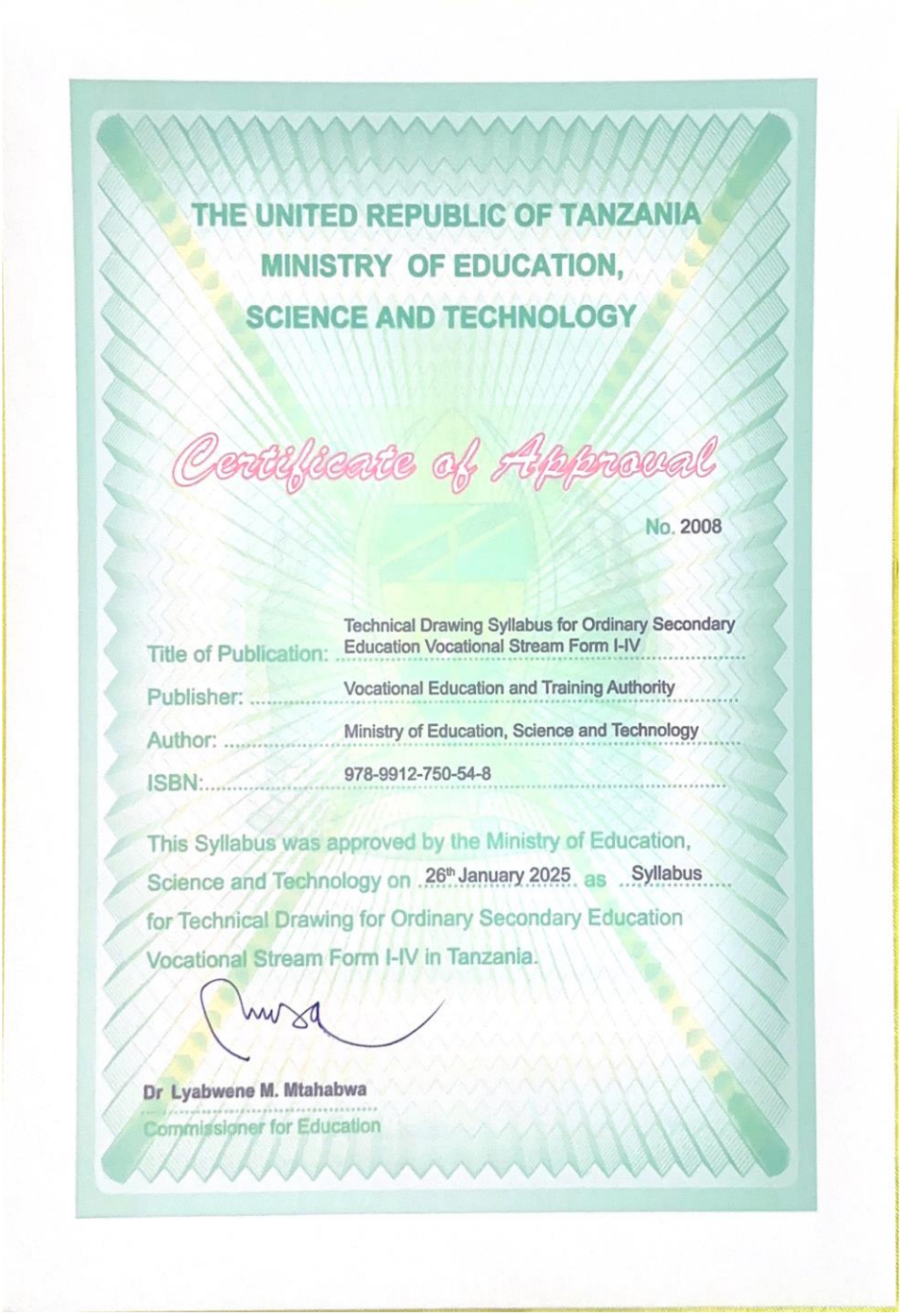
THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY



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Commissioner for Education

TECHNICAL DRAWING SYLLABUS FOR ORDINARY SECONDARY EDUCATION VOCATIONAL STREAM FORM I-IV

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Abbreviations and Acronyms

CA	Continuous Assessment
CAD	Computer Aided Design
CBET	Competence Based Education and Training
CPA	Certified Public Accountant
2D	2 Dimensional
3D	3 Dimensional
ICT	Information Communication Technology
ISO	International Organisation for Standardisation
VET	Vocational Education and Training
VETA	Vocational Education and Training Authority

Definition of Key Terms

Assessment: The process of collecting evidence and making judgments on whether competency has been achieved, or whether specific skills and knowledge have been achieved that will lead to the attainment of competency.

Assessment Criteria: Refers to the specific standards or expectations that are used to evaluate whether a learner has demonstrated the necessary skills, knowledge, and abilities to achieve a particular competence. These criteria outline the key aspects of performance that must be met for the learner to be considered competent in a specific area or task. The criteria should be clear, specific, and measurable so that both learners and educators can understand exactly what is expected in order to achieve competence.

Competence: The ability to use knowledge, understanding, hands-on learning and thinking skills to perform effectively to the workplace standards required in employment.

Element: A sub-unit (step), which reflects learning sequence with the aim of achieving broad learning objectives of a unit.

Unit: A statement of broad learning objectives, which prescribe the requirements of a standard in form of hands-on learning skills, knowledge and appropriate attitudes.

