NCDC
NATIONAL CURRICULUM DEVELOPMENT CENTRE

Uganda Advanced Certificate of Education

# TEACHING SYLLABI

*VOLUME 3*

# Engineering Metalwork
# Technical Drawing
# Woodwork

2013

THE REPUBLIC OF UGANDA
Ministry of Education and Sports

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NCDC takes full responsibility for any errors and omissions in the documents and welcomes suggestions to address them.

# FOREWORD

For a long time teachers have been using Uganda National Examinations Board (UNEB) syllabi to plan their teaching schemes. This approach has rendered the curriculum to be largely driven by examination.

Working with relevant subject panels, NCDC has produced the Teaching Syllabi for all the Advanced Level subjects. The subject content in the syllabi has been clarified using appropriate specific objectives. It should be noted that the content in the syllabi has remained largely the same except in a few subjects where it has been updated by removing obsolete and/ or irrelevant material. Suitable teaching / learning strategies have been suggested to the teacher and other users.

Teachers will find the syllabi useful in planning the teaching / learning processes. The content therein will go a long way in enhancing the learners' educational experiences and guide the teachers towards successful delivery of meaningful learning experiences.

The teaching / learning strategies suggested in the Syllabi are just a guide to the teacher but are not meant to substitute the rich professional approaches that the teacher may opt to use to deliver knowledge, and to develop understandings, skills, values and attitudes.

Connie Kateeba

**DIRECTOR**

**National Curriculum Development Centre**

# GENERAL INTRODUCTION

This volume is addressed to practicing teachers, teacher trainers and other educationists. It comprises three teaching syllabi, namely; **Engineering Metalwork, Technical Drawing and Woodwork.**

The specific objectives and activities in each syllabus are stated in terms of learners' cognitive, psychomotor and affective domains. In each of them, the scope and sequence of the content is well articulated in order to guide the teaching/learning process.

The suggested teaching/ learning and assessment strategies are clearly defined and it is hoped that all the users of this book will find it useful.

The development of the above syllabi answers the more serious long-term concerns of stakeholders to vocationalise the Uganda education system.

These hands-on technical subjects will go a long way in addressing the problems of unemployment in Uganda as the students will come out with skills that will foster self-employment. The subjects will, in a nut-shell, empower learners with skills for self-reliance, improved productivity and increased levels of employment.

The development of the demand-driven and market-oriented curricula will further empower learners with relevant knowledge, skills, and values as well as positive attitudes towards the world of work. The curricula emphasises the physical production skills rather than the mere acquisition of knowledge thus, producing more job makers than job seekers in the world of work.

It is hoped that this approach will reduce the high levels of un-employment and under employment. These practical skills therefore, become a timely intervention to prepare learners for self reliance, enabling them to be productive so that they benefit society dynamics in the ever expanding competitive market.

# Uganda Advanced Certificate of Education

# Engineering Metalwork

## TEACHING SYLLABUS

# Contents

# SECTION I

## Introduction

This is the Metalwork syllabus for Advanced Level. The syllabus was introduced during the missionary days and later the colonial and post-independence governments took it up. The subject started in City and Guild. It was designed by the Cambridge and Overseas Examination Syndicate and revised by East African Examination Council.

For some time, there was no standard Metalwork teaching syllabus in Uganda. However, teaching and learning took place. The syllabi that were used differed from school to school and lacked many aspects of a teaching syllabus. This made their use difficult.

This syllabus for teaching Metalwork has been produced with the intention of making the content clearer to the teacher by defining the scope, depth and sequence in order to guide the teaching and learning process.

### Purpose of the Teaching Syllabus

There has been a general outcry from stakeholders about learners completing Advanced Level with hardly any practical skills in Metalwork. The Ugandan society wants education with a practical touch that combines cognitive, psychomotor and affective domains. Yet schools offering Metalwork had no standard teaching syllabus. As a result, schools failed to deliver what was expected of them.

This teaching syllabus now guides the teacher to enable the learner to acquire the basic knowledge, skills, values and attitudes of geometry and working drawing. The learner also develops an understanding of Metalwork resulting in a meaningful life thereafter. The learner who successfully completes this teaching syllabus is expected to be self-employed and also work in architectural firms, building sites, workshops, garages and manufacturing industries, among others.

### Aims of Engineering Metalwork at Advanced Level

To enable the learner to:

- improve on developed and acquired skills in practical work, use of common hand tools, machines and various materials.
- develop imagination and ability to express ideas in designing and drawing.
- develop a positive attitude towards teamwork and cottage industry.
- encourage intelligent use of time, energy and finances.

- appreciate the value of safety rules and regulations.

## Target

This syllabus targets professional teachers with diploma and/or degree qualifications who are expected to facilitate learning at Advanced level.

## The Scope and Depth

The topics, sub-topics, specific objectives and content outline define the scope and depth of coverage.

## Teaching Sequence

| Class | Topics |
|---|---|
| **S5: Term I** | Materials<br>Testing of Materials |
| **S5: Term II** | Heat Treatment<br>Measuring and Inspection |
| **S5: Term III** | Cutting Tools<br>Metalworking Machines<br>- Drilling Machine<br>Engineering Metalwork Projects |
| **S6: Term I** | Metalworking Machines<br>- Lathe Machine<br>- Shaping Machine<br>- Milling Machine<br>- Grinding Machine |
| **S6: Term II** | Welding Processes<br>Foundry Work<br>Engineering Metalwork Projects |
| **S6 Term III** | Foundry Work (Continuation) |

## Time Allocation

The Engineering Metalwork shall have six periods per week throughout the two years of study. Each period is of 40 minutes duration. Time allocation for each topic has been suggested as a guide. The school is at liberty to adjust this time as appropriate.

It is assumed that there are twelve weeks of teaching and learning in every term except third term of senior six which has only ten weeks.

## How to Use this Teaching Syllabus

This syllabus guides the teacher and the learner to cover the entire subject. The topics have been structured from simple to complex areas of learning. The suggested teaching and learning strategies are not exhaustive. The teacher and the learner are encouraged to solicit information from the references given and further information from the library, newspapers, magazines, the Internet, catalogues and resource persons.

Carefully planned field visits to relevant areas of study like architectural firms, building sites, factories, garages and workshops are encouraged.

Enough time has been left for revision in S6 Term III so that the learner can discuss, internalise and prepare for final examinations.

Since the subject requires machines and their accessories, materials and supplies, as well as tools and equipment, a list of the suggested requirements is found in the appendix.

In freehand sketching, drawing instruments are not allowed. However, the drawing should be proportional.

It is recommended that this syllabus be used with relevant textbooks of Engineering Metalwork.

Lastly, international Metalworking conventions should be applied.

## Assessment

Assessment is finding out how much a student has learned during and after the teaching and learning processes.
The purposes of assessment are:

- identifying a learner who needs remedial work.
- finding out how much a learner has achieved.
- informing the learner what he/she has achieved.
- encouraging the learner to perform better.
- making new plans for effective teaching and learning.
- measuring progress from one topic to another.
- identifying a learner with exceptional talents for more challenging tasks.
- providing required information to the learner, administrators, parents, guardians and the Ministry of Education.

This syllabus will be assessed in two ways namely:

### *Continuous Assessment*

Continuous assessment accounts for 30% of the marks and covers work in the whole of S5 and Terms I and II of S6. For the final examinations, the results of S5 and S6 continuous assessments will be used for grading the final results by Uganda National Examinations Board. Continuous assessment is done in the normal periods of learning.

Since the subject is skills-based, all the competences, oral, written and practical, should be assessed by the teacher, who, among other things, records marks, observes the learners during practical sessions and examines articles produced.

The competences achieved by the learners are recorded on a progressive chart, in a simple and cumulative way, using a checklist which is later displayed to check performance and work done in order to inspire and motivate further learning. Regular reports should be given to the learners.

### *Summative Assessment*

**Examination Format**

There will be two papers and one coursework assessment.

**Paper 1: Theory (2 ½ hours) (100marks)**

This paper will consist of two sections, A and B. Section A will contain 40 compulsory objective questions carrying 40 marks. Section B will contain five essay-type questions of which the candidate is required to attempt three questions which carry 60 marks.

**Paper 2: Practical (6 hours) (70 marks)**

This examination will consist of machine work, foundry work and welding processes. At least three of the above processes may be examined at a time.

The assessment should reflect testable competences in the following domains:

a) Knowledge of terminologies, facts, skills and principles of the subject.
b) Comprehension involving the ability to explain and translate the working drawings to real products and use standard procedure to solve technical problems.
c) Application involving the ability to draft and interpret working drawings, apply rules and regulations to new situations and to approve working drawings.

d) A practical involving the ability to use knowledge, materials, tools and equipment to produce articles, take and read measurements and present cutting and material list in standard form.

**Note:**

1. Coursework marks should be submitted to UNEB by October 31, of the year of examination.
2. The final papers of candidates whose coursework marks are not submitted will not be graded.

# SENIOR FIVE TERM I

## Topic 1: Materials

*Duration: 36 Periods*

### Overview

This topic introduces the learner to the categories of materials and their applications in engineering. The knowledge acquired will enable the learner to select the most suitable materials for a specific practical work and project.

### General Objective

By the end of this topic, the learner should be able to identify and use the various types of materials.

## Sub-Topic 1: Introduction to Materials

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define materials.<br>• state the uses of materials in engineering.<br>• identify characteristics and working properties of materials. | <br>• Definition of materials<br>• Uses of materials<br><br>• General properties and characteristics of materials |

### Suggested Methodology

- Brainstorm the definition of materials.
- Use discussion to clarify the learners' contributions.
- Using the discovery method, take learners to the workshop and task them to:
  - identify the different types of materials,
  - explain the uses of the different types of materials,
  - describe the properties and characteristics of the different types of materials.
- Clarify the learners' contributions.

### Teaching Resources

- Charts
- Models

- Information and communication technology (ICT) equipment
- Materials
- Tools and equipment
- Workshop and materials room/store

### Assessment Strategies

- Class exercises on the properties and characteristics of materials
- Assign learners homework in their local community to:
  - identify the different engineering materials used.
  - describe how these materials are used.

## Sub-Topic 2: Categories of Materials

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• distinguish different categories of materials.<br>• identify the properties and applications of organic and non-organic materials. | • Organic materials<br>• Non-organic materials<br>• Properties and applications of organic and non-organic materials |

### Teaching and Learning Strategies

- Guide learners to discuss organic and non-organic categories of materials and state examples in each case.
- Give the learners an individual exercise to study and make notes on the properties and applications of organic and non-organic materials.

### Teaching Resources

- Charts
- Models
- ICT equipment
- Different types of materials (organic and non-organic)
- Tools and equipment
- Workshop/materials store

### Assessment Strategies

- Give learners a class exercise to list and categorise various materials.

- Assign learners to discuss the properties and applications of organic and non-organic materials.

## Sub-Topic 3: Metals

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define metals.<br>• classify metals.<br>• identify working properties and characteristics of metals.<br>• describe the various methods of working metals. | • Definition of metals<br>• Classification of metals<br>• Working properties and characteristics of metals<br>• Methods of working metals |

## Teaching and Learning Strategies

- Guide learners to brainstorm the definition of metals.
- Clarify the learners' contributions.
- Explain to learners the classification of metals.
- Guide learners to discuss in groups the working properties of metals under the following topics:
    - physical
    - mechanical
    - chemical
    - electrical and thermal
- Guide learners through illustrations to discuss the various methods of working metals.
- Use a study trip to any aluminium or steel rolling mills to expose learners to the practical application of working metals.

## Teaching Resources

- Charts
- Models
- ICT equipment
- Metals
- Tools and equipment
- Workshop/materials store

## Assessment Strategies

- Give learners assignments to discuss the classification and properties of metals.
- Learners should write individual reports of the field visit on the methods of working metals. This should be made with very clear sketches describing each metal working process and the advantages and disadvantages of each process.
- Use discussion to clarify the learners' contributions made through the field reports.
- Give learners a test to sum up the topic of materials.

# Topic 2: Testing of Materials

*Duration: 22 Periods*

## Overview

This topic is intended to introduce the learner to the general testing methods of properties of engineering materials. It will also help the learner to ascertain the various properties of materials and choose the suitable materials for specific activities.

## General Objective

By the end of this topic, the learner should be able to ascertain the properties of different materials.

## Sub-Topic: Methods of Testing Materials

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• describe the various methods of testing materials.<br>• carry out materials testing.<br>• identify materials by common workshop tests.<br>• determine the various properties of materials for a specific job. | • Methods of testing materials:<br>- destructive tests<br>- non-destructive tests<br>• Identification of materials by common workshop tests<br>• Determination of various properties of materials for specific jobs |
| **Practical Exercise** | |
| • The learner should be able to make different metal base articles and test their properties. | • Testing of properties of different articles made by the learner. The properties may include:<br>- physical<br>- mechanical<br>- electrical and thermal<br>- chemical and magnetic |

## Teaching and Learning Strategies

- Guide learners to discuss the reasons for testing materials.
- Use illustrations to discuss with learners the various destructive and non-destructive methods of testing materials.

- Guide learners in the workshop to practice identification of materials by common tests such as grinding, filing, colour, weight, lustre, sound, temperature and magnetic attraction.
- Take learners to a materials testing centre or industry to learn how materials are tested.
- Use demonstrations to guide learners in testing the various properties of materials.

**Teaching Resources**

- Charts
- Models
- ICT equipment
- Specimen for testing
- Tools and equipment

## Assessment Strategies

- Ask learners to discuss the various materials testing methods.
- Give learners a coursework to discuss the common workshop tests of identifying materials.
- Learners should write a report on a field trip.
- Discuss the learners' contributions in the field study report.
- Assign learners practical exercises to test the various properties of metals.
- Give a test to recapitulate the testing of materials.

SENIOR FIVE TERM II

# Topic 3: Heat Treatment of Materials

*Duration: 32 Periods*

## Overview

This topic teaches the learner how to heat-treat metals. It explains the basic heat treatment processes used in the production industry. The knowledge acquired from this topic should help the learner in the modification of properties of engineering components.

## General Objective

By the end of this topic, the learner should be able to carry out heat treatment of metals.

## Sub-Topic 1: Introduction to Heat Treatment

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define heat treatment.<br>• state the purposes of heat treatment. | • Definition of heat treatment<br>• Purposes of heat treatment |

### Teaching and Learning Strategies

- Use question and answer approach to guide learners in defining heat treatment.
- Guide learners in a group discussion on the purposes of heat treatment.
- Use the explanation method to clarify the learners' contributions.

### Teaching Resources

- Charts
- Models
- Heat treated articles
- ICT equipment
- Heat treatment tools and equipment

### Assessment Strategies

- Class exercises on the purposes of heat treatment.

## Sub-Topic2: Heat Treatment Processes

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• explain the heat treatment processes of ferrous metals.<br>• carry out heat treatment processes on self-made articles.<br>• identify and use the various heat treatment equipment, accessories and supplies.<br>• illustrate the internal structural changes of low and high carbon steels during heat treatment using iron carbon diagrams.<br>• identify the effects of cold working of engineering components.<br>• illustrate the effects of cold working of engineering components<br>• identify the health hazards involved in heat treatment.<br>• provide remedies for and suggest precautions against the heat treatment health hazards. | • Heat treatment processes of ferrous metals<br>• Heat treatment of tools made by the learner for example:<br>- centre punch<br>- cold chisel<br>- ball pein hammer<br>- bottle opener<br>• Heat treatment equipment, accessories and supplies furnaces:<br>- heat measuring equipment<br>- quenching medium<br>- case hardening compound (graphite, carbon powder, carbon dioxide gas)<br>• Internal structural changes of low and high carbon steels during heat treatment using equilibrium diagrams<br>• Effects of cold working of engineering components<br>• Health hazards involved in heat treatment<br>• Remedies for and precautions against the health hazards |
| **Practical Exercises** | |

## Teaching and Learning Strategies

- Use discussions to illustrate the various heat treatment processes of ferrous metals.
- Guide learners to discuss the performance of various heat treatment equipment, accessories and supplies.
- Guide learners to carry out various heat treatment processes at the school workshop on own made tools.
- Use illustrations to explain the internal structural changes of low and high carbon steels during heat treatment.
- Guide group discussions to:
  - identify the effects of work hardening in engineering components.
  - identify the health hazards involved in heat treatment.
- Use explanations to clarify the learners' contributions.
- Use study trips to plants such as steel rolling mills to expose students to the practicability of heat treatment processes.

## Teaching Resources

- Charts
- Models
- ICT equipment
- Heat treatment equipment
- Tools, equipment and supplies
- Workshop/forge room

## Assessment Strategies

- Class exercises on:
  - the explanation of the various heat treatment processes of ferrous metals
  - identification and performance of various heat treatment equipment, accessories and supplies
- Assignments/homework to carry out heat treatment processes on tools made by learners such as centre punch, hacksaw frames, hammers, chisels
- Report writing on a field study about heat treatment processes
- Test to summarise heat treatment of metals
- Practical assignments to perform various heat treatment processes on own made tools.

# Topic 4: Measurement and Inspection

*Duration: 28 Periods*

## Overview

The reason for teaching this topic is to train learners in the correct methods of measuring and inspecting of various measuring instruments. This should be emphasised during the teaching process to ensure the main objective of this topic is well achieved. The knowledge of this topic will help the learner to measure and inspect articles produced and check the accuracy of measuring instruments before using them.

## General Objective

By the end of this topic, the learner should be able to measure components and inspect measuring instruments.

## Sub-Topic 1: Measurement and Inspection

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• measure and inspect using the various instruments.<br>• determine and test the accuracy of measuring instruments.<br>• describe the importance of tolerances and allowances in the interchange-ability of parts. | • Definition of measures and inspection<br>• Measurement and inspecting using various instruments<br>• Importance of tolerances and allowances in interchange-ability of parts |

## Teaching and Learning Strategies

- Guide learners to define and give the applications of:
  - measurement.
  - inspection.
- Guide learners to carry out measuring and inspection processes, using the various tools and instruments to determine the dimensions of components and accuracy of measuring instruments.
- Guide learners in the discussion of tolerances and allowances and their importance in interchange-ability of parts for mass production.

## Teaching Resources

- Charts
- Models
- ICT equipment
- Measuring and inspection instruments
- Tools and equipment

## Assessment Strategies

- Class exercises on the definitions of:
  - measuring
  - inspection
- Practical assignments to carry out measuring and inspection on various tools and instruments to determine their accuracy.
- Homework to describe the importance of tolerances and allowances in interchange-ability of parts for mass production
- Give learners a test to recap measuring and inspection

SENIOR FIVE TERM III

# Topic 5: Cutting Tools

*Duration: 21 Periods*

## Overview

This topic is intended to give learners a general overview of cutting tools, their areas of application and materials out of which they are made. The knowledge of this topic will help learners to select the most suitable tools for specific cutting operations.

## General Objectives

By the end of this topic, the learner should be able to identify, use and maintain cutting tools.

## Engineering Metalwork Projects for S5

The learner should be able to demonstrate functional knowledge, skills and positive attitudes to design and produce marketable articles based on the topics so far covered.
At the beginning of Term III of S5, guide learners to design and produce a functional article based on the topics covered. The articles may include tools and devices such as spanners, hacksaw frames and other workshop tools and devices.
The learners should make presentations on the various designs they have made.

## Sub-Topic 1: Introduction to Cutting Tools

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define cutting tools.<br>• classify cutting tools. | • Definitions of cutting tools<br>• Classification of cutting tools |

## Teaching and Learning Strategies

- Use question and answer method to define the various cutting tools.
- Use demonstrations to clarify the learners' contributions.

- Use a guided discussion to classify cutting tools.

### Teaching Resources

- Charts
- Models
- ICT equipment
- Cutting tools and equipment
- Materials and supplies

### Assessment Strategies

- Class exercises to define and classify the various cutting tools.