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For and on behalf of:

Vocational Education and Training Authority

CPA. Antony M. Kasore

Director General

1.0. Introduction

Technical Drawing is one of the compulsory supportive subjects for Form I-IV students taking Engineering subjects in the Ordinary Secondary Education Vocational Stream, except Civil Draughting. Technical Drawing is multifaceted and plays a crucial role in developing essential skills that will serve students in both their academic and future professional careers. The purpose of learning Technical Drawing is to equip students with the necessary skills to visualize, communicate, and create engineering designs. It provides a solid foundation for future studies in engineering and helps to prepare them for hands-on learning careers in technical fields.

The Syllabus is designed to guide the teaching and learning of Technical Drawing at Ordinary Secondary Education Form I-IV Vocational Stream in the United Republic of Tanzania. The syllabus interprets the competences a student needs to develop while learning Engineering subjects. It contains valuable information that will enable teachers to effectively plan their teaching process and help learners to develop the intended competences. It is expected that the subject will help students to learn subjects related to Engineering field effectively.

2.0. Main Objectives of Education in Tanzania

The main objectives of education in Tanzania are to enable every Tanzanian to:

(a) Develop and improve his or her personality so that he or she values himself or herself and develops self-confidence;

(b) Respect the culture, traditions, norms and customs of Tanzania; cultural differences; dignity; human rights; attitudes and inclusive actions;

(c) Advance knowledge and apply science and technology, creativity, critical thinking, innovation, cooperation, communication and positive attitudes for his or her own development and the sustainable development of the nation and the world at large;

(d) Understand and protect national values, including dignity, patriotism, integrity, unity, transparency, honesty, accountability and the national language;

(e) develop life and work-related skills to increase efficiency in everyday life;

(f) Develop a habit of loving and valuing work to increase productivity and efficiency in production and service provision;

(g) Identify and consider cross-cutting issues, including the health and well-being of the society, gender equality, as well as the management and sustainable conservation of the environment; and

(h) Develop national and international cooperation, peace and justice per the Constitution of the United Republic of Tanzania and international conventions.

3.0. General Competences for Ordinary Secondary Education Vocational Stream

The general competences for Ordinary Secondary Education, Form 1–IV, Vocational Education stream are to:

(a) Apply the knowledge, skills and attitudes the student developed in the primary school stage to increase his/her understanding of technical skills;
(b) Apply technical skills in designing, inventing and making various things to cope with life and solve challenges in society;
(c) Appreciate citizenship and national virtues;
(d) Use language skills;
(e) Demonstrate self-confidence in learning in various fields, including science and technology, technical knowledge and technical skills;
(f) Apply technical knowledge and skills in designing, discovering and making various things to solve challenges in society, including crosscutting issues;
(g) Appreciate procedures and safety rules in using technical tools correctly; and
(h) Apply the technical knowledge and skills acquired to develop oneself with vocational and technical education and join the workforce.

4.0. General Competences of the Subject

Upon completion of this subject, students are expected to have ability to:

(a) Read and interpret technical drawings;

(b) Perform various projections of components;

(c) Produce detailed working drawings;

(d) Implementing Computer Aided Design; and

(e) Perform 2D and 3D CAD modelling.

5.0. Main and Specific Competences

The main and specific competences to be developed are presented in Table 1.

Table 1: *Main and Specific Competences for Form I-IV*

Module (Main competences)	Unit (Specific competences)
Form 1	
1.0 Drawing plane geometry	1.1. Drawing layout 1.2. Constructing angles 1.3. Constructing geometrical figures
2.0 Scale drawing	2.1 Constructing plane and diagonal scales
3.0 Constructing pictorial drawing	3.1. Constructing isometric projection 3.2. Constructing oblique projection
Form 2	
4.0 Constructing orthographic projection	4.1. Constructing orthographic projection 4.2. Drawing in the first-angle orthographic projection 4.3. Constructing drawing in the third-angle orthographic projection
5.0 Constructing sectional views	5.1 Sectioning of engineering components 5.2 Drawing conic section
Form 3	
6.0 Drawing of similar figures and equivalent areas	6.1 Enlarging and reducing of figures 6.2 Drawing equivalent areas
7.0 Drawing loci	7.1 Constructing locus of mechanism 7.2 Constructing basic curves
8.0 Developing objects and their interpenetration	8.1 Developing objects 8.2 Interpretating objects
Form 4	
9.0 Drawing detailed working drawings	9.1 Producing detailed working drawings
10.0 Implementing Computer Aided Design (CAD)	10.1 Performing 2D CAD basics 10.2 Performing 3D CAD modelling

6.0. The Roles of Teachers, Students and Parents in Teaching and Learning

Good relationships between a teacher, student and parent, or guardian is fundamental to ensuring successful learning. This section outlines the roles of each participant in facilitating effective teaching and learning of Technical Drawing.

6.1. The teacher

The teacher is expected to:

(a) Help the student to learn and develop the intended competences in Technical Drawing

(b) Use teaching and learning approaches that will allow students with different needs and abilities to:

(i) Develops the competences needed in the 21st Century; and

(ii) Actively participate in the teaching and learning process.

(c) Use student centred instructional strategies that make the student a centre of learning which allow them to think, reflect and search for information from various sources;

(d) Create a friendly teaching and learning environment;

(e) Prepare and improvise teaching and learning resources;

(f) Conduct formative assessment regularly by using tools and methods which assess theory and practice;

(g) Treat all the students according to their learning needs and abilities;

(h) Protect the student from the risky environment while he or she is at school;

(i) Keep track of the student's daily progress;

(j) Identify individual student's needs and provide the proper intervention;

(k) Involve parents/guardians and the society at large in the student's learning process; and

(l) Integrate cross-cutting issues and ICT in the teaching and learning process.

6.2. The student

The student is expected to:

(a) Develop the intended competences by participating actively in various learning activities inside and outside the classroom; and

(b) Participate in the search for knowledge from various sources, including textbooks, reference books and other publications in online libraries.

6.3. The parent/guardian

The Parents/Guardian is expected to:

(a) Monitor the child's academic progress;
(b) Where possible, provide a child with the needed academic support;
(c) Provide a child with a safe and friendly home environment which is conducive for learning;
(d) Keep track of a child's progress in behaviour;
(e) Provide the child with any necessary materials required in the learning process; and
(f) Instill in a child a sense of commitment and positive value towards education and work.

7.0. Teaching and Learning Methods

The teaching and learning methods are instrumental in developing student's competences. This syllabus suggests teaching and learning methods for each activity which includes but not limited to demonstration, observations, simulation, discussions, presentations, field visits, hands-on learning, research and project works. However, a teacher is advised to plan and use other appropriate methods based on the environment or context. All the teaching and learning methods should be integrated with the everyday lives of students.

8.0. Teaching and Learning Resources

The process of teaching and learning requires different resources. In that regard, both a teacher and students should work together to collect or improvise alternative resources available in the school and home environment when needed. Teachers and students are expected to constantly seek for information from various sources to effectively facilitate the teaching and learning process. The list of approved textbooks and reference books shall be provided by the TIE.

9.0. Assessment

Assessment is important in teaching and learning of Technical Drawing subject. It is divided into formative and summative assessments. Formative assessment informs both the teacher and students on the progress of teaching and learning, and in making decisions on improving the teaching and learning process. Teachers are therefore, expected to apply a wide range of formative assessment methods which include but not limited to demonstration, discussions, presentations, oral questions, experiments, observations, hands-on learning assignments and projects.

Summative assessment, on the other hand, will focus on determining student's achievement of learning. Teachers are expected to use a variety of summative assessments including mid-term tests, terminal, mock examinations and projects. The scores obtained from these assessments will be used as Continuous Assessment (CA). Therefore, the continuous assessments shall contribute 30% and the National Form IV Examination shall be 70% as indicated in Table 2.

9.1. Project Work

Project work is a carefully planned and clearly defined task or problem that a student undertakes, either alone or in a group, to enhance and apply the skills and knowledge gained in the classroom, workshop, kitchen, or laboratory. It is based on the principles of "Learning by Doing" and "Learning by Living." In this context, the implementation of Project Work in secondary schools' vocational streams is essential. Projects in the vocational stream should be conducted in the core subject (occupation). To ensure its success, the supervision and assessment of student project work must be consistent with the established guidelines provided by National Examinations Council of Tanzania (NECTA).

Table 2: *Contribution of Continuous Assessment and National Examination in the final score*

S/No	Assessment category	Percentage (%)
1.	Form Two National Assessment	6.0
2.	Form Three Terminal Examination	5.0
3.	Form Three Final Assessment	5.0
4.	Project	7.0
5.	Form IV Mock Examination	7.0
6.	Form IV National Examination	70
	Total	**100**

10.0. Number of Periods

The Technical Drawing Syllabus for Ordinary Secondary Education Vocational Stream Form I-IV provides time estimates for teaching and learning each specific competence. The estimates consider the complexity of the specific competences and the learning activities. Therefore, three (03) periods per week for Form I-II and four (04) periods per week for Form III-IV of 40 minutes each have been allocated for this subject.

11.0. Teaching and Learning Contents

The contents of the syllabus are organised into a matrix with seven columns which include main competences, specific competences, learning activities, suggested teaching and learning methods, assessment criteria, suggested resources and number of periods as presented in Table 3 to 6.

Form One

Table 3: *Detailed contents for Form One*

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
1 Drawing plane geometry	1.1 Drawing layout	(a) Describing the concept of Technical Drawing	**Brainstorming** Lead students to brainstorm on the meaning of Technical Drawing **ICT-based learning** Guide students in manageable groups to use ICT to discuss and come up with the importance of Technical Drawing and its applications in various engineering fields **Question and answer** Prepare questions and guide students to identify the importance of studying Technical Drawing	The concept of Technical Drawing is clearly described	**The following tools and equipment are to be available:** • Chalkboard • Flip charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	3
		(b) Constructing lines	**Group discussion** Guide students in manageable groups to define a line and identify types of lines, drawing instruments, grades	Different types of lines are correctly defined and constructed.	**The following tools and equipment are to be available:**	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			of pencils and ISO paper sizes **Demonstration** Demonstrate the applications and handling of drawing instruments and equipment in constructing various types of lines **Hands-on learning** ▪ Guide students to practice construction of various types of lines used in Technical Drawing ▪ Guide students to practice drawing paper layout		• Chalkboard • Flip charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
		(c) Performing lettering and numbering	**Discussion** Guide students to discuss on the methods of printing letters and numbers **ICT-based learning** Guide students in manageable groups to use ICT to discuss and explain styles of printing letters and numbers in Technical Drawing **Demonstration** ▪ Demonstrate how to print letters and numbers in vertical and inclined styles ▪ Demonstrate how to print letters in upper and lower case **Hands-on learning** Guide students to practice printing of letters and numbers	Lettering and numbering methods are described and printing is performed as per Technical Drawing standards	**The following tools and equipment are to be available:** • Chalkboard • Flip charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	
		(d) Drawing a title block	**Discussion** Guide students to discuss the functions of a title block **ICT-based learning** Guide students in manageable groups to use ICT to explore and identify various styles and specifications of	The functions of a title block are explained and the title block is drawn as per given standards	**The following tools and equipment are to be available:** • Chalkboard • Flip charts	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			title blocks **Demonstration** Demonstrate construction and printing of a title block **Hands-on learning** Guide students to practice construction and printing of a title block		• Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	
	1.2 Constructing angles	(a) Constructing perpendiculars and bisectors	**Discussion** Guide students to explain perpendiculars and bisectors **ICT-based learning** Guide students in manageable groups to use ICT to identify and describe the procedures for constructing perpendiculars and bisectors **Demonstration** Demonstrate how to construct perpendicular and bisectors **Hands-on learning**	Perpendiculars and bisectors are correctly constructed as per given procedures	**The following tools and equipment are to be available:** • Chalkboard • Flip charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources**	3