## Sub-Topic 2: Machine Cutting Tools

| Specific Objectives | Content |
|---|---|
| The learner should be able to: | |
| • identify the various machine cutting tools. | • Identification of various machine cutting tools |
| • state the various types of cutting tool materials. | • Cutting tool materials |
| • illustrate the constructional features of the various machine cutting tools. | • Constructional features of the various machine cutting tools |
| • identify cutting tool angles, their effects and uses. | • Cutting tool angles, their effects and uses |
| • identify faulty cutting tools. | • Identification of faulty cutting tools |
| • grind faulty cutting tools to correct angles and maintain the cutting tool angles. | • Tool grinding |
| • test the ground tool angles using gauges or templates. | • Testing of angles of ground tools using gauges or templates |
| • identify the materials produced by cutting tools. | • Materials produced by cutting tools such as chips and swarfs |

## Teaching and Learning Strategies

- Guide learners in identifying the various types of machine cutting tools and their materials.
- Illustrate the construction features of various machine cutting tools.
- Illustrate the construction of tool cutting angles.
- Describe to learners the effects and uses of various cutting tool angles.
- Guide the learners to practice grinding of various cutting tool angles.
- Guide learners to discover and describe the forms of materials produced by cutting tools such as chips and swarfs.

## Teaching Resources

- Charts
- Models
- ICT equipment
- Machine cutting tools and equipment
- Materials and supplies
- Workshop

## Assessment Strategies

- Class exercises on:
  - the types of machine cutting tools and their construction features including cutting angles
  - the effects and uses of various cutting tool angles
- Practical assignments on grinding and maintaining of various tool cutting angles.

## Sub-Topic 3: Cutting Fluids

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define cutting fluids.<br>• state the purposes of cutting fluids.<br>• classify cutting fluids.<br>• state factors governing the choice of cutting fluids.<br>• apply cutting fluids using appropriate methods. | • Definition of cutting fluids<br>• Purposes of cutting fluids<br>• Classification of cutting fluids<br>• Factors that affect choice of cutting fluids<br>• Methods of applying cutting fluids |

## Teaching and Learning Strategies

- Brainstorm the definition and purpose of cutting fluids.
- Clarify the learners' contributions.
- Use explanations to classify cutting fluids.
- Use guided discussion to state the factors that affect the choice of cutting fluids.
- Use demonstration to explain to learners the methods of applying cutting fluids.
- Guide learners to practice proper application of cutting fluids using appropriate methods.

## Teaching Resources

- Charts
- Models
- ICT equipment
- Cutting fluids and lubricants
- Tools and equipment
- Workshop
- Materials and supplies

## Assessment Strategies

- Class exercises on the factors that affect the choice of cutting fluids
- Homework to classify cutting fluids
- Tests to summarise cutting tools and cutting fluids

# Topic 6: Metalworking Machines

*Duration: 42 Periods*

## Overview

This topic introduces learners to the basic metalworking machines used in workshops. The topic helps learners to select suitable machines for specific machining operations. The knowledge of this topic will guide learners in the production of turned articles such as cylindrical, conical, flat and threaded surfaces.

## General Objective

By the end of this topic, the learner should be able to identify and use the most appropriate machine for a specific metal cutting operation.

## Sub-Topic 1: Introduction to Metalworking Machines

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define metalworking machines.<br>• classify metalworking machines.<br>• describe the basic requirements of metalworking machines.<br>• describe the materials used to make the basic parts of machines.<br>• discuss the advantages and disadvantages of using materials for specific basic parts. | • Definitions of metalworking machines<br>• Classification of metalworking machines<br>• Basic requirements of metalworking machines<br>• Materials used to make the basic parts of machines<br>• Advantages and disadvantages of using materials for the basic parts |

## Teaching and Learning Strategies

- Use question and answer method to define metalworking machines.
- Explain to learners the classification of metalworking machines.
- Use guided discussion to describe the basic requirements of metalworking machines.
- Clarify learners contributions.

- Use illustrations to describe materials used for making basic parts of machines, and discuss the advantages and disadvantages of using these materials.
- Use study trips to any well-equipped machine shop to expose learners to the different types that are not available in the school workshop.

## Teaching Resources

- Charts
- Models
- ICT equipment
- Machines and accessories
- Machine shop
- Materials and supplies

## Assessment Strategies

- Class exercises on the definition and classification of metalworking machines
- Assignment to:
  - describe the materials used to make the basic parts of machines.
  - discuss the advantages and disadvantages of using these materials to make the basic parts of machines.
- Report writing on the field trip.

## Sub-Topic 2: Drilling Machines

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define drilling machines.<br>• define the various types of drilling machines.<br>• identify and describe the constructional features of the various types of drilling machines.<br><br>• use the different types of drilling machine tools. | • Definition of drilling<br>• Definitions of different types of drilling machines<br>• Types and constructional features of various drilling machines like radial, pillar (upright) and multi-spindle to include:<br>- parts<br>- motions<br>• Drilling machine tools:<br>- cutting tools like drill bits, reamers, taps,<br>- holding devices like |

| Specific Objectives | Content |
|---|---|
| • describe and perform various drilling operations.<br>• identify drilling hazards and provide their remedies.<br>• design and make drilling jigs and fixtures.<br>• observe safety and care for drilling machines. | clamps, vices, jigs, fixtures<br>• Drilling hazards and their remedies<br>• Drilling machine operations<br>• Designing and making drilling jigs and fixtures<br>• Safety precautions and care for drilling machines |

## Teaching and Learning Strategies

- Brainstorm the definition of drilling and the different types of drilling machines.
- Use illustrations to describe the constructional features of various types of drilling machines.
- Guide learners through demonstrations to categorise and use the different drilling machine tools and devices.
- Guide discussions to identify drilling hazards and provide their remedies.
- Guide learners through practice to perform the various drilling machine operations.
- Guide learners to design and make simple drilling jigs and fixtures.
- Guide discussions on how to observe safety and care for the drilling machines.
- Organise Study trips to factories with machine shops.

## Teaching Resources

- Charts
- Models
- ICT equipment
- Drilling machines and accessories
- Materials

## Assessment Strategies

- Class exercises to:
  - describe the constructional features of various types of drilling machines

  - categorise the different drilling machine tools and devices
- Homework to:
  - identify drilling hazards and provide their remedies.
  - discuss how to observe safety and care for the drilling machines
- Practical assignments to perform the various drilling machine operations
- Report on the field study
- Tests to recapitulate on the drilling machine

SENIOR SIX TERM I

# Topic 6: Metalworking (Continued)

*Duration: 60 Periods*

## General Objective

The learner should be able to identify and use various metalworking machines.

## Sub-Topic 3: The Lathe Machine

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define various lathe machines.<br>• identify the various types of lathe machines.<br>• define the centre lathe.<br>• describe specifications for sizes of the centre lathe.<br>• describe constructional details of the various parts of the centre lathe.<br>• identify and use the various work holding methods.<br>• identify and use the various tool holding methods.<br>• identify and use the various lathe cutting tools.<br>• determine suitable cutting speeds, feeds and depth of cuts for various machining operations.<br>• identify and use the various types of lathe accessories.<br>• identify and provide remedies to lathe hazards.<br>• perform the various lathe operations.<br>• observe safety precautions and care for the centre lathe | • Definitions of various lathe machines<br>• Types of lathe machines like centre, turret, capstan<br>• The centre lathe:<br>- definition of the centre lathe<br>- sizes of centre lathes<br>- parts and motions of the centre lathe<br>- work holding devices on the centre lathe<br>- tool holding<br>- cutting tools<br>- speeds, feeds and depth of cuts<br>- lathe accessories<br>- hazards and their remedies<br>- Lathe operations including:<br>○ knurling<br>○ taper turning<br>○ drilling<br>○ screw thread cutting<br>○ eccentric turning<br>○ boring<br>○ counter boring<br>○ form and profile turning |

| Specific Objectives | Content |
|---|---|
| machine. | ○ turning between centres<br>• Safety and care of the centre lathe |

## Teaching and Learning Strategies

- Lead a brainstorming session to identify and define the various types of lathe machines.
- Use the participatory method to state and discuss, with illustrations, the:
  - sizes of centre lathes.
  - parts and motions of the centre lathe.
  - work holding devices on the centre lathe to include: centres, catch plates, three and four jaw chucks, face plates and collet chucks, mandrels, driving dogs and steadies.
  - tool holding devices.
  - cutting tools.
- Guide learners through discussions to determine suitable cutting speeds, feeds and depth of cuts for various lathe machining operations.
- Through illustrations, identify the various lathe accessories and demonstrate how they are used on the lathe machine.
- Use guided group discussions to:
  - identify lathe working hazards and provide their remedies.
  - devise means of observing safety precautions and care for the centre lathe.
- Use practice to guide learners to perform the various lathe operations such as:
  - knurling
  - taper turning
  - drilling
  - screw thread cutting
  - eccentric turning
  - boring
  - counter boring
  - form and profile turning
  - turning between centres
- Organise a study trip to industries with well-equipped machine shops.

## Teaching Resources

- Charts
- Models

- ICT equipment
- Centre lathes and accessories
- Materials and supplies
- Machine shop

## Assessment Strategies

- Class exercises to determine suitable cutting speeds, feeds and depth of cuts for various machining operations.
- Assignments to:
  - identify the various lathe accessories and illustrate how they are used on the lathe machine
    - identify lathe working hazards and provide their remedies
    - devise means of observing safety precautions and care for the centre lathe
- Homework to state and discuss with illustrations the:
  - sizes of centre lathes.
  - parts and motions of the centre lathe.
  - work holding devices on the centre lathe to include: centres, catch plates, three and four jaw chucks, face plates and collet chucks, mandrels, driving dogs and steadies
  - tool holding devices and cutting tools
- Give learners a test to recapitulate the lathe machine
- Report writing on the field visit

## Sub-Topic 4: Shaping Machine

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define shaping machines.<br>• describe the various parts and motions of the shaping machine.<br>• identify and use the various work holding methods.<br>• identify and use the various tool holding methods.<br>• identify and use the various shaper cutting tools.<br>• determine suitable cutting speeds, feeds and depths of cuts for various shaping | • Definition of shaping machines<br>• Parts and motions of the shaping machine<br>• Work holding<br>• Tool holding<br>• Cutting tools<br>• Speeds, feeds and depth of cuts |

| Specific Objectives | Content |
|---|---|
| operations.<br>• identify and use the various shaper accessories.<br>• identify shaping hazards and provide their remedies.<br>• perform the various shaping operations.<br>• observe safety precautions and care for the shaping machines. | • Shaper accessories<br>• Shaping machine hazards and their remedies<br>• Shaping machine operations including cutting of:<br>- horizontal and vertical surfaces<br>- angular surfaces<br>- contour surfaces<br>- keyways<br>- splines<br>- grooves<br>• Safety and care for shaping machines |

## Teaching and Learning Strategies

- Use question and answer method to introduce the sub-topic.
- Use illustrations to describe:
  - the parts and motions of the shaping machine.
  - work holding techniques.
  - tool holding techniques.
  - shaper cutting tools.
- Guide learners through discussions to determine suitable cutting speeds, feeds and depth of cuts for various shaping operations.
- Through illustrations identify the various shaper accessories and demonstrate how they are used on the shaping machine.
- Discuss the:
  - shaping machine hazards and provide their remedies.
  - safety and care for shaping machines.
- Guide learners to practice the various shaping operations such as cutting of:
  - horizontal and vertical surfaces
  - angular surfaces
  - contour surfaces
  - keyways
  - splines
  - grooves
- Use study trips to workshops with better machinery.

**Teaching Resources**

- Charts
- Models
- ICT equipment
- Shaping machine and accessories
- Materials and supplies

## Assessment Strategies

- Class exercises to:
  - determine suitable cutting speeds, feeds and depth of cuts for various shaping operations
  - identify the various shaper accessories and demonstrate how they are used on the shaping machine
- Assignments with illustrations to describe:
  - the parts and motions of the shaping machine
  - the shaper work holding and tool holding techniques
  - shaper cutting tools
- Homework to discuss the:
  - shaping machine hazards and provide their remedies
  - safety and care for shaping machines
- Practical assignments to perform various shaping operations
- Tests to evaluate students' understanding of the drilling machine
- Written report on the field study trip

## Sub-Topic 5: Milling Machine

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define milling. | • Definition of milling |
| • define the various milling machines. | • Definitions of milling machines |
| • differentiate between plain, horizontal and vertical milling machines. | • Types of milling machines:<br>- plain horizontal milling machine<br>- vertical milling machine |
| • describe the various parts and motions of the plain, horizontal and vertical milling machines. | • Parts and motions of plain, horizontal and vertical milling machines |
| • identify and use the various work holding methods. | • Principles of milling<br>• Work holding |
| • identify and use the various | • Tool holding |

| Specific Objectives | Content |
|---|---|
| tool holding methods. | |
| • identify and use the various milling cutters. | • Milling cutters to include:<br>- cylindrical (slab)<br>- side and face cutter<br>- slotting and slitting saws |
| • determine suitable cutting speeds, feeds and depth of cuts for various milling operations. | • Speeds, feeds and depth of cuts |
| • identify and use the various milling accessories. | • Milling accessories:<br>- dividing head<br>- tilting table<br>- slotting attachment<br>- rack milling attachment |
| • identify milling hazards and provide their remedies. | • Milling hazards and their remedies |
| • perform the various milling operations. | • Milling operations:<br>- plain milling<br>- angular milling<br>- gang milling<br>- straddle milling<br>- form milling like gears, threads, grooves, splines, keyways |
| • observe safety precautions when using the milling machine. | • Safety when using the milling machine. |
| • Care for milling the machine. | • Care for milling the machines. |

## Teaching and Learning Strategies

- Use a participatory approach to define the various milling machines and differentiate between plain, horizontal and vertical milling machines.
- Use discussion method to illustrate the:
  - parts and motions of plain, horizontal and vertical milling machines.
  - principles of milling.
  - milling machine work holding and tool holding techniques.
- By demonstration, guide learners to identify and use the various milling cutters.
- Guide learners through discussions to determine suitable cutting speeds, feeds and depth of cuts for various milling operations.

- Through illustrations, identify the various milling machine accessories and demonstrate how they are used on the milling machine.
- Discuss the:
  - milling machine hazards and provide their remedies.
  - safety and care for milling machines.
- Guide learners to practice the various milling operations to include:
  - plain, face and end milling
  - slotting
  - slitting
  - angular milling
  - gang milling
  - boring
  - straddle milling
  - form milling like cutting of gears, threads, grooves, splines, keyways
- Make study trips to industrial workshops with better and more machinery.

## Teaching Resources

- Charts
- Models
- ICT equipment
- Milling machines and accessories
- Materials and supplies
- Machine shop

## Assessment Strategies

- Class exercises on illustration of:
  - parts and motions of plain horizontal and vertical milling machines
  - principles of milling
  - milling machine work holding and tool holding techniques
- Practical assignments to use the various milling cutters and perform different milling operations
- Homework to:
  - determine suitable cutting speeds, feeds and depth of cuts for various milling operations
  - identify the various milling machine accessories and illustrate how they are used on the milling machine
- Tests to evaluate the knowledge and skills attained on the milling machine
- Written report on field visit

## Sub-Topic 6: Grinding Machine

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define grinding.<br>• define the various grinding machines.<br>• differentiate between off-hand and horizontal universal grinding machines.<br>• describe the various parts of off-hand and horizontal universal grinding machines.<br>• identify and select appropriate wheels for specific grinding operations.<br>• describe the techniques of wheel mounting and maintenance.<br>• identify and use the various work holding methods.<br>• identify and use the various types of tool holding methods.<br>• explain the factors governing grinding operations. | • Definition of grinding<br>• Definitions of the various grinding machines<br>• Types of grinding machines:<br>- off-hand grinding machine<br>- horizontal universal grinding machine<br>• Parts and motions of off-hand and horizontal universal grinding machines<br>• Grinding wheels:<br>- types<br>- shapes<br>- identification and selection of various grinding wheels<br>- testing for cracks<br>• Work holding methods:<br>- magnetic chucks<br>- vices<br>- vee-blocks<br>- clamps<br>- parallels<br>- fixtures<br>- chucks<br>- between centres<br>• Tool holding methods<br>• Wheel mounting and maintenance:<br>- dressing<br>- truing<br>- wheel balancing<br>• Grinding accessories<br>• Factors governing grinding processes:<br>- speeds<br>- feeds<br>- depth of cuts<br>- surface finishing<br>- types of material |

| Specific Objectives | Content |
|---|---|
| • identify grinding hazards and provide their remedies.<br>• Perform surface grinding operations.<br><br><br><br><br>• observe safety precautions and care for the grinding machines. | • Grinding machine hazards and their remedies<br>• Surface grinding operations with reference to:<br>- parallel surfaces<br>- angular surfaces<br>- circular surfaces<br>- tool grinding<br>• Safety and care for grinding machines |

## Teaching and Learning Strategies

- Use question and answer approach to:
  - define grinding and the various grinding machines.
  - differentiate between off-hand and horizontal universal grinding machines.
- Clarify the learners' contributions.
- Use group discussions to describe the parts and motions of off-hand and horizontal universal grinding machines.
- Use illustrations to explain grinding wheels in terms of:
  - types.
  - shapes.
  - identification and selection of various wheels for grinding.
  - testing for cracks.
- Use demonstration and practice to explain:
  - work holding methods to include:
    - magnetic chucks
    - vices
    - vee-blocks
    - clamps
    - parallels
    - fixtures
    - chucks
    - between centres
  - wheel mounting and maintenance techniques to include:
    - dressing
    - truing
    - wheel balancing
- Through illustrations, identify the various grinding machine accessories and demonstrate how they are used on the grinding machine.

- Guide learners to discuss the factors governing the choice of grinding processes such as:
  - speeds
  - feeds
  - depth of cuts
  - surface finishing
  - types of material
- Guide learners to:
  - identify grinding machine hazards and provide their remedies.
  - suggest ways of observing safety precautions and care for the grinding machine.
- Guide learners to practice the various surface grinding operations with reference to:
  - parallel surfaces
  - angular surfaces
  - circular surfaces
  - tool grinding
- Through study trips, expose learners to other types of grinding machines used in industries.

## Teaching Resources

- Charts
- Models
- ICT equipment
- Grinding machines and accessories
- Materials and supplies

## Assessment Strategies

- Class exercises to:
  - define grinding and the various grinding machines
  - differentiate between off-hand and horizontal universal grinding machines
- Assignments to:
  - describe the parts and motions of off-hand and horizontal universal grinding machines
  - illustrate grinding wheels in terms of types, shapes, identification and selection of various wheels for grinding and testing for cracks
- Practical assignments on work holding methods, wheel mounting and maintenance techniques
- Homework to:
  - discuss the factors governing the choice of grinding processes

  - identify grinding machine hazards and provide their remedies
  - discuss safety and care for the grinding machine
- Practical assignment on the various surface grinding operations
- Test to recap the grinding machine
- Written report on a field trip

# SENIOR SIX TERM TWO

## Engineering Metalwork Projects for S6

**General Objective**

By the end of the project, the learner should be able to demonstrate functional knowledge, skills and positive attitudes to design and produce functional articles that can be marketed.

At the beginning of Term II of S6, guide learners to design and produce a functional article based on the topics covered.

# Topic 7: Welding

*Duration: 60 Periods*

## Overview

This topic introduces the learner to the general welding techniques and processes used in fabrication. The knowledge and skills acquired shall help the learner to select the most appropriate welding process for specific works.

## General Objective

By the end of this topic, the learner should be able to perform the various welding processes.

## Sub-Topic 1: Introduction to Welding Processes

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define welding.<br>• state advantages and disadvantages of welding.<br>• describe crystalline structural changes during welding.<br>• outline the various welding processes. | • Definition of welding<br>• Advantages and disadvantages of welding<br>• Metallurgical aspects of welding<br>• Welding processes<br>- arc welding<br>- gas welding<br>- TIG welding<br>- MIG welding |

| Specific Objectives | Content |
|---|---|
| | - spot welding<br>- plastic welding |

## Teaching and Learning Strategies

- Use the participatory method to define and state the advantages and disadvantages of welding.
- Through illustrations, guide learners to describe the crystalline structural changes that take place during welding.
- Use demonstrations to explain the various welding processes.

## Teaching Resources

- Charts
- Models
- ICT equipment
- Welding machines and accessories
- Materials and supplies
- Workshop

## Assessment Strategies

- Class exercises to:
  - define and state the advantages and disadvantages of welding.
  - describe the crystalline structural changes that take place during welding.
- Assignments to explain the various welding processes.

# Sub-Topic 2: Arc Welding

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define arc welding.<br>• identify and use the various arc welding equipment and accessories.<br>• describe the characteristic requirements of electrode and electrode coating.<br>• explain factors that affect arc welding. | • Definition of arc welding<br>• Arc welding equipment<br>• Electrode and electrode coating<br>• Factors affecting arc welding |

| Specific Objectives | Content |
|---|---|
| • prepare edges of work pieces for arc welding.<br>• perform the different arc welding techniques.<br>• identify, explain and provide remedies for the various arc welding defects.<br>• perform various workshop tests for arc welds.<br>• identify arc welding hazards and provide their remedies.<br>• observe safety precautions during arc welding.<br>• Care for welding equipment and accessories. | • Edge preparation<br>• Arc welding techniques<br>• Arc welding defects<br>• Workshop tests of arc welds<br>• Arc welding hazards and remedies<br>• Safety and care for arc welding equipment<br>• Care for welding equipment |

## Teaching and Learning Strategies

- Brainstorm the definition of arc welding.
- Use demonstrations to guide learners to:
  - identify and use the various arc welding equipment and accessories.
  - prepare edges of work pieces for arc welding.
  - perform the different arc welding techniques through fabrication of articles such as furniture, spare parts, fittings.
- Use discussions to:
  - describe the characteristic requirements of electrode and electrode coating.
  - explain the factors that affect arc welding.
- Guide learners to perform various workshop tests for arc welds.
- Use group discussions to:
  - identify and provide remedies for the various arc welding defects and hazards.
  - identify and observe safety precautions and care for arc welding equipment.
- Prepare study trips to sites and industries that perform the various welding techniques.

## Teaching Resources

- Charts
- Models
- ICT equipment
- Arc welding plants and accessories
- Materials and supplies
- Workshop (welding shop)

## Assessment Strategies

- Class exercise on the definition of arc welding
- Practical exercises to:
  - identify and use the various arc welding equipment and accessories.
  - prepare edges of work pieces for arc welding
  - perform the different arc welding techniques
- Assignments to:
  - describe the characteristic requirements of electrode and electrode coating
  - explain the factors that affect arc welding
- Practical exercises to perform various workshop tests for arc welds
- Homework to:
  - identify and provide remedies for the various arc welding defects and hazards
  - describe safety precautions and care for arc welding equipment
- Test to recap arc welding
- Report writing on study trips

## Sub-Topic 3: Gas Welding

| Specific Objectives | Content |
|---|---|
| The learner should be able to: | |
| • define gas welding. | • Definition of gas welding |
| • identify and use the various gas welding equipment and accessories. | • Gas welding equipment and accessories |
| • set gas welding flames appropriately. | • Gas welding flames |
| • explain factors that affect gas welding. | • Factors affecting gas welding |
| • prepare edges of work pieces for gas welding. | • Edge preparation |
| • identify and use the various filler metals and fluxes. | • Filler metals and fluxes |
| • perform the different gas welding techniques. | • Gas welding techniques |
| • identify, explain and provide remedies to various gas welding defects. | • Gas welding defects |
| • identify gas welding hazards and provides their remedies. | • Gas welding hazards and their remedies |
| • perform various workshop tests for gas welds. | • Workshop tests for gas welds |
| • identify and observe safety precautions and care for gas welding equipment and accessories. | • Safety and care for gas welding equipment and accessories |

## Teaching and Learning Strategies

- Use question and answer to define gas welding.
- Encourage learners to:
  - identify and use the various gas welding equipment and accessories.
  - set and use the different gas welding flames.
  - discuss the factors affecting gas welding.
  - identify and use the various filler metals and fluxes.
- Using demonstration method, guide learners to practice:
  - edge preparation.
  - the various gas welding techniques.
  - workshop tests of gas welds.
- Guide a discussion on:

  - identifying gas welding defects and their remedies.
  - identifying gas welding hazards and their remedies.
  - observing safety and care for gas welding equipment and accessories.
- Arrange study trips to sites and industries on the various gas welding techniques.

## Teaching Resources

- Charts
- Models
- ICT equipment
- Gas welding plants and accessories
- Materials and supplies
- Workshop (welding)

## Assessment Strategies

- Class exercises to discuss:
  - gas welding equipment and accessories
  - gas welding flames
  - factors affecting gas welding
  - filler metals and fluxes
- Practical assignments on:
  - edge preparation
  - the various gas welding techniques
  - workshop tests of gas welds
- Homework on:
  - gas welding defects and their remedies
  - gas welding hazards and their remedies
  - safety and care for gas welding equipment and accessories
- Test recapitulate gas welding
- Written report on the study trip

## Sub-Topic 4: Non-Conventional Welding Processes

| Specific Objectives | Content |
|---|---|
| The learner should be able to: | |
| • list the various non-conventional welding processes. | • Types of non-conventional welding processes:<br>- Metal Inert Gas welding (MIG)<br>- Tungsten Inert Gas welding (TIG)<br>- spot welding<br>- plastic welding |
| • define each of the non-conventional welding processes. | • Definitions of the various non-conventional welding processes |
| • describe detailed characteristic features and states the functions of each of the non-conventional welding processes. | • Detailed descriptions and applications of the non-conventional welding processes |
| • state the advantages and disadvantages of each of the non-conventional welding processes. | • Advantages and disadvantages of each of the non-conventional welding processes |
| • identify the health hazards of each of the non-conventional welding processes and provide their remedies. | • Hazards of each of the non-conventional welding processes and their remedies |
| • observe safety precautions when using the non-conventional welding process. | • Safety when using the non-conventional welding process |
| • Care for equipment and accessories used in the non-conventional welding | • Care for the non-conventional welding equipment and accessories |

## Teaching and Learning Strategies

- Use participatory methods to list and define the various types of non-conventional welding processes.
- Use discussions to:
  - describe detailed characteristic features and state the functions/applications of each of the non-conventional welding processes.

  - state the advantages and disadvantages of each of the non-conventional welding processes.
- Through guided discussion:
  - identify the health hazards of each of the non-conventional welding processes and suggest remedies.
  - identify safety precautions and care for each of the non-conventional welding equipment and accessories.
- Organise study trips to industries and sites practicing non-conventional welding processes.

**Teaching Resources**

- Charts
- Models
- ICT equipment
- Non-conventional welding equipment and accessories
- Materials and supplies
- Welding sites and workshops

## Assessment Strategies

- Class exercises to define the various types of non-conventional welding processes.
- Assignments to:
  - describe detailed characteristic features and state the functions/applications of each of the non-conventional welding processes.
  - state the advantages and disadvantages of each of the non-conventional welding processes.
- Homework to:
  - identify health hazards of each of the non-conventional welding processes and provide their remedies.
  - identify safety precautions and care for each of the non-conventional welding equipment and accessories.
- Tests to recapitulate the non-conventional welding processes, and the welding topic.
- Report writing on the study trips.

# Topic 8: Foundry Work

*Duration: 60 Periods*

## Overview

This topic introduces the learner to the various casting processes and their applications in production of articles. It gives the learner the knowledge and skills of producing various articles through moulding and casting. The knowledge acquired will enable the learner to select the most appropriate method for production of castings.

## General Objective

By the end of this topic, the learner should be able to cast various shapes of articles from different materials.

## Sub-Topic 1: Introduction to Foundry Work

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define foundry work.<br>• explain the advantages and disadvantages of foundry work.<br>• identify the different types of foundries.<br>• identify the various foundry work processes. | • Definition of foundry work<br>• Advantages and disadvantages of foundry work<br>• Types of foundries<br>• Identification of various foundry work processes |

## Teaching and Learning Strategies

- Brainstorm the definition and importance of foundry work.
- Discuss the types of foundries.
- Use illustrations to discuss the various foundry work processes such as moulding, casting, heat treatment and forging.

## Teaching Resources

- Charts
- Models
- ICT equipment
- Castings
- Foundry shop

## Assessment Strategies

- Class exercise to define and discuss importance of foundry work.
- Assignments to describe the types of foundries.
- Assessments to discuss the various foundry work processes.

## Sub-Topic 2: Sand Casting

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define sand casting.<br>• define the various sand casting processes.<br>• identify the various materials used in sand casting.<br>• identify and use the tools, equipment and accessories for sand casting.<br>• observe the safety precautions and care for tools, equipment and accessories used in sand casting.<br>• identify sand casting hazards and provide their remedies.<br>• define the various sand casting processes.<br>• identify faults in sand castings and provide solutions.<br>• describe and carry out the activities of sand casting stages. | • Definition of sand casting<br>• Definitions of the various sand casting processes<br>• Tools, equipment and accessories used in sand casting<br>• Safety and care for tools, equipment and accessories used in sand casting<br>• Sand casting hazards and their remedies<br>• Materials used in sand casting:<br>- types of sand<br>- other sand additives<br>• faults in sand castings and their solutions<br>• Stages of sand casting:<br>- pattern and core making<br>- sand preparation<br>- mould making<br>- melting and pouring of metal<br>- finishing of the casting<br>- testing (fault finding)<br>- heat treatment (if necessary) |

## Teaching and Learning Strategies

- Use question and answer approach to define sand casting and the various sand casting processes.

- Guide learners to:
  - identify and use the tools, equipment and accessories for sand casting.
  - identify safety precautions and care for tools, equipment and accessories used in sand casting.
  - identify sand casting hazards and provide their remedies.
  - identify the various materials used in sand casting.
- Clarify the learners' contributions.
- Through demonstrations, guide learners to perform activities involved in the various sand casting stages such as:
  - pattern and core making
  - sand preparation
  - mould making
  - melting and pouring of metal
  - finishing of the casting
  - testing (fault finding)
  - heat treatment (if necessary)

## Teaching Resources

- Charts
- Models
- ICT equipment
- Sand casting tools, equipment and accessories
- Materials and supplies
- Foundry shop

## Assessment Strategies

- Class exercises to define sand casting and the various sand casting processes.
- Assignments to:
  - identify and use the tools, equipment and accessories for sand casting.
  - identify safety precautions and care for tools, equipment and accessories used in sand casting.
  - identify sand casting hazards and provide their remedies.
  - identify the various materials used in sand casting.
- Practical exercises to perform the various activities involved in sand casting stages.
- Written report on the field trip.
- Fabrication of articles such as furniture, spare parts and fittings

SENIOR SIX TERM THREE

# Topic 8: Foundry Work (Continuation)

*Duration: 60 Periods*

## Sub-Topic 1: Sand Casting (Continuation)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify faults in sand castings and provide their remedies.<br>• state advantages and disadvantages of sand casting process. | • Faults in sand casting and their remedies<br>• Advantages and disadvantages of sand casting. |

### Teaching and Learning Strategies

- Through demonstrations, guide learners to identify faults in sand castings and provide their remedies.
- Use group discussions to discuss advantages and disadvantages of sand casting process.
- Study trips to workshops and industries that carry out sand casting.

### Teaching Resources

- Charts
- Models
- ICT equipment
- Sand casting tools, equipment and accessories
- Materials and supplies
- Foundry shop

### Assessment Strategies

- Practical exercises to identify faults in sand castings and provide their remedies.
- Homework to discuss the advantages and disadvantages of the sand casting process.
- Test to recapitulate sand casting.
- Written report on field trips.
- Fabrication of articles such as furniture, spare parts and fittings

## Sub-Topic 2: Other Foundry Work Processes

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify other foundry work processes.<br>• explain other foundry work processes. | • Brief explanation of other foundry work processes such as:<br>- loam moulding,<br>- plate moulding,<br>- shell moulding,<br>- die casting,<br>- centrifugal casting |

## Teaching and Learning Strategies

- Use the participatory method to identify other foundry work processes such as loam moulding, plate moulding, shell moulding, die casting, and centrifugal casting.
- Clarify the learners' contributions.
- Demonstrate with illustrations, the operation of each of the identified foundry work processes.
- Organise study trips to workshops and industries that do other forms of foundry work.

## Teaching Resources

- Charts
- Models
- ICT equipment
- Other foundry work equipment and accessories
- Materials and supplies
- Foundry shop

## Assessment Strategies

- Class exercises on identification of other foundry work processes
- Assignment to discuss the operation of other foundry work processes
- Test to recapitulate foundry practices
- Written report on field trips

# Appendices

## Appendix I: Tools and Equipment

1. Set of files
2. Bench and accessories
3. Sheet metal tools and equipment
4. Bench tools (including measuring and gauging tools)
5. Drilling machine and accessories
6. Lathe machine and accessories
7. Milling machine and accessories
8. Shaping machine and accessories
9. Grinding machine and accessories
10. Arc welding equipment
11. Gas welding equipment
12. Brazing hearth and accessories
13. Adhesives
14. Moulding and casting equipment, tools and materials

## Appendix II: Materials and Supplies

### Materials

1. Cast Iron
2. Metal sheets (mild steel, bright drawn mild steel, tinned metal, copper, aluminium, stainless steel, galvanised)
3. Metal plates (iron, steel, aluminium, copper)
4. Bars (sectioned, square, round, hexagonal, flats, twisted )
5. Strips (copper, mild steel, aluminium)
6. Sections (square, round, rectangular, angular, beam, channels, Z, I-beam)
7. Rods (square, round, hexagonal)
8. Plastics (sheets, sections, bars, rods, strips)
9. Specimens for metal testing
10. Refractory materials (fire bricks, cement)

### Supplies

1. Welding electrodes
2. Welding and soldering fluxes
3. Solders (soft, hard)
4. Spelters

5. Case hardening compound (graphite, carbon powder, carbon dioxide gas)
6. Rivets of different types of heads, diameter, length (copper, aluminium)
7. Screw-thread fasteners (bolts and nuts, machine screws)
8. Oils and grease (lubricating, cutting, cooling, soluble)
9. Polishing materials (email cloth, metal polish)
10. Rust inhibiting metal primer
11. Paints
12. Sands (clay, core sand, facing sand, parting sand)
13. Parting powder
14. Marking out blue (Prussian blue)
15. Acid solutions for pickling copper and brass
16. Etching resist (wax, stopping varnish)
17. Acid mordants for etching copper, brass, mild steel, aluminium
18. Enamels for jewellery work
19. Colouring solution for copper and brass
20. Silver and copper plating solutions
21. Nickel plating solution
22. Fuels (charcoal, kerosene, diesel, petrol, LPG)
23. Hacksaw blades
24. Aluminium scraps for casting
25. Molten metal degassing tablets
26. Metal melting fluxes
27. Cooling medium for heat treatment
28. Cleaning materials (cotton and other fabric wastes)

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# Uganda Advanced Certificate of Education

# Technical Drawing

## TEACHING SYLLABUS

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**GEOMETRICAL AND MECHANICAL DRAWING**
**SENIOR FIVE TERM ONE**

**GEOMETRICAL AND BUILDING DRAWING**
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**BUILDING CONSTRUCTION - THEORY**
SENIOR FIVE TERM ONE

# Introduction

## Background

Our education system adopted its curriculum from City and Guilds Examinations Council and later crossed over to Cambridge. With development, we started the East African Examinations Council, which bore the present Uganda National Examinations Board (UNEB).

Since then, there has been no teaching syllabus for Technical Drawing; instead, schools were using the UNEB assessment regulations. This prompted individual schools to develop and follow their own syllabi and guides, which caused non-uniformity in the teaching learning process, implying haphazard content coverage and time wastage. It is against this background that it was deemed necessary to develop a teaching syllabus for uniformity and consistency in the teaching-learning process nationwide.

## Scope

The scope and depth of the subject content has been developed from the Ordinary Level teaching syllabus through the Advanced Level to prepare the learner for continuity to higher levels of education and self-gainful employment.

## Methodology

The suggested teaching methods given in this syllabus are not necessarily final. The teacher has the discretion to apply any other methods(s) deemed suitable. It is imperative that the teacher organises educational visits to resourceful sites to enhance the teaching/learning process.

## Assessment

**Examination Format**

There are three papers:

**Paper 1: Applied Geometry (3 Hours)**

This paper is applicable to both Building and Mechanical Drawings. It is set on part I of the detailed syllabus. It consists of **two** sections; A (Plane Geometry) and B (Solid Geometry). Each section contains **four** questions. Candidates are expected to attempt **five** questions selecting at least two from each section. (100marks)

**Paper 2: Either: Geometrical and Mechanical Engineering Drawing OR: Geometrical and Building Drawing (3 Hours)**

This paper is set on part II of the detailed syllabus. It consists of **two** sections: A and B. Section A contains two questions; candidates answer any one of the two, carrying 20 marks. Section **B** contains only **one** compulsory question, carrying 60 marks. (80 marks)

**Coursework Assessment**

Work done during the course should also be assessed. This should consist of at least five drawings from the eight topics indicated in part II of the detailed syllabus for Geometrical and Mechanical Engineering, and Building Drawing. (20 marks)

Coursework marks should be submitted to UNEB by the 31st October of the year of examination. Candidates whose coursework marks are **NOT** submitted should not be graded in this paper.

**Building Drawing (3 Hours)**

This paper is set on part II of the detailed syllabus. There are two questions set, from which the candidates are required to answer any **one.** (70marks)

**Coursework Assessment**

Work done during the course should also be assessed. This should consist of five drawings covering the topics in the detailed syllabus indicated in part II Building Drawing. (30 marks)

Coursework marks should be submitted to UNEB by the 31st October of the year of examination. Candidates whose coursework marks are **NOT** submitted should not be graded in this paper.

**Paper 3: Building Construction - Theory (1½ Hours)**

This paper is also based on part II of the detailed syllabus for Building Drawing. There are **six** questions set and candidates are required to answer any **four.** Each question is allocated 25 marks. (100 marks)

**Note**

In Paper 2, the questions normally require the preparation of drawing of:

a) A building or part of a building with the addition of some details from given information and freehand–sketches such as may be made on site).
b) Detailed drawings from small scale drawings and specifications.

1. The course in Building Drawing should be based as far as possible on the study of existing buildings such as dwelling houses, farm buildings, school buildings and small industrial buildings which can usually provide a wide range of the various methods of construction for the syllabus to be adequately covered. However, it is important that the buildings selected be designed and constructed in accordance with good building practice.

2. Visits to buildings at different stages of construction should be made wherever possible. A collection of specimen materials, which can be handled, is of great value.

3. Throughout the course in Building Drawing, clearly drawn freehand sketches of the details of constructions should be made. The materials and processes used can be studied to become the subject of separate and exhaustive treatment. Candidates should have some knowledge of the materials used in building including their suitability, conditions and availability. Dimensioned sketches of measured work with explanatory notes may also be prepared from these sketches rather than from other scale drawings. Good quality draughtsman ship in freehand sketches and scale drawings are required in the examinations.

**Time Allocation**

**For Applied Geometry, Geometrical and Mechanical Engineering Drawing, Geometrical and Building Drawing and Building-Construction Theory, there should be two periods per week in each case in both S5 and S6.**

# Topic 1: Introduction to Technical Drawing

Duration: 2 Periods

## Overview

This topic introduces the learner to the drawing skills and standards used in engineering. The knowledge acquired will enable the learner to interpret and communicate engineering drawings effectively.