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			Guide students to practice construction of perpendiculars and bisectors		• Search engines • Websites • E-books • Youtube videos	
		(b) Drawing parallel lines	**Discussion** Guide students to define and explain parallel lines **ICT-based learning** Guide students in manageable groups to use ICT to identify and describe the procedures for constructing parallel lines **Demonstration** ▪ Guide students to identify drawing instruments for parallel lines ▪ Demonstrate how to draw parallel lines **Hands-on learning** Guide students to practice construction of parallel lines	Parallel lines are constructed as per given procedures	**The following tools and equipment are to be available:** • Chalkboard • Flip charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	
		(c) Dividing a straight line into equal	**Discussion** Guide students to identify procedures of dividing	Division of straight lines into equal parts and	**The following tools and equipment are to**	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
		parts and given ratios	straight lines into equal parts and ratios **Demonstration** Demonstrate how to divide straight lines into equal parts and ratios **Hands-on learning** Guide students practice to divide straight lines into equal parts and ratios	ratios is performed as per given procedures	**be available:** • Chalkboard • Flip charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Online journals • Youtube videos	
		(d) Constructing angles by using compass and ruler only	**Brainstorming** Lead students to brainstorm on the meaning of an angle **ICT-based learning** Guide students in manageable groups to use ICT to identify types of angles and procedures for drawing angles using only compass and ruler	Angles are correctly constructed by using compass and ruler only	**The following tools and equipment are to be available:** • Chalkboard • Flip charts • Whiteboard • Projector • Drawing	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			Demonstration Demonstrate how to construct angles by using a compass and ruler only **Hands-on learning** Guide students to practice how to construct angles by using a compass and ruler only		equipment and instruments **On-line resources** • Search engines • Websites • E-books • Online journals • Youtube videos	
	1.3 Constructing geometrical figures	(a) Performing dimensioning	**Discussion** ▪ Guide students to explain dimensions and dimensioning ▪ Guide students to explain techniques and rules of dimensioning **ICT-based learning** Guide students in manageable groups to use ICT to state the importance of dimensioning and identify the various styles of dimensioning	Dimensioning is performed as per given rules and techniques	**The following tools and equipment are to be available:** • Chalkboard • Flip charts • Whiteboard • Projector • Drawing equipment and instruments	4

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			Demonstration Demonstrate on how to dimension various objects **Hands-on learning** ▪ Guide students to practice dimensioning of different objects			
		(b) Constructing triangles	**Discussion** Guide students to define the term triangle **ICT-based learning** Guide students in manageable groups to use ICT to identify different types of triangles **Demonstration** Demonstrate how to construct different types of triangles **Hands-on learning** Guide students to practice how to construct different types of triangles	Triangles are constructed as per given instructions	**The following tools and equipment are to be available:** • Chalkboard • Flip charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
		(c) Constructing quadrilateral	**Discussion** Guide students to define the term quadrilateral **ICT-based learning** Guide students in manageable groups to use ICT to identify different types of quadrilaterals **Demonstration** Demonstrate how to construct different types of quadrilaterals **Hands-on learning** Guide students to practice how to construct different types of quadrilaterals	Quadrilaterals are constructed as per given instructions	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	
		(d) Constructing regular polygons	**Discussion** Guide students to define the term polygon **ICT-based learning** Guide students in manageable groups to use ICT to	Regular polygons are constructed as per given instructions	**The following tools and equipment are to be available:** • Chalkboard • Charts	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			identify and describe different types of polygons **Demonstration** Demonstrate how to construct different types of regular polygons **Hands-on learning** Guide students to practice how to construct different types of regular polygons		• Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
		(e) Constructing circles	**Discussion** Guide students to define the term circle **ICT-based learning** Guide students in manageable groups to use ICT to identify different types of circles and their features **Demonstration** ▪ Demonstrate how to construct circles, concentric and eccentric circles ▪ Demonstrate how to inscribe and circumscribe circles in/on triangles **Hands-on learning** ▪ Guide students to practice how to construct circles, concentric and eccentric circles ▪ Guide students to practice to inscribe and circumscribe circles	Circles are constructed as per given instructions	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	
		(f) Constructing tangents and arc tangents	**Discussion** Guide students to discuss the terms tangent and arc tangent	Tangents and arc tangents are correctly constructed as per given	**The following tools and equipment are to be available:** • Chalkboard	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			ICT-based learning Guide students in manageable groups to use ICT to identify and describe the procedures for constructing tangents and arc tangents **Demonstration** Demonstrate how to construct tangent and arc tangent **Hands-on learning** Guide students to practice to construct tangent and arc tangent	procedures	• Charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	
		(g) Constructing an ellipse	**Discussion** Guide students to explain an ellipse and describe its parts **Demonstration** Demonstrate how to construct ellipses by using concentric circles/auxiliary method, rectangular, trammel/ordinate/foci methods and four center methods **Hands-on learning** Guide students to practice how to construct ellipse using the given methods	Ellipses are constructed as per given methods	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
					On-line resources • Search engines • Websites • E-books • Youtube videos	
2 Drawing scale	2.1 Constructing plain and diagonal scales	(a) Drawing plain and diagonal scales	**Brainstorming** Lead students to brainstorm on the meaning of the term scale **Discussion** ▪ Guide students to explain plain and diagonal scales ▪ Guide students to describe the procedure for determining representative fraction **ICT-based learning** Guide students in manageable groups to use ICT to identify and describe types of scales used in Technical Drawing **Demonstration**	Plain and diagonal scales are constructed as per specifications	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books	2

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			Demonstrate how to construct plain and diagonal scales **Hands-on learning** Guide students to practice construction of plain and diagonal scales		• Youtube videos	
3 Constructing of pictorial drawing	3.1 Constructing isometric projections	(a) Constructing square and rectangular boxes in isometric projection	**Discussion** ▪ Guide students to discuss the meaning of pictorial drawing and pictorial projection ▪ Guide students to describe types of pictorial drawing ▪ Guide students to explain isometric drawing and isometric projection **Demonstration** ▪ Demonstrate how to construct square and rectangular isometric boxes ▪ Demonstrate how to draw non-isometric lines ▪ Guide students on the proper uses of instruments and procedures for easy constructions **Hands-on learning**	Rectangular and square boxes are constructed in isometric projection as per given instructions	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	3

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			Guide students to practice construction of square and rectangular isometric boxes			
		(b) Constructing isometric stepped blocks	**ICT-based learning** Guide students in manageable groups to use ICT to find the meaning of stepped blocks as applied in Technical Drawing **Demonstration** Demonstrate how to construct isometric stepped blocks by using box method **Hands-on learning** Guide students to practice construction of neat isometric stepped blocks through proper steps	Neat isometric stepped blocks are constructed as per given instructions	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	
		(c) Constructing isometric circles and cylindrical	**Demonstration** ▪ Demonstrate how to construct isometric circles ▪ Demonstrate how to construct isometric cylindrical	Neat isometric circles and cylindrical shapes are	**The following tools and equipment are to be available:**	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
		shapes	shapes **Hands-on learning** ▪ Guide students when exercising how to construct neat isometric circles and cylindrical shapes ▪ Guide students to practice to construct neat isometric objects and circles	constructed as per given instructions	• Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	
	3.2 Constructing oblique projections	(a) Constructing square and rectangular boxes in oblique projection	**Discussion** ▪ Guide students to discuss about oblique projection ▪ Guide students to explain and illustrate cavalier oblique projection **Demonstration** Demonstrate the construction of square and rectangular boxes using both types of oblique projections **Hands-on learning**	Types of oblique projections are described, and square and rectangular boxes are constructed in oblique projection	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments	3

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			Guide students to practice construction of square and rectangular boxes in oblique projection		**On-line resources** • Search engines • Websites • E-books • Youtube videos	
		(b) Constructing stepped blocks in oblique projections	**Demonstration** Demonstrate steps for constructing a stepped block in oblique projection **Hands-on learning** Guide students to practice construction of different stepped blocks in oblique projection	Types of stepped blocks are described, and constructed in oblique projection	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
					• Youtube videos	
		(c) Constructing circles and cylindrical shapes in oblique projection	**Demonstration** Demonstrate on how to draw oblique circles and cylindrical shapes on inclined side of an obliquely projected object **Hands-on learning** Guide students to practice drawing different oblique projected objects with circles and cylindrical features	Circles and cylindrical shapes are constructed in oblique projection	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	

Form Two

Table 4*: Detailed Contents for Form Two*

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
1 Constructing orthographic projection	1.1 Drawing in the first-angle orthographic projection	(a) Projecting blocks in the first-angle projection system	**Discussion** ▪ Guide students to discuss the meaning of orthographic projection ▪ Describe position of views in first-angle projection **Demonstration** ▪ Demonstrate how to draw symbols for first angle orthographic projection ▪ Demonstrate how to project views in first-angle projection **Hands-on learning** Guide students to project views of square and rectangular blocks in first-angle projection	Rectangular and square blocks are correctly projected in the first-angle projection system	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	7
		(b) Projecting engineering	**Discussion** Guide students to explain features of various	Engineering components are	**The following tools and**	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
		components in the first-angle projection system	engineering components **Demonstration** Demonstrate how to interpret and construct views of engineering components into first-angle projection **Hands-on learning** Guide students to practice projecting views of engineering components in first-angle projection	correctly projected in the first-angle projection system	**equipment are to be available:** • Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
		(c) Sketching by freehand	**Discussion** Guide students to discuss the meaning of freehand sketching **Demonstration** Demonstrate how to perform freehand sketching **Hands-on learning** Guide students to practice how to perform freehand sketching	Freehand sketching of various figures is performed as instructed	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	
	1.2 Drawing in the third-angle orthographic projection	(a) Projecting blocks in the third-angle projection system	**Discussion** ▪ Guide students to discuss the principles of third-angle projection ▪ Guide students to explain and draw third-angle and first-angle projection symbols	Rectangular and square blocks are correctly projected in the third-angle projection system	**The following tools and equipment are to be available:** • Chalkboard • Flip charts • Whiteboard	6