## General Objective

By the end the topic, the learner should be able to communicate engineering ideas to the required standards.

## Sub-Topic: Introduction

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define technical drawing.<br>• Outline the importance of technical drawing.<br>• Use drawing equipment correctly<br>• Identify the various drawing paper sizes<br>• acquire basic skills in drawing.<br>• identify and use different types of drawing lines<br>• use ISO conventions. | • Definition of technical drawing<br>• Importance of technical drawing<br>• Drawing equipment<br>• paper sizes<br>• Lines, lettering, figures<br>• Paper layout and dimensions<br>• Conventions in drawing (symbols and standards) |

## Suggested Teaching/ Learning Strategies

- Brainstorm the definition and importance of technical drawing.
- Use discussion method to classify:
  - Geometrical and Mechanical Drawing.
  - Geometrical and Building Drawing.
- Demonstrate the use of drawing equipment and paper sizes.
- Illustrate the construction and drawing of:
  - lines, letters and figures according to BS 308 drawing standards.

- paper layout and dimensioning according to BS 308 drawing standards.
- symbols and standards in drawing according to BS 308 drawing conventions

## Teaching Resources

- BS 308 Pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information Communication and Technology Equipment
- Models
- Real objects

## Assessment Strategies

- Class exercises on the definition and importance of technical drawing.
- Assignments to:
  - draw lines, letters and construct figures according to BS 308 drawing standards.
  - layout drawing papers and dimension figures according to BS 308 drawing standards.
  - draw symbols and standards in drawing according to BS 308 drawing conventions.
- Test to recap the introduction to technical drawing.

# Topic 2: Plane Geometrical Figures

Duration: 7 Periods

## Overview

This topic introduces the learner to the construction and drawing of plane geometrical figures. The knowledge and skills acquired will enable the learner to construct structures like arches, bridges and make art and craft pieces.

## General Objective

By the end of the topic, the learner should be able to construct and draw plane figures.

## Sub-Topic: Plane Figures

| Specific Objectives | Content |
|---|---|
| Using given data, the learner should be able to: | A brief review of the following content to remind the learners of the skills acquired in O level: |
| • use drawing equipment.<br>• draw plane figures.<br>• draw tangents and normal's | • Lines and angles<br>• Triangles<br>• Quadrilaterals<br>• Polygons<br>• The circle and its properties |
| • use the principles of tangency to draw curved shapes | • Tangency<br>• Inscribed, circumscribed and escribed plane figures |
| • construct scales (plain and diagonal) | • Scales (plain and diagonal) |
| • enlarge and reduce plane figures. | • Reduction and enlargement by<br>- ratio of sides<br>- area |
| • use scales to construct plane figures. | • Transformation of plane figures |

## Suggested Teaching/Learning Strategies

- Use learner participation to illustrate the construction of:
  - lines and angles
  - triangles

  - quadrilaterals
  - polygons
- Clarify on the learners' participation.
- Use group discussions to illustrate the circle and its properties.
- Clarify on the learners' contributions.
- Demonstrate the construction of:
  - tangents.
  - inscribed, circumscribed and escribed plane figures.
  - plain and diagonal scales.
- Guide learners to:
  - reduce and enlarge geometrical figures by ratio of sides and area.
  - transform plane figures.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Models
- Real objects

## Assessment Strategies

- Class exercises on construction of:
  - lines and angles
  - triangles
  - quadrilaterals
  - polygons
- Assignments to construct:
  - tangents
  - inscribed, circumscribed and escribed plane figures
  - plain and diagonal scales
- Homework on:
  - illustration of the circle and its properties
  - reduction and enlargement of geometrical figures by ratio of sides and area
  - transformation of plane figures

- Tests to recap on plane geometrical figures

# Topic 3: Loci

## Duration: 11 Periods

## Overview

This topic is intended to give learners a general overview of loci; their construction and areas of application. The knowledge and skills of this topic shall help learners in construction of gears, springs, stairs and arches.

## General Objective

By the end of the topic, the learner should be able to construct and draw different loci.

## Sub-Topic: Simple Loci

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• locate points of loci.<br>• trace loci of points.<br>• apply principles of helices in constructing and drawing screw threads, springs and helical stairs.<br>• constructs tangents and normals to specific loci. | • Ellipses, parabolas and hyperbolas<br>• Cycloids, epicycloids, and hypocycloids<br>• Trochoids, epitrochoids and hypotrochoids<br>• Involutes and spirals<br>• Evolutes<br>• Helices and their applications in construction of springs , screw threads and helical stairs<br>• Link mechanisms<br>• Tangents and normals to specific loci |

## Suggested Teaching /Learning Strategies

- Use question and answer approach to introduce loci.
- Clarify on the learners contributions.
- Use demonstration method to construct and draw:
  - Ellipses, parabolas, and hyperbolas
  - Cycloids, epicycloids, and hypocycloids

- Use learner participatory method to construct trochoids, epitrochoids and hypotrochoids.
- Guide learners to construct involutes, evolutes and spirals.

- Illustrate the construction of helices and their applications in springs, threads and
  stairs.
- Guide learners to practice the construction and drawing of:
  - link mechanisms
  - tangents and normals to specific loci
- Organise study trips to industries and construction sites to expose learners to the practical application of loci.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information, communication and technology equipment
- Models
- Real objects

## Assessment Strategies

- Class exercises to construct and draw:
  - ellipses, parabolas and hyperbolas
  - cycloids, epicycloids and hypocycloids
- Assignments to construct:
  - trochoids, epitrochoids and hypotrochoids
  - involutes, evolutes and spirals
- Home work on construction of:
  - helices and their applications in springs, threads and stairs
  - link mechanisms
  - tangents and normals to specific loci
- Test to summarise loci
- Report writing on the field trips

SENIOR FIVE TERM TWO

# Topic 4: Geometrical Solids

Duration: 20 Periods

## Overview

This topic introduces learners to the methods of constructing geometrical solids. The knowledge of this topic will help the learners to construct chimneys, tanks, rain gutters and drums from sheet metal. It will also help learners in the making of interior decorations of buildings and graphics adverts.

## General Objective

By the end of the topic, the learner should be able to identify, construct and draw geometrical solids.

## Sub-Topic 1: Isometric Projection

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify, construct and draw solids in isometric projection.<br>• construct and draw orthographic views from given isometric solids.<br>• construct and draw isometric solids from given orthographic views.<br>• project and draw views of truncated solids.<br>• construct and draw solids using isometric scale. | • Upright and inclined full geometrical solids:<br>- prisms<br>- pyramids<br>- cylinders<br>- cones<br>• Upright and inclined truncated geometrical solids<br>• Applications of isometric scale in drawing geometrical solids |

## Suggested Teaching/Learning Strategies

- Demonstrate the construction of upright and inclined full geometrical solids including:
  - prisms
  - pyramids
  - cylinders
  - cones

- Guide learners to construct upright and inclined truncated geometrical solids.
- Brainstorm the applications of isometric scales in drawing geometrical solids.

### Teaching Resources
- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information, communication and technology equipment
- Models
- Real objects

### Assessment Strategies
- Class exercises to construct upright and inclined full geometrical solids
- Assignments on construction of upright and inclined truncated geometrical solids
- Home work on the applications of isometric scales in drawing geometrical solids

## Sub-Topic 2: Oblique Projection

| Specific Objectives | Content |
|---|---|
| • The learner should be able to construct and draw oblique solids from given orthographic views using given data. | • Cavalier and cabinet projection of prisms, pyramids, cylinders, cones and related shapes |

### Suggested Teaching/Learning Strategies
- Guide learners on cavalier and cabinet projection of:
  - prisms
  - pyramids
  - cylinders
  - cones and related shapes

### Teaching Resources
- BS 308 pamphlets
- Charts

- Drawing equipment and drawing aids
- Drawing papers
- Information, communication and technology equipment
- Models
- Real objects

### Assessment Strategies

- Class exercises on construction of prisms and pyramids
- Assignments on cones and cylinders
- Tests on oblique projection

## Sub-Topic 3: Surface Development

| Specific Objective | Content |
|---|---|
| The learner should be able to:<br>• develop surfaces of open and closed solids by parallel line and radial line methods.<br>• develop surfaces of open and closed truncated solids. | • Open and closed solids by parallel line method:<br>- cylinders<br>- prisms<br>• Open and closed solids by radial line method:<br>- cones<br>- pyramids<br>• Open and closed truncated solids by parallel and radial line methods |

### Suggested Teaching/ Learning Strategies

- Explain the construction techniques in surface development.
- Illustrate the steps in drawing surface development using parallel and radial line methods.
- Guide learners to practice drawing surface development of open and closed truncated solids.

### Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers

- Information, communication and technology equipment
- Models
- Real objects

## Assessment Strategies

- Class exercises on development of open and closed solids by parallel line method:
  - cylinders
  - prisms
- Assignments on development of open and closed solids by radial line method:
  - cones
  - pyramids
- Home work on development of open and closed truncated solids by parallel and radial line methods

## Sub-Topic 4: Intersection of Solids

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• determine points of intersections.<br>• trace curves of intersections. | • Intersection of solids including:<br>- cylinder to cylinder<br>- cylinder to cone<br>- cylinder to prism<br>- cone to prism<br>- cone to sphere<br>- prism to prism<br>- pyramid to prism<br>- pyramid to cylinder |

## Suggested Teaching/Learning Strategies

- Demonstrate how different solids intersect with one another.
- Explain construction steps of plotting points of intersection.
- Illustrate how to plot points of intersection.
- Guide learners to practice techniques of drawing lines of intersection.

## Teaching Resources

- BS 308 pamphlets
- Charts

- Drawing equipment and drawing aids
- Drawing papers
- Information, communication and technology equipment
- Models
- Real objects

## Assessment Strategies

- Class exercises on intersection of different solids at right angles
- Assignments on intersection of different solids at inclined angles
- Test on intersection of solids

SENIOR FIVE TERM THREE

# Topic 5: Cams

Duration: 7 Periods

## Overview

This topic introduces learners to practical application of cams such as in weaving, printing, brick ramming, compacting, stamping machine, crank shaft and reciprocating sewing machine needles.

## General Objective

By the end of the topic, the learner should be able to identify, construct and draw the different cam motions.

| Specific Objectives | Content |
|---|---|
| The learner should be able to: | |
| • define and state practical applications of cams in engineering. | • Definition and applications of cam |
| • explain cam terminologies. | • Cam terminologies |
| • identify types of cams. | • Types of cams |
| • identify types of cam followers. | • Types of cam followers (offset and in-line):<br>- point follower<br>- knife-edge follower<br>- roller follower<br>- flat follower<br>- radial arm follower |
| • identify cam follower motions. | • Cam follower motions:<br>- uniform acceleration and retardation<br>- simple harmonic motion<br>- uniform velocity<br>- dwell |
| • construct and draw graphs to represent different cam follower motions. | • Cam follower motion graphs |
| • determine and draw cam profiles. | • Cam profiles |
| • construct and draw cam | |

| Specific Objectives | Content |
|---|---|
| performance graphs from given cam profiles. | |

## Suggested Teaching/ Learning Strategies

- Define cams as related to practical application in engineering.
- Demonstrate cam follower motion.
- Discuss types of cam followers.
- Explain cam terminologies.
- Expose learners to engineering constructions that use cam principles (field visits).
- Illustrate how to draw cam profiles.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information, communication and technology equipment
- Models
- Real objects

## Assessment Strategies

- Class exercises on application of cams used in engineering construction
- Assignments on motions (performance graphs):
  - uniform acceleration and retardation
  - simple harmonic motion
  - uniform velocity
  - dwell
- Home work on cam followers (offset & in-line):
  - point follower
  - knife-edge follower
  - roller follower
  - flat follower
  - radial arm follower
- Test on performance graphs from cam profiles

# Topic 6: Vector Geometry

Duration: 7 Periods

## Overview

This topic introduces learners to construction of structures such as roof trusses, bridges and stair rails.

## General Objective

By the end of the topic, the learner should be able to use geometrical constructions to resolve forces in structures.

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define a vector.<br>• resolve forces in frameworks.<br>• use vector geometry to solve structural problems. | • Definition of a vector.<br>• Graphical resolution of forces<br>• Statics:<br>- concurrent coplanar forces<br>- non-concurrent coplanar forces<br>- loaded beams and beam moments<br>- frameworks |

## Suggested Teaching/ Learning Strategies

- Illustrate graphical resolution of forces.
- Demonstrate statics:
  - concurrent coplanar forces
  - non-concurrent coplanar forces
  - loaded beams and beam moments
  - frameworks

## Teaching Resources

- BS 308 Pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Models
- Real objects

## Assessment Strategies

- Assignments on graphical resolution of forces
- Test on statics:
  - concurrent coplanar forces
  - non-concurrent coplanar forces
  - loaded beams and beam moments
  - frameworks

SENIOR SIX TERM ONE

# Topic 7: Further Surface Development

Duration: 12 Periods

## Overview

This topic introduces learners to further practical application of making things like tanks, chimneys, roof spires, balls and umbrellas.

## General Objective

By the end of the topic, the learner should be able to develop surfaces of transitional solids.

## Sub-Topic 1: Development by Triangulation

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify types of transition solids.<br>• develop surfaces by triangulation method. | • Transition pieces including: square to round, rectangular to round, hood and warped shapes |

## Suggested Teaching/Learning Strategies

- Explain the different types of transition solids.
- Illustrate surface development by triangulation method.
- Guide learners in panel development.

## Teaching Resources

- BS 308 Pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Models
- Real objects

## Assessment Strategies

- Class exercises on types of transition solids
- Assignments on developing surfaces by triangulation method
- Test on triangulation development

## Sub-Topic 2: Panel Development

| Specific Objectives | Content |
|---|---|
| • The learner should be able to develop various panels of objects. | • Panel development |

## Suggested Teaching/Learning Strategies

- Explain the different types of transition solids.
- Illustrate surface development by panel method.
- Guide learners in panel development.

## Teaching Resources

- BS 308 Pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Models
- Real objects

## Assessment Strategies

- Class exercises on types of transition solids
- Assignments on developing surfaces by panel method
- Test on panel development

# Topic 8: Further Intersection of Solids

Duration: 8 Periods

## Overview

This topic introduces learners to further exercises of intersection of solids such as making of chimneys, pipe fittings, roofs, pipe works and dormer windows.

## General Objective

By the end of the topic, the learner should be able to determine and trace lines/curves of intersection.

## Sub-Topic: Projection of Second Auxiliary Views

| Specific Objectives | Content |
|---|---|
| The learner should be able to determine, locate and trace points and curves of intersections. | Intersections/interpenetrations including:<br>- elbow and cylinder<br>- elbow and sphere<br>- cone and cylinder<br>- cone and sphere<br>- cone and prism<br>- cylinder and sphere<br>- oblique cone and prism<br>- oblique cone and cylinder<br>- oblique pyramid and cylinder |

## Suggested Teaching/Learning Strategies

- Illustrate examples of intersections/interpenetration of different solids.
- Guide learners in constructing points of intersection/ interpenetration of different solids.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Models

- Real objects

## Assessment Strategies

- Class exercises on intersection/ interpenetration
- Assignments on intersection/ interpenetration
- Test on interpenetration/intersection of solids
- Report writing

SENIOR SIX TERM TWO

# Topic 9: Further Auxiliary Projection

Duration: 12 Periods

## Overview

This topic introduces learners to practical application of architectural construction and graphic adverts.

## General Objective

By the end of the topic, the learner should be able to project and draw second auxiliary views.

## Sub-Topic 1: Projection of Second Auxiliary Views

| Specific Objective | Content |
|---|---|
| The learner should be able to;<br>• project and draw second auxiliary views. | • Second auxiliary:<br>- elevations<br>- plans |

## Suggested Teaching/Learning Strategies

- Demonstrate how to construct second auxiliary views.
- Illustrate the steps in constructing second auxiliary elevations and plans.
- Guide learners to practice correct procedures of constructing second auxiliary plans and elevations.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Models
- Real objects

## Assessment Strategies

- Class exercises on second auxiliary:
  - elevations

  - plans
- Assignments on second auxiliary:
  - elevations
  - plans
- Test on further auxiliary projection

## Sub-Topic 2: Applications of Second Auxiliary Views

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• determine true lengths of lines.<br>• determine true shapes of planes or laminae.<br>• determine the intersections between lines and planes.<br>• determine the intersections between planes. | • True lengths of lines<br>• Point views of lines<br>• Edge views of planes<br>• True shapes of planes<br>• Piercing points of lines with planes<br>• Dihedral angle of two intersecting planes<br>• Shortest distance between two skew lines |

## Suggested Teaching/Learning Strategies

- Demonstration
- Illustrate:
  - true lengths of lines
  - point views of lines
  - edge views of planes
  - true shapes of planes
- Practice:
  - piercing points of lines with planes
  - dihedral angle of two intersecting planes
  - shortest distance between two skew lines

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Models
- Real objects

## Assessment Strategies

- Class exercises on drawing:
  - true lengths of lines
  - point views of lines
  - edge views of planes
  - true shapes of planes
- Assignments on:
  - piercing points of lines with planes
  - dihedral angle of two intersecting planes
  - shortest distance between two skew lines
- Test on applications of second auxiliary views

# Topic 10: Lines in Space

Duration: 15 Periods

## Overview

This topic introduces learners to practical application of architectural construction and graphic adverts.

## General Objective

By the end of the topic, the learner should be able to project points, lines and planes in space.

## Sub-Topic: Projection of Points and Lines

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define terminologies used in projection of points and lines.<br>• determine traces of lines and plane figures.<br>• project:<br>- points, lines and planes onto oblique planes.<br>- solids cut by oblique planes.<br>- points and views of solids from principal planes to oblique planes and vice versa.<br>• convert oblique planes to inclined planes.<br>• determine:<br>- true angles of inclination of a plane to the horizontal and vertical planes.<br>- traces of oblique planes.<br>- intersections between planes.<br>- elevations, plans and true shapes of laminae. | • Terminologies<br>• Traces of lines and plane figures<br>• Orthographic projection of points, lines and planes.<br>• Projection of:<br>- solids cut by oblique planes<br>- points into oblique planes<br>- views of solids from principal planes to oblique planes and vice versa<br>• Converting oblique planes to inclined planes<br>• Determination of:<br>- true angles of inclination of a plane to the horizontal and vertical planes<br>- traces of an oblique plane<br>- intersections between oblique planes<br>- elevations, plans and true shapes of laminae |

## Suggested Teaching/ Learning Strategies

- Illustrate:
  - traces of lines and plane figures.
  - orthographic projections of points, lines and planes.
  - projection of solids cut by oblique planes.
  - projection of views of solids from principal planes to oblique planes and vice-versa.
- Guide the learner in:
  - converting oblique planes to inclined planes.
  - determining true angles of inclination of a plane to the horizontal and vertical planes given their traces.
  - determining traces of an oblique planes when given the front elevation.
  - determining points of intersections between oblique planes.
  - determining elevations and true shapes of laminae using traces of oblique planes and plans.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Models
- Real objects

## Assessment Strategies

- Class exercises on drawing:
  - traces of lines and plane figures
  - orthographic projections of points, lines and planes
  - projection of solids cut by oblique planes
  - projection of views of solids from principal planes to oblique planes and vice-versa
- Assignments on:
  - converting oblique planes to inclined planes
  - determining true angles of inclination of a plane to the horizontal and vertical planes given their traces.
  - determining traces of an oblique plane when given the front elevation

- determining intersections between oblique planes
- determining elevations and true shapes of laminae using traces of oblique planes and plans.

- Test on drawing lines in space

SENIOR SIX TERM THREE

# Topic 11: Conic Sections

Duration: 10 Periods

## Overview

This topic introduces the learners to conic sections and its application in areas such as heat and light reflectors in torches, vehicle lamps and floodlights.

## General Objective

By the end of the topic, the learner should be able to construct and draw various conic sections.