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			Demonstration Demonstrate to construct third-angle orthographic projection of square and rectangular blocks **Hands-on learning** Guide students to practice construction of square and rectangular blocks in third-angle projection		• Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube videos	
		(b) Projecting engineering components in the third-angle projection system	**Discussion** ▪ Guide students on how to interpret engineering objects in third-angle projection ▪ Guide students on positioning views of engineering objects relative to each other in third-angle projection **Demonstration** Demonstrate on how to draw third-angle projection of engineering objects	Engineering components are correctly projected in the third-angle projection system	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments **On-line**	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			Hands-on learning Guide students to practice projection of engineering objects in third-angle projection		**resources** • Search engines • Websites • E-books • Youtube videos	
2 Constructing sectional views	2.1 Sectioning of engineering components	(a) Drawing sections	**Discussion** ▪ Guide students to discuss the concept of sectioning and its importance ▪ Guide students to mention types of sectioning and rules for sectioning ▪ Guide students to explain sectioning exceptions **Demonstration** Demonstrate how to perform various types of sections **Hands-on learning** Guide students to practice performing various types of sections	Types of sections are described and performed as per given instructions	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books • Youtube	7

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
					videos	
		(b) Drawing standard symbols	**Brainstorming** ▪ Lead students to brainstorm on symbols and conventional representation ▪ Guide students to describe common standard abbreviations in Technical Drawing **Demonstration** Demonstrate how to draw standard symbols and conventional representations **Hands-on learning** Guide students to practice drawing of standard symbols and conventions	Standard symbols and conventions of engineering components are drawn as per ISO.	**The following tools and equipment are to be available:** • Chalk/whiteboard • Charts • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books	
	2.2 Drawing conic sections	(a) Constructing conic sections	**Discussion** Guide students to discuss different types of conic sections	Various types of conic sections are described, and constructed	**The following tools and equipment are to be available:**	6

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			Demonstration Demonstrate the procedures for drawing different types of conic sections, including ellipse, parabola, hyperbola, etc. **Hands-on learning** Guide students to practice drawing different conic sections as per given instructions	as instructed	• Chalk/whiteboard • Charts • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books	

Form Three

Table 5: *Detailed Contents for Form Three*

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
1 Drawing of similar figures and equivalent areas	1.1 Performing enlarging and reducing of figures	(a) Performing enlarging and reducing of plane figures	**Discussions** ▪ Guide students to explain enlargingand reducing figures ▪ Guide students to explain ratio andproportion of similar figure **Demonstration** Demonstrate how to enlarge and reduce size of similar figures by radial, direct method one and direct method two	Methods for enlarging and reducing figures are identified and applied as per given instructions	**The following tools and equipment are to be available:** • Chalk/whiteboard • Charts • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books	3

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			Hands-on learning Guide students to practice how to enlarge and reduce drawings or figures by various methods			
	1.2 Drawing equivalent areas	(a) Constructing equal areas	**Discussion** Guide students to explain the basis of equivalent areas **Demonstration** Demonstrate how to construct equivalent areas **Hands-on learning** Guide students to practice constructions of equivalent areas of common plane figures	Equivalent areas of plane figures are constructed as instructed	**The following tools and equipment are to be available:** • Chalk/whiteboard • Charts • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books	3
2 Drawing of loci	2.1 Constructing locus of mechanism	(a) Constructing locus of various	**Discussion** Guide students to explain locus and crank mechanism	Procedures for performing locus of various	**The following tools and equipment are to**	7

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
		mechanism	**Demonstration** Demonstrate how to construct locus of various mechanism **Hands-on learning** Guide students to practice constructing locus of various mechanisms	mechanisms are described and applied as instructed	**be available:** • Chalk/whiteboard • Charts • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books	
	2.2 Constructing basic curves	(a) Constructing cycloids, epi-cycloid and hypo-cycloids	**Discussion** Guide students to discuss different types of basic curves **Demonstration** Demonstrate to the student procedures for constructions ofdifferent basic curves **Hands-on learning** Guide students to practice construction of various basic	Basic curves are identified, distinguished and correctly constructed	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Drawing sheets A4/A3 • Drawing equipment and instruments	6

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			curves			
		(b) Constructing trochoids	**Discussion** Guide students to explain trochoids **Demonstration** Demonstrate how to construct trochoids **Hands-on learning** Guide students to practice how to construct trochoids	Trochoids are constructed as per given instructions	**The following tools and equipment are to be available:** • Chalkboard • Charts • Whiteboard • Drawing sheets A4/A3 • Drawing equipment and Instruments.	
3 Construction of development and interpenetration	3.1 Performing development of objects	(a) Developing objects by straight lines, parallel lines and radial line	**Brainstorming** ▪ Lead students to brainstorm on the concept of development ▪ Guide students to explain rules of development **Demonstration** Demonstrate how to develop objects by straight lines, parallel lines (cylinders, prisms), and radial lines (pyramids, cones)	Objects are correctly developed using straight, parallel and radial line approaches	**The following tools and equipment are to be available:** • Chalk/whiteboard • Flip charts • Projector • Drawing equipment and instruments	6

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			Hands-on learning Guide students to practice developing an object by straight,parallel and radial lines		**On-line resources** • Search engines • Websites • E-books	
		(b) Developing objects by triangulation method	**Discussion** Guide students to describe transition pieces **Demonstration** Demonstrate how to draw development of a circular top withsquare base transition pieces by using triangulation method **Hands-on learning** Guide students to practice drawing development of transition pieces (circular top with square base transition piece) by triangulation method	Triangulation method is correctly applied to develop various transition pieces	**The following tools and equipment are to be available:** • Chalk/whiteboard • Flip charts • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books	
	3.2 Performing	(a) Performing interpenetration of	**Discussion**	Laws of interpenetration	**The following tools and**	6