## Sub-Topic: Conic Sections

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify conic sections.<br>• draw conic sections.<br><br>• determine focal points, directrices, asymptotes and true shapes of conic sections using focal sphere. | • Conic sections:<br>- circle<br>- ellipse<br>- parabola<br>- hyperbola<br>• Determining focal points, directrices, asymptotes and true shapes of conic sections |

## Suggested Teaching /Learning Strategies

- Explain conic sections.
- Illustrate drawing of different conic sections.
- Guide the learners in determining focal points, directrices, asymptotes and true shapes using focal sphere.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Models

- Real objects

## Assessment Strategies

- Class exercises on conic sections
- Assignments on determining focal points, directrices, asymptotes and true shapes
  using focal sphere
- Test on conic sections

# GEOMETRICAL AND MECHANICAL DRAWING

SENIOR FIVE TERM ONE

## Topic 1: Introduction to Mechanical Drawing

### Overview
This topic introduces learners to mechanical drawing specifications used in placing orders, product regulation and control.

### General Objective
By the end of the topic, the learner should be able to produce mechanical drawings.

### Sub-Topic: Conventional Representations

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify and correctly use standard symbols in mechanical engineering drawing.<br>• identify and correctly use standard mechanical engineering drawing ISO standards. | • Symbols like diameter (Ø), angle ( $\angle$ ).<br>• Standard practices like lines, relationship between diameters of bolts and their heads, alignment of orthographic views, angles for isometric drawing |

### Suggested Teaching/Learning Strategies
- Discuss symbols used in mechanical drawing.
- Explain standard practices like lines, relationship between diameters of bolts and their heads, alignment of orthographic views and angles for isometric drawing.

### Teaching Resources
- BS 308 pamphlets

- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Models
- Real objects

## Assessment Strategies

- Class exercises on use of symbols in mechanical drawing
- Assignments on standard practices used in mechanical drawing

# Topic 2: Mechanical Fasteners

# Duration: 17 Periods

## Overview

This topic introduces the learners to fasteners used in mechanical drawing and assembly of components, structures and machines like bicycles, roof trusses and motor vehicle engine parts.

## General Objective

By the end of the topic, the learner should be able to identify fasteners used in mechanical drawing.

## Sub-Topic: Types and Applications of Fasteners

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify and draw the different types of screw threads using conventional symbols<br>• identify and conventionally draw the different types of bolts, nuts and washers to show their typical applications.<br>• identify and conventionally draw the different types of springs and locking devices to show their typical applications. | • Types of fasteners:<br>- screw threads<br>- bolts, studs, nuts and washers<br>- springs<br>- locking devices to include among others locknuts, tab washers, spring washers, split pins |

## Suggested Teaching/Learning Strategies

- Discuss different fasteners and components used in mechanical drawing
- Explain different screw threads used in mechanical drawing.
- Illustrate assembly of components, structures and machines.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids

- Drawing papers
- Information communication and technology equipment
- Models
- Real objects

## Assessment Strategies

- Class exercises on screw threads, bolts, studs, nuts, washers and springs
- Assignments on assembly of components, structures and machines
- Test on types and applications of fasteners

SENIOR FIVE TERM TWO

# Topic 3: Dimensioning, Limits and Fits

# Duration: 11 Periods

## Overview

This topic introduces the learners to dimensioning mechanical drawings and use of limits and fits, mass production of interchangeable parts and designs of fits.

### General Objective

By the end of the topic, the learner should be able to properly dimension mechanical drawings and use limits and fits.

### Sub-Topic 1: Dimensioning

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify and use different dimensioning styles according to BS 308 part 2.<br>• demonstrate the applications of dimensioning terms and notations.<br>• indicate and interpret the tolerance dimensions using ISO 4500 recommendations. | • Standard terms and notations for; dimension lines, arrow heads, datum<br>• Dimensioning techniques using ISO standards.<br>• Indication and interpretation of tolerance dimensions |

### Suggested Teaching/Learning Strategies

- Discuss terms and notations
- Explain dimensioning techniques according to ISO standards.
- Guide the learners on indication and interpretation of tolerances and dimensions.

### Teaching Resources

- BS 308 pamphlets
- Charts

- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Class exercises on dimensioning techniques according to ISO standards
- Assignments on indication and interpretation of tolerances and dimensioning
- Test on dimensioning

## Sub-Topic 2: Limits and Fits

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define terminologies used in limits and fits.<br>• carry out calculations related to limits and fits.<br>• determine types of fits with aid of BS 4500 data sheet.<br>• state the importance of the use of hole and shaft basis systems for interchangeable manufacture of components. | • Terminologies used in limits and fits<br>• Limits of size<br>• Fits<br>• Interchangeable manufacturing based on standard hole and shaft basis systems |

## Suggested Teaching/Learning Strategies

- Explain the terminologies used in limits and fits.
- Illustrate calculation of limits and fits.
- Discuss the importance of the use of standard hole and shaft basis systems for interchangeable manufacture of components.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Class exercises on terminologies used in limits and fits
- Assignments on interchangeable manufacturing based on standard hole and shaft
- Test on limits and fits

# SENIOR FIVE TERM THREE

## Topic 4: Power Transmission System

Duration: 20 Periods

### Overview
This topic introduces practical applications of power transmission systems applied in motor vehicles, machines, bicycles, etc and transmission of power in gear boxes of machines, motor vehicles and aircrafts.

### General Objective
By the end of the topic, the learner should be able to identify and use components of power transmission system in machines.

### Sub-Topic 1: Elements of Power Transmission

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify structures and typical applications of each of the various types of power transmission elements.<br>• use drawings to describe the structures and typical applications of each of the various types of power transmission elements. | • Power transmission elements:<br>- bearings<br>- belts<br>- cams<br>- chains<br>- clutches<br>- couplings<br>- gears<br>- pressure transmission joints and packings<br>- shafts |

### Suggested Teaching/Learning Strategies
- Explain the terms and components used in power transmission.
- Illustrate the different components used in power transmission.
- Guide the learners to demonstrate power transmission.

### Teaching Resources
- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids

- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Class exercises on components used in power transmission
- Assignments on components used in power transmission

## Sub-Topic 2: Involute Spur Gears

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• explain gear terminologies.<br>• use calculated data to construct and draw gear teeth profiles. | • Terminologies of spur gears<br>• Spur gears involving gears in mesh like wheel and pinion, rack and pinion |

## Suggested Teaching/Learning Strategies

- Explain terminologies used in spur gears.
- Illustrate calculation and construction of spur gears including gears in mesh such as wheel and pinion, rack and pinion.
- Demonstrate application of involute spur gears.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Class exercises on calculation and construction of spur gears
- Assignments on terminologies of spur gears

SENIOR SIX TERM ONE

# Topic 5: Working Drawing

Duration: 7 Periods

## Overview

This topic introduces the learners to working drawings, quick recording and generation of design ideas. It communicates design to the manufacturers, produces service manuals and exposes internal details of mechanical drawings.

## General Objective

By the end of the topic, the learner should be able to produce working drawings.

## Sub-Topic 1: Freehand Sketching

| Specific Objective | Content |
|---|---|
| The learner should be able to draw freehand pictorial and orthographic views of single and assembled components. | • Freehand pictorial and orthographic views of single and assembled components |

## Suggested Teaching/Learning Strategies

- Demonstrate drawing of freehand pictorial and orthographic views of single and assembled components.
- Illustrate orthographic views of single and assembled components.
- Organise study trips to related industries.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Assignments on freehand pictorial and orthographic views of single and assembled components.

- Test on freehand sketching
- Report writing

## Sub-Topic 2: Detailed and Assembly Drawings

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define the terminologies related to detailed and assembly engineering drawings.<br>• identify major components of a complete set of working engineering drawings<br>• use drawings to differentiate between detailed and assembly engineering drawings.<br>• interpret and draw outside views of working engineering drawings. | • Terminologies related to detailed and assembly engineering drawings<br>• Components of working engineering drawings<br>• Detailed drawings of single components<br>• Assembly drawings |

## Suggested Teaching/Learning Strategies

- Illustrate components of working engineering drawings:
  - detailed drawings of single components
  - assembly drawings
- Guide the learners to produce components of working engineering drawings:
  - detailed drawings of single components
  - assembly drawings

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Explain terminologies related to detailed and assembly drawings
- Home work on producing components of working engineering drawings:

- detailed drawings of single components
- assembly drawings

- Test on detailed and assembly drawings

SENIOR SIX TERM TWO

# Topic 6: Complete Working Drawings

Duration: 20 Periods

## Overview

This topic gives learners a complete outlook of the finished engineering products and their application.

## General Objective

By the end of the topic, the learner should be able to produce detailed and assembly engineering drawings.

## Sub-Topic: Introduction to Sectioning

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define the terminologies related to detailed and assembly engineering drawings.<br>• draw freehand pictorial and orthographic views of single and assembled components.<br>• identify major components of complete set of working engineering drawings.<br>• use drawings to differentiate between detailed and assembly engineering drawings.<br>• interpret and draw outside views of working engineering drawings.<br>• define sectioning terminologies.<br>• interpret and draw sectional views of working engineering drawings.<br>• interpret and draw sectional views of detailed and assembly engineering drawings. | • Sectioning terminologies<br>• Types of sections such as: half sections, full sections, partial sections, or broken sections<br>• Sectioning techniques involving sectioning of webs, adjacent parts, spindles and screw threads |

## Suggested Teaching/Learning Strategies

- Illustrate types of sections such as half sections, full sections, partial sections, and broken-out sections.
- Guide the learners to practice sectioning techniques involving sectioning of webs, adjacent parts, spindles and screw threads.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Class exercises on types of sections such as half sections, full sections, partial sections, or broken-out sections
- Assignments on techniques involving sectioning of webs, adjacent parts, spindles and screw threads

# GEOMETRICAL AND BUILDING DRAWING

SENIOR FIVE TERM ONE

## Topic 1: Introduction to Building Drawing

Duration: 14 Periods

### Overview

This topic introduces the learners to the concepts of building drawing. It deals with scales, paper layout, ground floor plans, pictorial freehand sketching, elevations and sectional views of buildings.

### General Objective

By the end of the topic, the learner should be able to acquire knowledge, skills, positive attitude and competences required in producing building drawings.

## Sub-Topic 1: Building drawings (Scales 1:50 and 1:100)

This sub-topic covers the definition, overview of building drawing, drawing layout, drawing equipment, scales, symbols and conventions (symbols and standards).

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define building drawing.<br>• layout building drawing.<br>• identify and use drawing equipment and instruments.<br>• identify and use architectural conventions (symbols and standards).<br>• use scales to produce drawings. | • Definition of building drawing<br>• Overview of a building<br>• Drawing layout of a building<br>• Drawing equipment and instruments<br>• Architectural conventions (symbols and standards)<br>• Graphics<br>• Elevations<br>• Sections<br>• Plans<br>• Scales |

## Suggested Teaching/Learning Strategies

- Explain building drawing
- Discuss the building overview
- Illustrate paper layout
- Demonstrate the use of drawing equipment, instruments, scales, conventions (symbols and standards)

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give exercises on drawing layout, use of drawing instruments, equipment, scales conventions (symbols and standards).
- Give exercises on illustrating paper layout.
- Give exercises on the use of drawing equipment and instruments.

# Sub-Topic 2: Paper Layouts

This sub-topic will cover drawing of boundary/border/margin lines, title block and printing.

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• draw border (boundary or margin) lines.<br>• draw a title block.<br>• print on the drawing. | • Border (boundary or margin) lines<br>• Title block<br>• Printing |

## Suggested Teaching /Learning Strategies

- Illustrate the quality of lines.
- Demonstrate the drawing of margins, title block and printing of figures.
- Discuss positioning of drawings on the paper.

## Teaching Resources

- BS 308 pamphlets
- Charts

- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

### Assessment strategies

- Give exercises on paper layout.

## Sub-Topic 3: Ground Plans (Scales 1:50, 1:100)

This sub-topic will take the learner through drawing ground floor plans according to specifications.

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• interpret and use specifications.<br>• Draw roof plans.<br>• Use the compass correctly.<br>• indicate compass direction.<br>• use conventions (symbols and standards) correctly.<br>• draw the different components of ground floor plan<br>• dimension and label the ground floor plan. | • Specifications:<br>- walls<br>- splash apron<br>- windows and doors<br>• Roof<br>• Labelling and dimensioning<br>• Compass<br>• Compass direction<br>• Conventions used in drawing<br>• Ground floor plan |

### Suggested Teaching/Learning Strategies

- Explain ground floor plan.
- Demonstrate how to draw ground floor plan, use of symbols and conventions.
- Discover the suitable arrangement of doors and windows.
- Guide the learners to draw ground floor plan with dimensions and labels.
- Illustrate the drawing of roof plan, splash apron and compass direction.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment strategies

- Give the learners exercises on specifications, walls and splash apron.
- Give home work on windows, doors and roof plans.

# Sub-Topic 4: Pictorial Freehand Sketching

This sub-topic deals with principles of pictorial freehand sketching, three-dimensional views and the components of a building.

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• practice the principles of freehand sketching.<br>• draw freehand isometric sketches of a building.<br>• show the building components. | • Pictorial sketching in isometric:<br>- proportionality<br>- neatness<br>- pencil work<br>• Components of the building<br>- splash apron<br>- wall finishes<br>- doors, windows and ventilators<br>- roof |

## Suggested Teaching/Learning Strategies

- Explain the principles of pictorial freehand sketching.
- Illustrate pictorial freehand sketching.
- Demonstrate pictorial freehand sketching.
- Guide the learners to produce pictorial freehand sketches.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids

- Drawing papers
- Information communication and technology equipment
- Real objects

### Assessment Strategies

- Give learners exercises and tests on pictorial freehand sketching.
- Assignments on components of a building

## Sub-Topic 5: Elevations (Scales 1:50, 1:100)

This sub-topic will enable the learner to draw end, front and rear elevations of a building to scale.

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• project and draw an end elevation from ground floor plan. | • End elevation<br>- splash apron (use dimensions and include the fall)<br>- wall span, height and include appropriate finish(es)<br>- door(s), window(s) and ventilators (type)<br>- roof pitch (angle or ratio)<br>- roof slope (length of the slope including eaves, ridge cup and gutter)<br>- gable ventilation (in case of gable roof) |
| • project and draw front and rear elevations from the ground floor plan. | • Elevations (front and rear)<br>- splash apron (use dimensions and include the fall)<br>- wall length, height and include appropriate finish(es)<br>- door(s), window(s) and ventilators (type)<br>- roof slope (length of the slope including eaves, ridge cup and gutter) |
| • Label and dimension drawings. | • Labelling and dimensioning |

## Suggested Teaching/Learning Strategies

- Practice drawing of elevations.
- Explain and illustrate elevations.
- Discuss the methods of drawing elevations.
- Demonstrate how to draw the different elevations.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment strategies

- Give the learners exercises on drawing elevations.

## Sub-Topic 6: Sectional Views (Scales 1:50, 1:100)

This sub-topic will further the knowledge and skills of the learners in drawing sectional elevations of buildings to scale.

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• draw sectional views of the buildings.<br>• Draw sections through:<br>- Walls<br>- Doors and windows<br>- roofs<br>• indicate conventions (symbols and standards).<br>• label and dimension the drawings | • Building section.<br>- Foundation (types, natural and artificial foundations, trenches and their chamfering, blinding, backfilling and compaction, foundation wall, A.P.C, dimension)<br>- Splash apron (dimension, fall, finish)<br>- Ground level (150mm to D.P.C)<br>- Ground floor (compacted soil, hardcore, blinding, D.P.M, over site concrete, cement sand screed and other floor finishes)<br>• Walls (sizes, wall fittings) |

| | |
|---|---|
| | • Doors and windows (types, dimensions)<br>• Roof (types, classification, constructional details)<br>• Conventions (building components) |

## Suggested Teaching/Learning Strategies

- Illustrate sectional views.
- Discuss how to draw sectional views of a building.
- Demonstrate the drawing of sectional views while following conventions.
- Guide the learners to draw sectional views.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give learners exercises on drawing sectional views.
- Test on drawing sectional views of walls, foundations, doors, floors and roofs.

SENIOR FIVE TERM TWO

# Topic 2: Foundations and Floors

Duration: 10 Periods

## Overview

This topic introduces the learners to foundations and floors.

## General Objective

By the end of the topic, the learner should be able to identify and draw foundations and floors.

## Sub-Topic 1: Foundations (Scales 1:50, 1:100)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify foundation materials.<br>• draw different types of foundations.<br>• draw section(al) views.<br><br>• label and dimension foundations. | • Foundations<br>• Types of foundations<br>- Trenches<br>- Conventions (symbols and standards)<br>• Sections<br>• Labelling and dimensioning |

## Suggested Teaching/Learning Strategies

- Illustrate components of foundations.
- Demonstrate how to draw the different types of foundation.
- Discuss trenches, labelling and dimensioning.
- Guide the learners to draw foundations.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment strategies

- Give learners exercises on foundations.
- Test the learners on construction of foundation types.

## Sub-Topic 2: Floors (Scales 1:50, 1:100)

This sub-topic will give learners more knowledge and skills of drawing floors.

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• draw solid and suspended timber ground floor.<br>• draw fireplace details.<br>• draw solid and suspended timber upper floors.<br>• label and dimension floors. | • Solid ground floor<br>• Suspended timber ground floor<br>• Fireplace<br>• Solid upper floor<br>• Suspended timber upper floor<br>• Labelling and dimensioning |

## Suggested Teaching/Learning Strategies

- Discuss the methods of drawing floors.
- Illustrate floor types.
- Discuss fire place and details of construction.
- Guide the learners to draw different floor types.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give learners exercises on floors.
- Give assignments on fire place construction.
- Test the learners on floors construction.

# Topic 3: Walls and Concrete

Duration: 10 Periods

## Overview

This topic introduces the learners to walls and concrete. It deals with brick, block and concrete, bonding, elevations, plans, junctions, labels and dimensions of walls and concrete.

## General Objective

By the end of the topic, the learner should be able to identify and draw bonds, elevations, plans and junctions of walls.

## Sub-Topic 1: Wall Bonding (Scales 1:50, 1:100)

This sub-topic covers brick and block methods of arranging and binding in different ways.

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify brick and block bonding methods. | • Brick and block bonding:<br>- ½ brick thick wall / stretcher bond<br>- 1brick thick wall in:<br>o stretcher bond<br>o header bond<br>o Flemish bond<br>o English bond<br>- 1 ½ brick thick wall in:<br>o Flemish bond<br>o English bond |
| • draw elevations and plans of the different bonds in various wall thicknesses. | • Elevations and plans |
| • draw the plans of the different junctions. | • Junctions |
| • label and dimension walls. | • Labelling and dimensioning walls |

## Suggested Teaching/Learning Strategies

- Discuss bonding methods in various walls and block thicknesses.
- Demonstrate types of bonding.
- Explain different types of bonding.
- Guide the learners to draw brick and block bonding.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give learners exercises on wall bonding.
- Give assignments on wall bonding.
- Test on wall bonding.

## Sub-Topic 2: Concrete

This sub-topic covers concrete and methods of mixing it.

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify components of concrete.<br>• State places where concrete is used.<br>• State types of concrete; admixers. | • Concrete<br>• Concrete use<br>• Types of concrete<br>• Admixers |

## Suggested Teaching/Learning Strategies

- Discuss types of concrete.
- Illustrate different types of concrete.
- Guide learners to practice mixing of concrete.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give learners exercises on mixing of concrete.
- Test the learners on types of concrete.

SENIOR FIVE TERM THREE

# Topic 4: Doors and Windows

Duration: 8 Periods

## Overview

This topic introduces the learners to identifying and drawing doors and windows. It also deals with drawing of elevations and sections of doors and windows.

## General Objective

By the end of the topic, the learner should be able to identify and draw sections, elevations and plans of doors and windows.