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
	interpenetration	prisms and cylinders	▪ Guide students to explaininterpenetration and laws of interpenetration ▪ Guide students to describe shapes of prism and cylinders **Demonstration** Demonstrate how to draw interpenetration of prism and cylinders at right angle and at any angle **Hands-on learning** Guide students to practice how to draw interpenetration of prism and cylinders	are described and interpenetration of prisms and cylinders is correctly performed	**equipment are to be available:** • Chalk/whitebo ard • Flip charts • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books	
		(b) Performing interpenetration of pyramids and cones	**Discussion** Guide students to explain for conducting lines of interpenetration of pyramids and cones **Demonstration** Demonstrate on how to construct lines of interpenetration for prisms and cylinders interpenetrating right pyramids and cones at right angles and at any angle **Hands-on learning** Guide students to practice construction of lines of	Interpenetration of pyramids and cones is correctly performed	**The following tools and equipment are to be available:** • Chalk/whitebo ard • Flip charts • Projector • Drawing equipment and instruments **On-line**	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			interpenetration for pyramids and cones		**resources** • Search engines • Websites • E-books	
		(c) Performing interpenetration of spheres	**Brainstorming** Lead students to brainstorm on the shape of a sphere and the interpenetration concept **Demonstration** Demonstrate how to draw interpenetration of spheres intersecting other objects (sphere intersecting cone) **Hands-on learning** Guide student to practice how to draw interpenetration of spheres	Interpenetration of spheres is correctly performed	**The following tools and equipment are to be available:** • Chalk/whiteboard • Flip charts • Projector • Drawing equipment and instruments **On-line resources** • Search engines • Websites • E-books	

Form Four

Table 6: *Detailed Contents for Form Four*

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
1 Performing working drawing	1.1 Drawing detailed working drawing	(a) Producing detailed working drawing	**Discussions** ▪ Guide students to explain detailed working drawing ▪ Guide students to describe system of fits and surface symbols ▪ Guide students to interpret detailed working drawings **Demonstration** Demonstrate how to draw detailed working drawings **Hands-on learning** Guide students to practice produce detailed working drawings	Detailed working drawings are correctly produced	**The following tools and equipment are to be available:** • Chalk/whiteboard • Flip charts • Whiteboard • A3/A4 drawing sheets • Drawing equipment and instruments.	14
2 Implementing Computer Aided Design (CAD)	2.1 Performing 2D CAD basics	(a) Identifying CAD components	**Brainstorming** ▪ Lead students to brainstorm on the term CAD ▪ Guide students to explain the importance of CAD ▪ Guide students to identify and describe the menu bar, status bar, tool bar and drawing window	Components of CAD interface are identified	**The following tools and equipment are to be available:** • Plain papers • Printer	17