## Sub-Topic 1: Doors (Scales 1:5, 1:10, 1:20, 1:50, 1:100)

This sub-topic covers drawing of different types of doors.

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify doors, frames / linings.<br><br><br><br><br>• draw doors, frames/linings using conventions.<br><br>• draw sectional views.<br>• label and dimension doors. | <br>• Types of doors:<br>- match boarded<br>- flush<br>- panel<br>- casement<br>• Conventions (symbols and standards)<br>• Frames and linings<br>• Sections and elevations<br>• Labelling and dimensioning |

## Suggested Teaching/Learning Strategies

- Discuss types of doors and their construction details.
- Visit existing structures to see different types of doors, or use models.
- Illustrate drawing of different types of doors.
- Guide the learners to draw elevations and sections of different types of doors.

## Teaching Resources

- BS 308 pamphlets
- Charts

- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give the learners assignments on construction of doors.
- Test learners on different types of doors.

## Sub-Topic 2: Windows (Scales 1:5, 1:10, 1:20, 1:50, 1:100

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify windows, frames / linings and draw them.<br>• draw sectional views.<br>• label and dimension windows. | • Types of windows:<br>- match boarded<br>- flush<br>- panel<br>- casement<br>• Conventions (symbols and standards):<br>- frames and linings<br>- sections and elevations<br>• Labelling and dimensioning |

## Suggested Teaching/Learning Strategies

- Discuss types of windows.
- Explain frames and linings.
- Illustrate sections and elevations of various windows.
- Demonstrate labelling and dimensioning of doors.
- Guide learners to practice drawing of sections and elevations of windows.
- Take learners to sites to observe different types windows or use models.

## Teaching Resources

- BS 308 Pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information Communication and Technology Equipment

- Models
- Real objects

## Assessment Strategies

- Give learners exercises and tests on window types and construction.

# Topic 5: Bridging Wall Openings

Duration: 8 Periods

## Overview

This topic deals with drawing different methods of bridging wall openings.

## General Objective

By the end of the topic, the learner should be able to identify and draw different beams, lintels and arches.

## Sub-Topic 1: Beams and Lintels (Scales 1:5, 1:10, 1:20, 1:50, 1:100)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify different materials for beams and lintels. | • Different materials for beams and lintels:<br>- wooden beams and lintels<br>- metallic beams and lintels<br>- reinforced concrete beams and lintels |
| • draw the cross sectional views of beams and lintels.<br>• draw beams and lintels using given scale.<br>• label and dimension beams and lintels. | • Cross sectional view for beams and lintels<br>• Labelling and dimensioning<br>• Scale drawing of beams and lintels. |

## Suggested Teaching/Learning Strategies

- Guide learners to practice drawing elevations and sections of different beams.
- Discuss types of beams, lintels and their constructional methods.
- Visit existing structures to see different types of beams and lintels or use models.
- Explain and illustrate different types of beams and lintels.
- Demonstrate drawing different beams and lintels.

## Teaching Resources

- BS 308 pamphlets
- Charts

- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

### Assessment Strategies

- Give learners exercises and tests on various methods of bridging wall openings.

## Sub-Topic 2: Arches (Scales 1:5, 1:10, 1:20, 1:50, 1:100)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify arches.<br>• classify arches.<br>• draw arches.<br><br>• label and dimension arches. | • Arches<br>• Classification of arches based on:<br>- construction<br>o axed arches<br>o rough arches<br>o soldier arches<br>- Shapes<br>o flat / camber<br>o semi-circular<br>o segmental<br>o tudor<br>o equilateral<br>o semi-elliptical<br>• Drawing arches.<br>• Labelling and dimensioning |

### Suggested Teaching/Learning Strategies

- Discuss types of arches and their constructional methods.
- Explain and illustrate different types of arches, use models if possible.
- Demonstrate drawing different types of arches.
- Guide learners to practice drawing elevations and sections of different types of arches.
- Organise visits to existing structures to see different types of arches in use.

### Teaching Resources

- BS 308 pamphlets
- Charts

- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give learners exercises and tests on methods of constructing arches.

# Topic 6: Roofs

## Duration: 4 Periods

## Overview

This topic deals with identifying and drawing of different types and classes of roofs.

## General Objective

By the end of the topic, the learner should be able to identify and draw different types of roofs, elevations and sections of roofs as well as label and dimension roofs.

## Sub-Topic : Types of Roof (Scales 1:50, 1:100)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify different types of roof.<br>• classify roofs.<br>• draw different types of roof.<br>• draw section (al) view(s) of roofs.<br>• section eaves.<br>• label and dimension roofs | • Roof types<br>• Roof classification<br>• Section(al) views of a roof:<br>- roof trusses<br>- ceilings<br>- eaves<br>- roof coverings<br>- sections eaves |

## Suggested Teaching/Learning Strategies

- Guide learners to practice drawing elevations and sections of different roofs.
- Discuss types of roofs and their constructional methods.
- Visit existing structures to see different types of roofs or use models.
- Explain and illustrate different types of roofs.
- Demonstrate drawing different types of roofs.
- Discuss ceilings and eaves construction.
- Discuss roofing materials.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers

- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give learners exercises and tests on roof types, construction, ceilings and roof covering materials.
- Ask learners to write a report on observations made during field visits.

SENIOR SIX TERM ONE

# Topic 7: Stairs

Duration: 4 Periods

## Overview

This topic deals with identifying and drawing of different types and classes of stair, including drawing of elevations, sections and plans.

## General Objective

By the end of the topic, the learner should be able to identify and draw different types of stair.

## Sub-Topic: Stairs (Scales 1:5, 1:10, 1:20, 1:50, 1:100)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• classify and differentiate stairs.<br>• draw plans, elevation and cross section views.<br>• label and dimension stairs. | • Types of stair<br>• Plan, elevation, cross section views of stairs<br>• Labelling and dimensioning of stairs |

## Suggested Teaching/Learning Strategies

- Discuss types of stair and their constructional methods.
- Explain and illustrate different types of stair.
- Demonstrate drawing different types of stair.
- Visit existing structures to see different types of stair or use models.
- Practice the drawing of elevations, plans and sections of different stairs.

## Teaching Resources

- BS 308 Pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information Communication and Technology Equipment
- Models
- Real objects

## Assessment Strategies

- Give learners exercises and tests on stair types and construction.
- Ask the learners to draw elevations and plans of stairs.

# Topic 8: Residential Buildings

## Overview

This topic deals with identifying, interpreting and drawing residential buildings including drawing types of roof, elevations, sections, labelling and dimensioning of cottage buildings.

## General Objective

By the end of the topic, the learner should be able to interpret and draw residential buildings.

## Sub-Topic 1: Cottage Buildings (Scales 1:5, 1:10, 1:20, 1:50, 1:100)

| Specific Objectives | Content |
|---|---|
| The learner should be able to: | |
| • interpret and draw floor plans of cottage buildings. | • Plan shapes:<br>- rectangular<br>- square<br>- L-shaped<br>- U-shaped<br>- T-shaped |
| • draw freehand sketches of cottage buildings. | • Sketches |
| • draw different elevation of a buildings. | • Elevations |
| • draw sectional views of the building. | • Section(al) view |
| • label and dimension cottage buildings. | • Labelling and dimensioning cottage buildings |

## Suggested Teaching/Learning Strategies

- Discuss types of cottage buildings and their constructional methods.
- Explain and illustrate different types of cottage buildings.
- Demonstrate drawing of different types of cottage buildings.
- Visit existing structures to see different types of cottage buildings.
- Practice drawing plans, freehand sketches, elevations and sectional views of cottage buildings.

## Teaching Resources

- BS 308 pamphlets
- Charts

- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

### Assessment Strategies

- Give the learners exercises and tests on cottage buildings.

## Sub-Topic 2: Bungalow Buildings (Scales 1:50, 1:100)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• interpret and draw floor plans of bungalows. | • Plan shapes:<br>- rectangular<br>- square<br>- L-shaped<br>- U-shaped<br>- T-shaped |
| • draw freehand sketches. | • Sketches |
| • draw different elevations of a bungalow building. | • Elevation |
| • draw sectional views of a bungalow building. | • Section(al) view |
| • label and dimension bungalow | • Labelling and dimensioning bungalow buildings |

### Suggested Teaching/Learning Strategies

- Discuss types of bungalow buildings and their construction details.
- Explain and illustrate different types of bungalow buildings.
- Demonstrate drawing different types of bungalow buildings.
- Practise drawing plans, freehand sketches, elevations and sectional views of bungalow buildings.
- Visit existing structures to see different types of bungalow buildings.

### Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategy

- Give the learners different exercises and tests on bungalow buildings.

## Sub-Topic 3: Semi-Detached Buildings (Scales 1:50, 1:100)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define semi-detached buildings<br>• identify, interpret and draw floor plans.<br>• draw pictorial freehand sketches from ground floor plans.<br>• draw elevations and sectional views of the building.<br>• use conventions.<br>• prepare door and window schedules<br>• label and dimension buildings. | • Definition of semi-detached buildings<br>• Plan (square, rectangular, L-shaped, T-shaped, U-shaped)<br>• Pictorial freehand sketches<br>• Elevations and sectional views<br>• Conventions<br>• Door and window schedules<br>• Labelling and dimensioning |

## Suggested Teaching/Learning Strategies

- Discuss types of semi-detached buildings and their constructional methods.
- Explain and illustrate different types of semi-detached buildings.
- Demonstrate drawing different types of semi-detached buildings.
- Practice drawing plans, freehand sketches, elevations and sectional views of semi-detached buildings.
- Visit existing structures to see different types of semi-detached buildings.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give the learners different exercises and tests on semi-detached buildings.

## Sub-Topic 4: Flats (Scales 1:50, 1:100)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define flats<br>• identify, interpret and draw floor plans.<br>• draw pictorial freehand sketches from ground floor plans.<br>• draw elevations and sectional views of flat buildings.<br>• use conventions.<br>• prepare door and window schedules<br>• label and dimension flat buildings. | • Definition of flats to one storied<br>• Plan (square, rectangular, L-shaped, T-shaped, U-shaped)<br>• Pictorial freehand sketches of flats<br>• Elevations and sectional views of flats<br>• Conventions<br>• Door and window schedules<br>• Labelling and dimensioning |

## Suggested Teaching/Learning Strategies

- Discuss type of flats and their constructional methods.
- Explain and illustrate different types of flat buildings.
- Demonstrate drawing different types of flat buildings.
- Practice drawing plans, freehand sketches, elevations and sectional views of flats.
- Visit existing structures to see different type of flats or use models.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give the learners exercises and tests on flats.

SENIOR SIX TERM TWO

# Topic 9: Projects

Duration: 20 Periods

## Overview

This topic deals with identification, interpretation and drawing of roofs, elevations, sections, labelling and dimensioning of commercial buildings.

## General Objective

By the end of the topic, the learner should be able to design, draw and interpret commercial and public buildings.

## Sub-Topic 1: Commercial Buildings (Scales 1:50, 1:100)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define a commercial building.<br>• identify, interpret and draw ground floor plans.<br>• draw pictorial freehand sketches from ground floor plans.<br>• draw elevations and sectional views of the buildings.<br>• use conventions.<br>• prepare door and window schedules<br>• label and dimension commercial buildings. | • Definition of commercial building<br>• Plan (square, rectangular, L-shaped, T-shaped, U-shaped)<br>• Pictorial freehand sketches<br>• Elevations and sectional views<br>• Use conventions<br>• Door and window schedules<br>• Labelling and dimensioning |

## Suggested Teaching/Learning Strategies

- Discuss type of commercial buildings and their constructional methods.
- Explain and illustrate different types of commercial buildings.
- Practice drawing plans, freehand sketches, elevations and sectional views of commercial buildings.
- Visit existing structures to see different type of commercial buildings.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give the learners exercises and tests on drawing plans, elevations and sectional views of commercial buildings.

# Sub-Topic 2: Public Buildings (Scales 1:50, 1:100)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define a public building.<br>• identify, interpret and draw ground floor plans.<br>• draw pictorial freehand sketches from ground floor plans.<br>• draw elevations and sectional views of the building.<br>• use conventions.<br>• prepare door and window schedules<br>• label and dimension public buildings. | • Definition of public building<br>• Plan (square, rectangular, L-shaped, T-shaped, U-shaped)<br>• Pictorial freehand sketches<br>• Elevations and sectional views<br>• Conventions<br>• Door and window schedules<br>• Labelling and dimensioning |

## Suggested Teaching/Learning Strategies

- Discuss type of public buildings and their constructional methods.
- Explain and illustrate different types of public buildings.
- Demonstrate drawing different types of public buildings.
- Practice drawing plans, freehand sketches, elevations and sectional views of public buildings.
- Visit existing structures to see different type of public buildings.

## Teaching Resources

- BS 308 pamphlets
- Charts

- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategy

- Give the learners exercises and tests on drawing plans, elevations and sectional views of public buildings.

SENIOR SIX TERM THREE

# Topic 10: Remedial Lessons

Duration: 10 Periods

## Overview

This topic deals with extra lessons to demonstrate knowledge, skills, positive attitudes and competences in building drawing by reviewing key areas which were not properly grasped.

## General Objective

By the end of the topic, the learner should be able to demonstrate knowledge, skills, positive attitudes and competences in building drawing.

## Sub Topic 1: Revision

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• consolidate knowledge and skills learnt in building drawing.<br>• internalise and use drawing concepts.<br>• gain confidence in building drawing by practicing.<br>• improve pencil work. | • Revision of topics not well grasped<br>• Time based exercises<br>• Accuracy, legibility and cleanliness of drawings |

## Suggested Teaching/Learning Strategies

- Discuss types of building drawings and their constructional methods/details.
- Explain different types of building drawing.
- Demonstrate drawing different types of building drawing.
- Practice drawing plans, freehand sketching, elevations and sectional views of building drawings.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids

- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategy

- Give the learners timed exercises and tests on the contents of the various topics covered.

# BUILDING CONSTRUCTION - THEORY

## SENIOR FIVE TERM ONE

## Topic 1: Preliminary Works and the Building Team

Duration: 20 Periods

### Overview

This topic deals with activities that prepare a building site ready for construction work to begin and all the players involved in the building construction work.

### General Objective

The learner should be able to identify the building team and their roles. They should also be able to explain activities involved in preparing a building site.

### Sub-Topic: Introduction to Building Construction Theory /Building Team

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define the concept of building construction.<br>• classify methods of building construction.<br>• state roles of individuals in the building team. | • Overview of building construction theory<br>• Methods of building:<br>- convention (traditional)<br>- modern (industrial)<br>• The building team |

### Suggested Teaching/Learning Strategies

- Explain the overview of building construction.
- Discuss preliminary works.
- Discuss the building team.
- Organise site visits for the learners to observe preliminary works.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give the learners exercises and tests on preliminary works.
- Ask the learners to explain the roles of individual building team members.

# Sub-Topic 2: Site Works

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• state factors for choice of the site.<br>• state procedure for site investigation.<br>• describe site work activities.<br>• level and excavate a site. | • Choice of a site<br>• Site investigation<br>• Site clearing and demolition<br>• Levelling/Excavations |

## Suggested Teaching/Learning Strategies

- Explain site works.
- Discuss the factors that govern the choice of a building site.
- Explain site investigation procedures.
- Discuss site clearing, demolition and levelling.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give the learners exercises and tests on site works.

## Sub Topic 3: Temporary Works

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify temporary site works.<br>• explain temporary site works .<br>• describe procedures for setting out.<br>• define terminologies. | • Site fencing<br>• Site hoarding<br>• Site planning<br>• Storage of materials<br>• Datum level<br>• Setting out<br>• Excavation of trenches<br>• Timbering<br>• Shoring<br>• Scaffolding<br>• Gantries<br>• Form works<br>• Centres<br>• Terminologies |

### Suggested Teaching/Learning Strategies

- Explain and illustrate temporary works.
- Explain safety and health precautions.
- Discuss and demonstrate temporary works.
- Guide the learners to observe safety related to temporary works on a site.
- Define terminologies.

### Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

### Assessment Strategy

- Give the learners exercises and tests on temporary site works.

SENIOR FIVE TERM TWO

# Topic 2: Foundations

Duration: 7 Periods

## Overview

This topic deals with the part of a building, which is in direct contact with the ground.

## General objective

The learner should be able to identify foundation types and their application in different situations.

## Sub-Topic 1: Foundations

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define foundation.<br>• identify and describe different types of foundation and design.<br>• state functions of foundations.<br>• explain foundation terminologies. | • Definition<br>• Natural and artificial foundations<br>• Types of foundation<br>• Foundation design (choice)<br>• Foundation sizing<br>• Functional requirements of foundations<br>• Functions of foundations<br>• Foundation failure<br>• Under-pinning<br>• Foundation terminologies |

## Suggested Teaching/Learning Strategies

- Define foundation.
- Discuss natural and artificial foundations.
- Explain and illustrate foundation types.
- Discuss the choice, functions and functional requirements of foundations.
- Explain the foundation terminologies.

## Teaching Resources

- BS 308 pamphlets

- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give the learners exercises to differentiate between natural and artificial foundation.
- Ask learners to explain functions and functional requirements of foundations.
- Ask learners to explain foundation terminologies.

# Topic 3: Floors

Duration: 7 Periods

## Overview

This topic deals with types and procedures of constructing floors.

## General Objective

By then end of the topic, the learner should be able to describe floors as required in different situations.

## Sub Topic: Floors

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define a floor.<br>• identify types of floor.<br>• state functions of a floor<br>• describe types of floor.<br>• state the functional requirements of a floors.<br><br>• make a choice for a suitable floor.<br>• explain floor terminologies.<br>• mention the finishes applied to floors. | • Definition of a floor<br>• Functional requirements of floors:<br>- solid ground floor<br>- suspended timber ground floor<br>- suspended timber upper floor<br>- double upper floor<br>- joints and strutting floors<br>• Choice of a floor<br>• Treatment around an opening in timber upper floors.<br>• Floor finishes (applied and in-situ floor finishes) |

## Suggested Teaching/Learning Strategies

- Define floor.
- Explain and discuss the choice of a floor.
- Explain and discuss the functions of a floor and functional requirements of different floor types.
- Illustrate the different types of floor.
- Organise site visits for the learners to observe the type of floor.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategy

- Give the learners exercises and tests on different types of floor.

# Topic 4: Concrete

Duration: 6 Periods

## Overview

This topic deals with operations involved in preparing concrete, how it is handled after preparation and the processes that follow.

## General Objective

By the end of the topic, the learner should be able to identify and state concrete components in their correct proportions.

## Sub-Topic: Concrete

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define concrete.<br>• identify and describe components of concrete.<br>• identify and describe different concrete types.<br>• describe the preparation of concrete.<br>• explain the processes involved in the use of concrete.<br>• describe the workability tests of concrete.<br>• state the reaction of concrete to chemicals. | • Definition of concrete<br>• Components of concrete<br>• Types (plain and reinforced concrete)<br>• Preparation of concrete (batching and mixing of concrete)<br>• Ways of handling concrete (processes / reactions):<br>- transportation of concrete<br>- placing of concrete<br>- curing of concrete<br>• Chemical failure in concrete<br>• Testing of concrete for workability |

## Suggested Teaching/Learning Strategies

- Define concrete.
- Discuss components of concrete.
- Explain the preparation of different types of concrete.
- Explain the processes involved in the use of concrete.
- Illustrate the workability tests of concrete.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategy

- Give the learners exercises and tests on concrete preparation, use and workability tests.

SENIOR FIVE TERM THREE

# Topic 5: Walls

## Overview

This topic deals with all type of walls in buildings and structures.

## General Objective

By the end of the topic, the learner should be able to identify and describe different walls.

## Sub-Topic 1: Walls

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define a wall<br>• state functions of walls<br>• state functional requirements of walls.<br>• construct walls in stones, bricks/blocks.<br>• construct walls in ½, 1, 1½ bricks in English, Flemish, Stretcher and header bonds.<br>• identify types of walls.<br>• identify fixtures and fittings to walls.<br>• identify and describe bonding in walls.<br>• state causes of dampness in walls. | • Definition of a wall<br>• Functions of walls<br>• Functional requirements of walls<br>• Construction of walls:<br>- brick/block/stone bonding (types, ½ brick and block thick stretcher bond, 1brick and block thick stretcher, header, Flemish, English bond, 1 ½ brick and block thick Flemish, English bond,)<br>- solid walls<br>- cavity walls<br>• Types of walls:<br>- external walls<br>- partition walls<br>- perimeter walls<br>- parapet walls<br>- boundary walls<br>- perimeter walls<br>- retaining walls<br>- buttressing walls<br>• Dampness in walls |

| Specific Objectives | Content |
|---|---|
| | • Internal fixings to walls<br>• Internal fittings to walls |

## Suggested Teaching/Learning Strategies

- Define a wall.
- Discuss the functions and functional requirements of walls.
- Discuss and illustrate type of walls.
- Discuss the construction of different types of wall.
- Explain and illustrate type of fixtures and fittings and their methods of securing to walls.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give the learners exercises and tests on wall construction.
- Ask learners to outline functional requirements for walls.
- Ask learners to state the uses of fixtures and fittings to walls.

# Topic 6: Walling Materials

Duration: 6 Periods

## Overview

This topic deals with materials used in construction of wall units.

## General Objective

By the end of the topic, the learner should be able to identify and describe different types of walling materials and be familiar with associated terminologies.

## Sub-Topic 1: Walling Materials

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define walling materials.<br>• identify the different walling materials.<br>• describe the process of manufacturing walling units.<br>• explain the associated terminologies. | • Definition of walling materials<br>- Mortars<br>- Concrete<br>- Bricks<br>- Blocks<br>- Stones<br>• Production of walling units.<br>• Terminologies |

## Suggested Teaching/Learning Strategies

- Identify and define different walling units.
- Discuss the process of manufacturing walling units.
- Illustrate walling units.
- Explain the terminologies used.
- Organise site visits for the learners to observe the process of manufacturing walling units.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give the learners exercises and tests on walling materials; mortar, concrete and bricks

## Sub-Topic 2: Wall Openings

This sub-topic deals with provision for door, window and ventilator openings in walls.

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define wall openings.<br>• describe different wall openings.<br>• explain methods of bridging wall openings.<br>• illustrate methods of bridging wall openings.<br>• explain terminologies in wall openings | • Definition of wall opening<br>• Types of wall opening<br>• Bridging wall opening (lintel, beams and arches)<br>• Wall openings (windows, doors, ventilators)<br>• Wall opening terminologies. |

## Suggested Teaching/Learning Strategies

- Identify and define different wall openings.
- Discuss the bridging techniques.
- Illustrate window, door and ventilator openings.
- Explain and discuss the related terminologies.
- Organise site visits for the learners to observe the bridging techniques.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give the learners exercises and tests on wall openings.

SENIOR SIX TERM ONE

# Topic 7: Stairs

Duration: 8 Periods

## Overview

This topic deals with means and methods of constructing access to other floors.

## General Objective

By the end of the topic, the learner should be able to identify and describe type of stairs as required in different situations.

## Sub-Topic: Stairs

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define a stair.<br>• classify stairs.<br>• state type of stairs.<br>• state functions of stairs<br>• state functional requirements of a stair.<br>• explain stair terminologies. | • Definition of stair<br>• Classification of stairs (wooden, metallic, concrete)<br>• Type of stairs<br>• Construction of stairs (arrangement of different parts)<br>• Functions of stairs<br>• Functional requirements of stairs<br>• Stair terminologies |

## Suggested Teaching/Learning Strategies

- Define a stair.
- Discuss different classes and types of stair.
- Illustrate types of stair.
- Explain and illustrate the related terminologies.
- Organise site visits for the learners to observe the construction of stairs.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers

- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give the learners exercises and tests on stair construction.
- Ask learners to state functional requirements of stairs.
- Ask learners to explain meanings of key terminologies used in stairs.

# Topic 8: Roofs

Duration: 20 Periods

## Overview

This topic deals with definition, types, roof covering materials and constructional methods of roofs.

## General Objective

By the end of the topic, the learner should be able to identify different types of roof and their applications to suit different situations.

## Sub-Topic 1: Timber

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define timber.<br>• classify timber.<br>• explain quality of timber as a result of conversion method.<br>• explain reasons for preserving roof timber.<br>• identify suitable moisture content in timber for various works.<br>• store timber correctly. | • Definition<br>• Classification<br>• Conversion<br>• Moisture content<br>• Storage<br>• Defects and decay<br>• Preservation |

## Suggested Teaching/Learning Strategies

- Define timber.
- Discuss different classes of timber.
- Illustrate methods of converting logs into timber.
- Discuss preservation for roofing timber.
- Organise site visits for the learners to observe the use of timber in roof construction.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids

- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give the learners exercises and tests on timber as a roof construction material.

## Sub-Topic 2: Roofs

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define roofs.<br>• state functions of roofs.<br>• state functional requirement of roofs.<br>• identify types of roof.<br>• choose correct roof type to suit a particular situation.<br>• identify roof covering materials.<br>• identify and describe joints used in roof construction.<br>• explain roof terminologies. | • Definition of a roof<br>• Functions of a roof<br>• Functional requirements of a roof<br>• Types of roof<br>• Choice of roof types<br>- Roof trusses (wood and steel)<br>- Construction of roof framing<br>• Roof coverings<br>• Joints used in roof construction<br>• Roof terminologies |

## Suggested Teaching/Learning Strategies

- Define a roof.
- Discuss functions of a roof.
- Explain functional requirements of a roof.
- Discuss types and choice of a roof.
- Illustrate and discuss roof trusses, framing and coverings.
- Illustrate roof joints.
- Explain terminologies used in roof construction.

## Teaching Resources

- BS 308 Pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers

- Information Communication and Technology Equipment
- Models
- Real objects

## Assessment Strategies

- Give the learners tests on roof construction.
- Ask the learners to explain reasons for choice of a particular roof type.
- Give learners exercises on roof joints.

SENIOR SIX TERM TWO

# Topic 9: Fireplace

Duration: 7 Periods

## Overview
This topic deals with fireplace construction.

## General Objective
By the end of the topic, the learner should be able to identify and state the functions of a fireplace.

## Sub-Topic: Fireplace

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define a fireplace.<br>• describe the components of a fireplace.<br>• identify requirements of a fireplace.<br>• explain fireplace terminologies. | • Definition<br>• Fireplace<br>- Chimney<br>- Flues<br>• Requirements of a fireplace<br>• Terminologies |

## Suggested Teaching/Learning Strategies
- Define a fireplace.
- Discuss functions of a fireplace.
- Explain functional requirements of a fireplace.
- Discuss types and choice of fireplaces.
- Explain parts of a fireplace.
- Explain fireplace terminologies.

## Teaching Resources
- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategies

- Give the learners exercises and tests on:
  - types of fireplace.
  - fireplace construction.
  - functional requirements of a fireplace.

# Topic: 10 Finishes

Duration: 7 Periods

## Overview
This topic deals with decorative and protective treatments to buildings.

## General Objective
By the end of the topic, the learner should be able to identify and describe building finishes.

## Sub-Topic: Building Finishes

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define building finishes.<br>• identify type of finishes.<br>• state functions of finishes.<br>• state functional requirements of finishes.<br>• identify finishes for floors, walls and ceilings.<br>• explain finishing terminologies. | • Definition of finishes<br>• Type of finishes<br>• Functions of finishes<br>• Functional requirements of finishes<br>• Floor finishes<br>• Wall finishes<br>• Ceiling finishes<br>• Terminologies related to finishes |

## Suggested Teaching/Learning Strategies
- Define finishes.
- Explain functions of finishes.
- Discuss functional requirements of finishes.
- Discuss type and choice of finishes.
- Explain terminologies related to finishes.

## Teaching Resources
- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers

- Information communication and technology equipment
- Real objects

## Assessment Strategy

- Give the learners exercises and tests on building finishes.

# Topic 11: Field Trips

Duration: 6 Periods

## Overview

This topic exposes learners to real life situations.

## General Objective

By the end of the topic, the learner should be able to relate acquired knowledge to its application in the field.

## Sub-Topic 1: Field Trips

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify different building clients, activities, professionals and operatives in the building trade.<br>• identify different building materials and their manufacturing processes.<br>• write field trip reports | • Building sites<br>• Hardware shops<br>• Trade shows<br>• Timber yards<br>• Training institutions<br>• Industries<br>• Building materials and their manufacturers<br>• Building construction companies<br>• Report writing |

## Suggested Teaching/Learning Strategies

- Explain the field trip.
- Discuss the purpose of the field trip.
- Explain and discuss writing of field reports.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategy

- Give the learners exercises on the field trip and to write reports on field trip observations.

SENIOR SIX TERM THREE

# Topic 12: Remedial Lessons

Duration: 10 Periods

## Overview

This topic deals with extra lessons to demonstrate knowledge, skills, positive attitude and competences in building construction theory. It also revisits topics whose contents were not properly grasped by the learners.

## General Objective

By the end of the topic, the learner should be able to demonstrate knowledge, skills, positive attitude and competences in building construction theory.

## Sub-Topic: Revision

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• consolidate acquired knowledge and skills.<br>• internalise and use learnt concepts.<br>• gain confidence. | • Revision of selected topics<br>• Time based exercises<br>• Tests<br>• Question approach<br>• Past papers<br>• Seminars |

## Suggested Teaching/Learning Strategies

- Discuss topics that were not well grasped.
- Give and revise tests.
- Organise internal and external seminars.

## Teaching Resources

- BS 308 pamphlets
- Charts
- Drawing equipment and drawing aids
- Drawing papers
- Information communication and technology equipment
- Real objects

## Assessment Strategy

- Let the learners participate in the remedial activities.

## Drawing Equipment

- A ruler
- Set squares
- Compass
- Dividers
- Eraser
- Pencil
- Sharpener
- Templates
- Flexible rods
- Drawing boards
- Drawing table
- Stool
- Tee square
- Protractor
- Drawing paper
- Clips / tapes

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# Uganda Advanced Certificate of Education

# Woodwork

## TEACHING SYLLABUS

## Contents

# Introduction

This is the teaching syllabus for woodwork A Level (S5 and S6). It is a modification of the syllabus earlier designed by the then East African Examination Council. The content has been slightly reviewed to suit the developmental trends and the practical skills need which are market driven.

You will realise that some topics covered in the O Level syllabus have also resurfaced here. The intention is to consolidate the concepts earlier learnt and the felt need to handle those topics or areas in depth in order to prepare the learner for more challenges ahead in the world of work.

The syllabus covers 3 terms in S5 and S6. The third term of senior six is designed to allow ample time for syllabus coverage and revision work.

## Purpose of the Teaching Syllabus

This teaching syllabus is intended to guide the teacher, to impart the syllabus content to the learner according to the depth and scope desired. It also ensures that the assessment areas and methods at the end of the course remain uniform for all those who will take this course. It equips the learner with more knowledge and skills required for self reliance, and employment opportunities.

It is recommended that this syllabus be used in conjunction with the relevant textbooks of woodwork. Also international conventions for woodwork should be applied.

## Aims of Teaching Woodwork at A Level

To enable the learner to:

- acquire more knowledge and skills in woodwork.
- consolidate correct use of common hand tools, machines and various materials at a higher level.
- develop imagination and ability to express ideas in designing and drawing.
- develop a positive attitude towards teamwork and cottage industry.
- practise proper workshop habits, safety rules and regulations.

## Target Group

This syllabus targets students who had previously covered the O Level Woodwork syllabus, and are interested in and capable of pursuing the subject further, in preparation for specific future careers.

## Scope and Depth

The scope of this syllabus has been defined in the topics and their sub-topics and the depth by the content outlines.

## Teaching Sequence

| Section I: Theory | |
|---|---|
| **Class** | **Topic/Sub-Topic** |
| **S5 Term I** | **1: Introduction to Workshop**<br>Sub-Topic1:Workshop Layout and Safety<br><br>**2: Woodworking Machines**<br>Sub-Topic1: Fixed Power Machines<br>Sub-Topic 2:Portable Power Hand Machines |
| **S5 Term II** | **3: Timber Technology**<br>Sub-Topic 1: Tree Growth<br>Sub-Topic 2: Felling of Timber Trees<br>Sub-Topic 3: Conversion of Logs<br>Sub-Topic 4:Timber Seasoning and Shrinkage<br>Sub-Topic 5:Timber Defects<br>Sub-Topic 6: Diseases and Pests<br>Sub-Topic 7: Timber Preservation<br>Sub-Topic 8: Properties of Timber |
| **S5 Term III** | **4: Timber Mechanics**<br>Sub-Topic 1: Manufactured Timber Beams<br>Sub-Topic 2: Strength in Timber Beams and Bending Moments<br>Sub-Topic 3: Classification of Timber Structures and Jointing Methods<br><br>**5: Use of Timber in Furniture and Building Construction**<br>Sub-Topic 1: Selection of Timber for different Jobs<br>Sub-Topic 2: Importance of Correct M.C in Wood for Specific Jobs<br>Sub-Topic 3: Woodworking Joints<br>Sub-Topic 4: Domestic and Public Furniture<br>Sub-Topic 5 : Manufactured Boards |
| | |
| **S6 Term I** | **6: Doors and Windows Construction**<br>Sub-Topic 1: Identification of Doors and their Construction.<br>Sub-Topic 2: Identification of Windows and their Construction |

| | |
|---|---|
| | Sub-Topic 3: Fixtures and Fittings |
| **S6 Term II** | **7: Roofs**<br>Sub-Topic 1:Type of Roofs<br>Sub-Topic 2:Roof Coverings<br>Sub-Topic 3:Roof Openings<br><br>**8: Wooden Stair Construction**<br>Sub-Topic 1: Types of Stair<br>Sub-Topic 2: Stair Construction (Regulation and Functional Requirement) |
| **S6 Term III** | **9: Finishes**<br>Sub-Topic :Finishes |
| **Section II: Design and Drawing** | |
| **S5 Term I** | **10: Design Theory**<br>Sub-Topic 1: Design Principles<br>Sub-Topic 2: Design Elements |
| **S5 Term II** | Sub-Topic 3: Design Process |
| **S5 Term III** | **11: Design and Drawing**<br>Sub-Topic 1**:** The concept of Design and Drawing |
| **S6 Term I** | Sub-Topic 2**:** Design Task I (Chair/Table Construction) |
| **S6 Term II** | Sub-Topic 3**:** Design Task II (Car Case Construction) |
| **S6 Term III** | Sub-Topic 4: Design Task III (Cushioned Dressing Stool) |
| **Section III: Practical** | |
| **S5 Term I** | **12: Car Case Construction**<br>Sub-Topic 1: Jewel Box |
| **S5 Term II** | Sub-Topic 2: Bedside Cabinet |
| **S5 Term III** | **13:Frame Construction**<br>Sub-Topic :Office Table |
| **S6 Term I**<br><br><br>**S6 Term II** | **14: Projects**<br>Sub-Topic 1:Project I (Project of Students' Choice but guided by the Teacher)<br>Sub-Topic 2:Project II (Project of Students' Choice but guided by the Teacher) |
| **S6 Term III** | Sub-Topic 3: Project III (Project of Students' Choice but guided by the Teacher) |

## Time Allocation

Woodwork shall have four periods for theory, design and drawing and practicale each, every week in every year of study and each period will last 40 minutes. Time allocation for each topic is given as a guide. The school is at liberty to improve on this time allocation.
It is assumed that, there are ten to twelve weeks of teaching and learning in every term except third term of senior six which will have between four to five weeks for teaching.
Enough time has been left for revision in third term of senior six so that the learner can discuss, internalise and prepare for the final examinations.

## Mode of Assessment

Assessment is finding out how much a learner has achieved during and after the teaching/ learning processes.
Learners are assessed because of the following reasons:

- To identify learners who need remedial work.
- To find out how much the learner has achieved.
- To inform the learners on what they have achieved.
- To encourage learners to perform better.
- To make new plans for effective teaching and learning.
- To measure progress from one topic to another.
- To identify learners who have exceptional talents for more challenging tasks.
- To provide required information to learners, administrators, parents, guardians and Ministry of Education.

The modes of assessment include **continuous** and **summative**.

### *Continuous Assessment*

This covers practical work, course work, project assignments and exercises covered in senior five and the first two terms of S6.
For external examinations, course work assessment should be based on the candidate's original work done during the period specified above. It should be marked by the subject teacher and external examiner, should it be necessary. The teacher should keep the record of marks and practical pieces to confirm the course work marks sent to UNEB.

Since the subject is skill based, all the competences, oral, written and practical should be assessed by the teacher, who records marks, observes learners in practicals and examines work produced among others.

### *Summative/Final Assessment*

The learners should sit examinations prepared by Uganda National Examinations Board (UNEB) at the end of the two years of A Level.

### *Examination Format*

There are **three** papers:

## Paper 1: Theory (2 hours)

This paper consists of **two** sections A and B. **(100marks)**
Section A contains forty compulsory objective questions, carrying 40 marks.
Section B contains **five** essay type questions of which the candidate is required to attempt any **three**, carrying 60marks.

## Paper 2: Design and Drawing (2 hours)

This paper consists of **three** questions and candidates are expected to answer **one** question
**(100 marks)**

## Paper 3: Practical and Course Work

**A. Practical(6 hours)**
This paper consists of a single construction usually found as part of a furniture or fitting, and may in addition include a setting out problem. The construction normally should be related to the problems set in paper 2 **(70marks)**

**B. Coursework**
Each student in Senior 5 should make progressive series of sketches for Projects suggested in terms 1, 2, & 3 for his own practical work. From those sketches they should make a complete project.

Progressively they should learn how to use the circular saw, the hand saw, the surface planer and the thickness planers, and later the mortorising machine and the spindle moulder.

A certain percentage of the examination marks should be allocated to work done during the two years of S5 and S6, [theory and practical including a project (of the candidate's choice)]. The candidate should do this in the two years preceding the examination.
Course work marks should be submitted to the board by 31st October of the year of the final examination. Candidates whose course work marks are not received by the Board should not be graded.

SECTION I: THEORY

SENIOR FIVE TERM ONE

# Topic 1: Introduction to Workshop

Duration: 8 Periods

## Overview

This topic covers the general overview of items in the workshop and their layout, the safety/health precautions and hazards.

## General objective

By the end of this topic, the learner should be able to acquire knowledge on workshop layout and observe safety and health precautions.

## Sub-Topic 1: Workshop Layout and Safety

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify different items in the workshop and their positions.<br>• identify workshop hazards and safety precautions.<br>• practise general safety and health precautions.<br>• practice hygiene related to workshop.<br>• apply protective measures against hazards.<br>• identify workshop risks and hazards.<br>• practise proper workshop safety and regulations. | • Items in the workshop and their positions<br>• Workshop hazards and safety precautions<br>• General safety and health precautions<br>• Hygiene related to the workshop<br>• Protective measures against hazards<br>• Workshop risks and hazards<br>• Workshop regulations |

## Procedure

- Introduce the different items and their locations in the workshop layout.
- Explain safety and health aspects to avoid danger.
- Discuss the workshop hazards and safety precautions.
- Demonstrate how to apply the protective measures.

- Discuss proper hygiene strategies.
- Demonstrate movement and fire drills.

## Assessment Strategies

- Take note of the learners' conduct in and around the workshop.
- Give exercises basing on the safety precautions, tools and machines.

# Topic 2: Woodworking Machines

Duration: 32 Periods

## Overview

This topic covers fixed and portable power driven machines used in the repair and production of wooden articles.