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			Hands-on learning Guide students to practice identifying components of CAD interface		• Marker pens • CAD software • Projector/smartboard • Whiteboard • Flip charts • Computers	
		(b) Performing setting up the drawing area and paper size	**Demonstration** ▪ Demonstrate how to select/set drawing units for drawing ▪ Demonstrate how to select/set the drawing scale and paper size for drawing ▪ Demonstrate how to draw borders around the drawing area **Hands-on learning** ▪ Guide students to practice how to select/set drawing units, drawing scale and paper size ▪ Guide students to practice how to draw boarders around the drawing area	Setting up the drawing area and paper size are correctly performed	**The following tools and equipment are to be available:** • Plain papers • Printer • Marker pens • CAD software • Projector/smartboard • Whiteboard • Flip charts • Computers	
		(c) Accessing CAD commands and draft setting	**Discussion** Guide students to explain different uses of CAD	CAD commands and draft setting are correctly	**The following tools and equipment are to**	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			commands **Demonstrations** ▪ Demonstrate how to construct drawings using CAD commands ▪ Demonstrate how to construct drawing by using drawing aids **Hands-on learning** Guide students to practice how to edit drawings by using modify tools	accessed	**be available:** • Plain papers • Printer • Marker pens • CAD software • Projector/smartboard • Whiteboard • Flip charts • Computers	
		(d) Creating basic shapes (squares and rectangles) using coordinate systems	**Discussion** Guide students to describe the procedures on how to construct objects by using coordinate systems **Demonstrations** ▪ Demonstrate how to construct figures by using absolute coordinate method ▪ Demonstrate how to construct objects by using relative coordinate method **Hands-on learning** Guide students to practice how to construct objects by	Basic shapes are correctly created using coordinate systems	**The following tools and equipment are to be available:** • Plain papers • Printer • Marker pens • CAD software • Projector/smartboard • Whiteboard • Flip charts • Computers	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			using coordinate methods			
		(e) Applying dimensions and annotations	**Discussion** Guide students to describe the principles of dimensioning and the role of annotations in Technical Drawing **Hands-on learning** ▪ Guide students to apply dimensioning standards in real-world engineering ▪ Guide students to place dimensions and annotations correctly in a drawing using CAD software ▪ Guide students to recognize and apply different dimension types, including linear, angular, and radial dimensions	Various dimensioning styles and annotations are properly applied	**The following tools and equipment are to be available:** • Plain papers • Printer • Marker pens • CAD software • Projector/smartboard • Whiteboard • Flip charts • Computers	
		(f) Applying layers, hatching and patterns	**Discussion** Guide students to explain the purpose and function of layers in CAD **Demonstration** Demonstrate how to use layers in CAD software **Hands-on learning** ▪ Guide students to apply hatching and patterns in drawings based on industry conventions	Layers, hatching and patterns are correctly applied	**The following tools and equipment are to be available:** • Plain papers • Printer • Marker pens • CAD software • Projector/smartboard	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			▪ Guide students to choose appropriate hatching and patterns for different materials or design components		• Whiteboard • Flip charts • Computers	
		(g) Conducting multiple entities with array and basic editing commands	**Demonstrations** ▪ Demonstrate the concepts of multiple entities and arrays (rectangular, polar) using real-world examples ▪ Guide students to use CAD commands to create and modify arrays of multiple entities ▪ Demonstrate and elaborate on the use of basic editing commands like copy, move, rotate, mirror, and scale **Peer reviewing** Facilitate peer reviewing exercise, where students assess and provide feedback on each other's use of arrays and basic editing commands in CAD software	Multiple entities with array and basic editing commands are properly conducted	**The following tools and equipment are to be available:** • Plain papers • Printer • Marker pens • CAD software • Projector/smartboard • Whiteboard • Flip charts • Computers	
		(h) Performing plotting and saving files in PDF	**Discussion** Explain the purpose and process of plotting in engineering designs **Demonstration** Demonstrates how to configure plot settings, including	Plotting and saving files in PDF are correctly performed	**The following tools and equipment are to be available:** • Plain papers • Printer	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			paper size, plot styles, and plot areas **Hands-on learning** ▪ Guide students in setting up a drawing with correct scale, layout, and views for plotting in CAD software ▪ Guide students in exporting CAD drawings to PDF and review common errors		• Marker pens • CAD software • Projector/smartboard • Whiteboard • Flip charts • Computers	
	2.2 Performing 3D CAD modelling	(a)Identifying toolbars for 3D CAD modelling	**Discussion** Guide students to explain the importance of different toolbars in 3D modelling and their role in creating and editing models **Demonstration** Demonstrate how to locate and identify the drawing, modification, navigation, and visualization toolbars common in CAD when performing 3D modelling **Hands-on learning** ▪ Guide students to practice using key 3D tools such as Extrude, Revolve, Loft and Sweep to create simple models ▪ Guide students to practice customizing the software workspace to optimize tool accessibility for specific modelling tasks	Tools bars for 3D modelling are clearly identified	**The following tools and equipment are to be available:** • Plain papers • Printer • Marker pens • CAD software • Projector/smartboard • Whiteboard • Flip charts • Computers	16

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
		(b) Implementing the fundamentals of 3D CAD modelling	**Discussion** Guide students to describe the fundamentals of 3D modelling and its significance in design work **Demonstrations** ▪ Demonstrate how to navigate the interface of CAD modelling software and introduce key tools and functions in 3D **Hands-on learning** ▪ Guide students to create simple 3D models by combining basic geometric shapes ▪ Guide students to modify 3D models using Scaling, Rotation and Extrusion tools	Fundamentals of 3D CAD modelling are correctly implemented	**The following tools and equipment are to be available:** • Plain papers • Printer • Marker pens • CAD software • Projector/smartboard • Whiteboard • Flip charts • Computers	
		(c) Creating basic 3D modelling shapes	**Discussion** Guide students to discuss the concept of 3D geometry and the common shapes used in design modelling **Demonstration** Demonstrate how to create basic 3D shapes using tools in CAD modelling software **Hands-on learning**	Basic 3D modelling shapes are correctly created.	**The following tools and equipment are to be available:** • Plain papers • Printer • Marker pens • CAD software • Projector/smar	

Module Title (Main Competence)	Unit Title (Specific Competences)	Elements (Learning Activities)	Suggested Teaching and Learning Methods	Assessment Criteria	Suggested Teaching and Learning Resources	Number of Periods per Unit
			▪ Guide students to exercise Extrude, Revolve and Sweep tools to transform 2D sketches into 3D shapes ▪ Guide students to practice modifying the size, position, and orientation of 3D models ▪ Guide students practice combining multiple basic shapes to create more complex models		tboard • Whiteboard • Flip charts • Computers	

References

1. Terence, D. (1987). *Technical drawing for today*, 2nd Ed. Macmillan Education Ltd. ISBN: 0-333-42910-9

2. Morling, K. (2010). *Geometric and Engineering Drawing*, 3rd Ed. Elsevier. ISBN: 978-0-08-096768-4

3. Venkata, R.K. (2008). *Text Book of Engineering Drawing*, 2nd Ed. BS Publications ISBN: 81-7800-149-7

4. Leach, J. A. (2000). *Your AutoCAD 2000 Instructor*. McGraw-Hill Co.

5. Ministry of Education, Science and Technology. (2023). *Curriculum for Ordinary Secondary Education Form I–IV*. Tanzania Institute of Education.

6. Kyles, S. (2008). *AutoCAD Workbook for Architects and Engineers*. Wiley-Blackwell.

7. Simmons C.H. & Maguire D.E. (2004). *Manual of Engineering Drawing*, 2nd Ed. Elsevier.

8. William, S.P. (1980). *Drafting Technology and Practice*. Glencoe Publishing Company.

9. Shumaker, T.M. & Madsen, D.A. (2002). *AutoCad and It's Applications*. Goodheart Willcox.

10. Ministry of Education, Science and Technology. (2022). *A Syllabus for Technical Drawing*. Vocational Education and Training Authority.