## General Objective

By the end of this topic, the learner should be able to describe and acquire knowledge on the safe use and care of woodworking machines.

## Sub-Topic 1: Fixed Power Machines

These are woodworking machines that are firmly fixed in one place.

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• describe fixed power machines, name their parts and state their functions.<br>• practise health and safety precautions related to each machine.<br><br>• operate and use fixed power machines.<br><br>• care for fixed power machines. | • Woodworking machines like:<br>- mortising machines,<br>- spindle moulder<br>- belt stroke sander<br>- combined surfacer and thicknesser<br>- band saw<br>- Wood lathe<br>- Circular saws<br>• Parts of the various machines and their functions<br>• Safety and hazards related to each machine<br>• Specific precautionary measures in the operation and use of individual machines<br>• Care and maintenance of the machines |

## Sub-Topic 2: Portable Power Hand Machines

These are small woodworking power hand machines which can be carried around.

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify portable power hand machines and their parts.<br><br><br><br>• observe safety precautions in the use of power hand machines.<br>• operate and use portable power hand machines.<br><br>• care for the machines. | • Portable power hand machines to include:<br>- Jig saw, sander, planer, router, circular saw, hand drill<br>• Use of each portable power hand machine<br>• Parts of the various machines and their functions<br>• Safety and health hazards<br>• Specific precautionary measures in the operation and use of each machine<br>• Care and maintenance of portable power hand machine |

### Procedure

- Introduce Portable power hand machines.
- Identify, list and mention portable power hand machines.
- Explain the use of each machine and the functions of the various parts.
- Discuss the safety/health hazards and the precautionary measures.
- Demonstrate the operation and the uses of each machine.
- Guide learners through the practical use of each machine.
- Guide learners in the care and maintenance of the various machines.

### Assessment Strategies

- Give exercises on the use, operation and maintenance of machines.
- The learners to explain precautionary measures related to the use of each machine.

SENIOR FIVE TERM TWO

# Topic 3: Timber Technology

Duration: 40 Periods

## Overview

This topic covers, tree growth, felling, conversion, seasoning, defects, diseases and pests, preservation and properties of timber.

## General Objective

By the end of this topic, the learner should be able to acquire knowledge of timber production and its application.

## Sub-Topic 1: Tree Growth

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify and explain factors that determine tree growth.<br>• appreciate environmental issues that affect tree growth.<br>• Identifies factors that determine timber quality<br>• identify different parts of a growing tree and state their functions.<br>• State functions of the cross-sectional parts of a tree trunk<br>• classify trees.<br>• identify characteristics of timber. | • General overview (deforestation, rainfall pattern, global warming, socio economic factors)<br>• Tree growth (wind pressure and other natural hazards)<br>• Determinants of the quality of timber (soil, locality and climate)<br>• Parts of a growing tree (the crown, trunk and the root system)<br>• Functions of the different sectional parts of a tree trunk.<br>• Classification of trees (hard and soft woods). Specific characteristics of East African species (hard and soft woods)<br>• Characteristics of timber (figure, smell, grain, texture and colour)<br>• Types of trees (Exogens and Endogens)<br>• Cell compositions of hard and |

| Specific Objectives | Content |
|---|---|
| • differentiate between endogens and exogens.<br>• identify dominant cells in hard and softwood trees. | soft woods. (parenchimas, vessels, tracheids, fibre, and resin canals) |

## Procedure

- Introduce timber technology.
- Explain tree growth.
- Illustrate sectional parts of a tree trunk and explain their functions.
- Differentiate between hardwood and softwood.
- Illustrate and explain the cell composition of hardwood and softwood.
- Discuss world distribution of tree species, E. African common species.

## Assessment Strategy

- Give exercises on the covered concepts.

## Sub-Topic 2: Felling of Trees

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• state factors that govern the selection of trees for felling.<br>• state conditions favourable for felling trees.<br>• identify methods and tools used for felling timber trees.<br>• state the treatment given to trees after felling.<br>• identify means of transporting logs to the saw mill. | • Factors that govern selection of trees for felling<br>• Conditions for felling of timber trees<br>• Methods and tools used in tree cutting<br>• Treatment of logs<br>• Transportation of logs to saw mills |

## Procedure

- Define felling of timber trees.
- State the conditions favourable for felling of timber trees and the factors governing selection of trees for felling.
- Explain the methods of felling trees and mention the tools used.
- Explain and illustrate the methods of transportation and treatment given to logs.

## Assessment Strategies

- Give exercises on the covered concepts e.g. learners to state factors to consider when selecting trees for felling.
- Describe methods of cutting trees and means of transporting logs to saw mills.

## Sub-Topic 3: Conversion of Logs

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define timber conversion.<br>• describe methods of conversion.<br>• state advantages and disadvantages of conversion methods.<br>• identify suitable conversion methods for various timber sizes.<br>• identify suitable methods of conversion for desired timber quality. | • Definition of timber conversion<br>• Methods of conversion<br>• Advantages and disadvantages of conversion methods<br>• Sections of timber sizes for various constructional needs<br>• Quality of converted timber |

## Procedure

- Give an overview on conversion of logs.
- Illustrate the methods of conversion of logs.
- Discuss the advantages and disadvantages of conversion methods.
- Illustrate the common marketable sizes of timber.
- Show the different sizes of timber.
- Explain the quality of timber.

## Assessment Strategies

- Give exercises on the covered concepts.
- Give assignments on advantages and disadvantages of conversion methods.

## Sub-Topic 4: Timber Seasoning and Shrinkage

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define timber seasoning.<br>• give reasons for seasoning timber.<br>• identify methods of seasoning.<br>• state advantages and disadvantages of seasoning methods.<br>• calculate moisture content.<br><br>• define shrinkage.<br><br>• describe forms of shrinkage.<br><br>• describe effects of shrinkage in timber. | • Definition of timber seasoning<br>• Reasons for seasoning timber<br>• Seasoning methods<br>• Advantages and disadvantages of seasoning methods<br><br>• Methods of establishing moisture content levels in timber<br>• Safe moisture content levels for various uses<br>• Shrinkage in timber<br>• Forms of shrinkage in timber<br>• Effects of shrinkage in timber |

### Procedure

- Define seasoning and shrinkage.
- Give reasons for seasoning.
- Discuss the methods of seasoning.
- List the advantages and disadvantages of respective seasoning methods.
- State methods of determining moisture content.
- Define shrinkage.
- Describe forms and effects of shrinkage.
- Organise a visit for learners to seasoning sites.

### Assessment Strategies

- Give learners a task of calculating moisture content.
- Ask learners to state the effects of shrinkage in timber.

## Sub-Topic 5: Timber Defects

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define timber defects.<br>• classify timber defects.<br>• identify causes of defects.<br>• State advantages and disadvantages of defects.<br>• state ways of preventing defects.<br>• mention remedies for defects. | • Definition of defects<br>• Classification of timber defects<br>• Causes of defects<br>• Advantages and disadvantages of defects<br>• Prevention of defects<br>• Remedies to defects |

### Procedure

- Define defects.
- Classify defects.
- Illustrate the different defects.
- Explain causes of defects.
- Discuss advantages and disadvantages of defects.
- Discuss the prevention and remedies of defects.
- Tour around the school to observe defects in likely places.

### Assessment Strategy

- Give exercises on causes, prevention and eradication of defects.

## Sub-Topic 6: Diseases and Pests

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify types of diseases and timber pests.<br>• state ways of preventing the spread of diseases and timber pests.<br>• state ways of eradicating diseases and timber pests. | • Type of diseases and timber pests<br>• Prevention methods of timber diseases and pests<br>• Eradication of timber diseases and pests |

### Procedure

- Define diseases and pests.
- Explain the types of diseases.
- Explain the types of pests.

- Discuss effects of diseases and pests on timber.
- Discuss the prevention and eradication of diseases and pests.

### Assessment Strategies

- Give exercises on the prevention and eradication of diseases and pests.
- Give an assignment to research on the difference between diseases and pests.

## Sub-Topic 7: Timber Preservation

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define timber preservation.<br>• describe different methods of timber preservation.<br>• state advantages and disadvantages of various preservatives.<br>• describe various types of preservatives.<br>• identify qualities of a good preservative.<br>• identify methods of fire retardation to timber/wood. | • Timber preservation<br>• Types of preservative methods<br>• Advantages and disadvantages of various preservatives<br>• Types of preservatives<br>• Qualities of a good preservative<br>• Protecting timber/wood against destruction by fire |

### Procedure

- Define timber preservation.
- Classify the preservatives.
- Discuss types of preservatives.
- State the qualities of a good preservative.
- Discuss the methods of application.
- Discuss the advantages and disadvantages of the various methods of application.
- Organise a field tour to preservation sites to observe and discover the various methods of preservation.

### Assessment Strategies

- Ask learners to classify preservatives.
- Ask learners to state qualities of a good preservative.
- Ask learners to describe various methods of preservative application, stating advantages and disadvantages of each method.

## Sub-Topic 8: Properties of Timber

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify different properties of timber.<br>• describe the effects of various timber properties in timber use. | • Properties of timber;<br>- Chemical properties<br>- Physical properties<br>• Effects of timber properties on timber usage |

### Procedure

- Explain properties of timber.
- Discuss the various chemical and physical timber properties
- Illustrate some of the timber properties.
- Demonstrate some physical properties.

### Assessment Strategy

- Give a research assignment on timber properties.

SENIOR FIVE TERM THREE

# Topic 4: Timber Mechanics

Duration: 16 Periods

## Overview

This topic highlights the strength, classification and jointing of timber beams in construction.

## General Objective

By the end of this topic, the learner should be able to acquire knowledge of timber mechanics and its
behaviour in construction.

## Sub-Topic 1: Manufactured Timber Beams

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• describe different timber beams.<br>• mention methods of production of timber beams.<br>• identify suitable areas for timber beam application. | • Types of timber beams<br>• Methods of production<br>• Application of timber beams in construction |

## Procedure

- Define manufactured timber beams.
- Mention and illustrate the types of timber beams.
- Explain the various methods of constructing timber beams.
- Discuss the application of timber beams.
- Discuss advantages and disadvantages of timber beams.
- Organise visits to construction sites.

## Assessment Strategies

- The learners to give examples of the uses of timber beams in construction
- Describing methods of production of timber beams

## Sub-Topic 2: Strength in Timber Beams and Bending Moments

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify factors that affect strength in timber beams. | • Factors contributing to strength in timber beams like: type of wood, Knots, grains and grain direction, Constructional methods, size, placement of beams |
| • identify bending moments on uniformly loaded beams. | • Bending moments of uniformly loaded beams |
| • identify forces experienced in timber beams. | • Forces in different timber beams |

### Procedure

- Discuss the factors that affect strength in timber beams.
- Illustrate the bending moments and forces in timber beams.
- Demonstrate the different forces acting on timber beams.
- Organise site visits for learners to observe and discover the construction and application of timber beams.

### Assessment Strategy

- Give exercises on bending moments and forces in timber beams.

## Sub-Topic 3: Classification of Timber Structures and Jointing Methods

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify different timber structures and related joints. | • Timber structures.<br>- Partitions(stud, framed, staggered)<br>- Roof frames<br>- Ceilings<br>- Frames<br>- Timber floors<br>- Struts<br>- External timber walls |
| • identify joints involved in the use of timber beams. | • Timber beam joints |

## Procedure

- Explain the different timber structures.
- Discuss the construction of the various timber structures.
- Illustrate the joints in the timber beam construction and in their application.
- Organise site visits to observe wooden structures and timber beams.

## Assessment Strategies

- Give exercises on the sketching of the different joints in timber beams.
- Learner to write a report on site visit

# Topic 5: Use of Timber in Furniture and Building Construction

Duration: 24 Periods

## Overview

In this topic, the selection of timber for specific jobs in reference to moisture content, woodworking joints basing on domestic and public furniture are covered. It also addresses the use of manufactured boards in furniture and building construction.

## General Objective

By the end of this topic, the learner should be able to select and use suitable timber for specific jobs.

## Sub-Topic 1: Selection of Timber for Different Jobs

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• select correct timber for specific jobs.<br>• identify characteristics of softwoods and hardwoods.<br>• identify properties of good timber.<br>• identify timber resistant to fungal and insect attack. | • Quality and size of timber<br>• Timber workability<br>• Suitability for furniture and building construction<br>• Resistance to fungal and insect attack<br>• Hard and soft woods |

## Procedure

- Explain the qualities of good timber (sizing of timber, the resistance to fungi and insect attacks).
- Discuss the workability of timber.
- Learners try out the various workability aspects of timber (planing, sawing, drilling, bending and ability to take finishes).

## Assessment Strategies

- Give exercises on timber identification, size and measurement.

- Give an assignment to specify the different sizes of timber used in making home and school furniture.

## Sub-Topic 2: Importance of Correct Moisture Content for Specific Jobs

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify suitable moisture content for various uses.<br>• use suitable methods in determining moisture content in timber. | • Suitable moisture contents in wood for furniture and building construction<br>• Methods of determining moisture content in wood |

### Procedure

- define moisture content and its importance in timber.
- illustrate the different methods of determining moisture content.
- discuss the suitability of specific moisture content for particular jobs.
- demonstrate the methods of testing moisture content.
- guide learners to discover how moisture is distributed in the different parts of a given piece of wood.

### Assessment Strategy

- Give exercises on how to determine the percentage moisture content in wood.

## Sub-Topic 3: Woodworking Joints

| Specific Objective | Content |
|---|---|
| The learner should be able to identify suitable joints and where they are applied. | • Types of joints used in furniture and construction:<br>- Widening joints(tongue and groove, butt, dowelled joint, slot screw, rebate, loose tongue and groove),<br>- Angle/corner (simple butt, rebated butt, plain mitre, rebated and mitred, housed and shouldered, dado/tongue and trenched, combed, dovetailed, dowelled mitred) |

| Specific Objective | Content |
|---|---|
| | - Framing joints (dowelled, mitred, bridle halving, mortice and tenon, housing, knuckle, bird's mouth)<br>- Lengthening joints (scarf, butt, halving, splayed) |

## Procedure

- Classify woodworking joints.
- Discuss the types of joints and their suitability for specific jobs.
- Illustrate the type of joints.
- Organise a tour around the school to observe and discover the different application of joints.

## Assessment Strategy

- Give exercises on illustration and application of the different joints.

# Sub-Topic 4: Domestic and Public Furniture

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify and differentiate between domestic and public furniture.<br>• describe the procedure of constructing domestic and public furniture.<br>• describe the procedure of upholstery construction works.<br>• identify furniture for placement in different positions. | • Domestic and public furniture<br>• Construction of domestic and public furniture<br>• Upholstery (webbing materials, and platforms)<br>• Placement of furniture in various positions |

## Procedure

- Define and differentiate between domestic and public furniture.
- Describe the procedure of constructing public and domestic furniture.
- Describe the process of upholstery.
- Discuss furniture in different positions.

### Assessment Strategies

Ask learners to:

- differentiate between public and domestic furniture.
- describe the procedure involved in upholstery work.
- state reasons for placement of furniture in different locations.
- write a report on observations made during visits outside the school.

## Sub-Topic 5: Manufactured Boards (Manmade Boards)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify various types of manufactured boards<br>• describe various manufactured boards and their methods of producing manufactured boards..<br>• state advantages and disadvantages of manufactured boards.<br>• state appropriate uses of the various manufactured boards.<br>• apply techniques of using manufactured boards. | • Types of manufactured boards: wood base and plastic base<br>• Methods of producing manufactured boards (laminating and fiber compression)<br>• Advantages and disadvantages of manufactured boards<br>• Application of various manufactured boards<br>• Techniques of using manufactured boards |

### Procedure

- Define manufactured boards.
- Mention the classes and types of manufactured boards.
- Discuss the methods of producing manufactured boards.
- State the application and discuss techniques of using manufactured boards.
- Demonstrate and guide learners to discover the advantages and disadvantages of manufactured boards.
- Show samples of different manufactured boards.

### Assessment Strategies

- Give exercises on the uses of various categories of manufactured boards.
- Assign learners to research on the advantages and disadvantages of using manufactured boards.

SENIOR SIX TERM ONE

# Topic 6: Doors and Windows Construction

Duration: 40 Periods

## Overview

This topic covers type of doors and windows, their construction and methods of fixing.

## General Objective

By the end of this topic, the learner should be able to identify, acquire knowledge of constructing different type of doors and windows.

## Sub-Topic 1: Identification of Doors and their Construction

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define a door.<br>• identify various door types.<br>• describe methods of constructing various door types.<br>• describe the construction of fir resistance doors<br><br>• state functional requirements of a door.<br>• explain methods of fixing door frames and shutters.<br>• identify ironmongery used in door construction. | • Definition of door<br>• Type of doors:<br>- Match boarded<br>- Paneled<br>- Glazed<br>- Flush<br>- Garage doors<br>- Fire resistance doors<br>• Construction of fire resisting doors.<br>• Fixing door frames and shutters<br>• Frames and linings (vented and unvented)<br>• Functional requirements of a door<br>• Methods of fixing doors and shutters<br>• Ironmongery in door construction |

## Procedure

- Define a door
- Explain the functional requirements of a door.
- Illustrate and discuss the types of doors, door frames and lining, methods of fixing doors.
- Discuss the various door ironmongeries.
- Demonstrate door operations.
- Organise a tour around the school and other sites to observe and discover the various door types, methods of fixing and operating.

## Assessment Strategies

- Give exercises on the covered concepts e.g. types and methods of door construction.
- Ask learners to write reports on site visits focusing on fixing and operating doors.

## Sub-Topic 2: Identification and Construction of Windows

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define a window.<br>• identify various types of windows.<br>• describe methods of constructing various types of windows.<br><br>• describe methods of fixing window frames and shutters<br>• identify ironmongery used in window construction.<br><br>• state functional requirements of a window. | • Definition of a window<br>• Type of windows:<br>- Match boarded<br>- Panel/sash<br>- Glazed/casement<br>- Louvered<br>- Pivoted sashes<br>- Dormer windows<br>- Flush<br>• Construction of windows<br>• Fixing window frames and shutters<br>• Frames and linings (vented and unvented)<br>• Functional requirements of a window<br>• Ironmongery in window construction |

## Procedure

- Take learners to see different windows
- Discuss construction of various windows
- Explain the methods of fixing window frames and shutters

## Assessment Strategies

- Assign learners to write a report on the site visits focusing on different window types and their construction.

## Sub-Topic 3: Fixtures and Fittings

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify various fixtures and fittings.<br>• describe methods of applying fittings and fixtures.<br>• state functions of the various fixtures and fittings.<br>• identify and discuss decorative finishings. | • Fixtures and fittings<br>• Methods of applying fixtures and fittings<br>• Functions of fixtures and fittings<br>• Decorative finishings |

## Procedure

- Explain fittings and fixtures.
- Discuss the various fittings and fixtures.
- Discuss the functions of fixtures and fittings.
- Discuss decorative finishings/fixtures.
- Illustrate methods of applying fittings and fixtures.
- Take learners to sites and hardware stores to observe and discover fittings and fixtures.

## Assessment Strategies

- Give exercises on the methods of applying fittings and fixtures.
- Give exercises on the identification and functions of fittings and fixtures.
- Assign learners to write a report on the site visits focusing on fittings and fixtures.

SENIOR SIX TERM TWO

# Topic 7: Roofs

Duration: 24 Periods

## Overview

This topic covers the various type of roofs, roof covering materials and opening in roofs.

## General Objective

By the end of this topic, the learner should be able to classify types of roof, identify covering materials and roof openings.

## Sub-Topic 1: Types of Roofs

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• classify roofs.<br>• identify type of roofs.<br>• identify roof components. | • Types of roof/Classifications<br>➢ By Appearance;<br>- Flat, Lean-to, Gabled, Hipped, mono pitch, mansard, gambrel, jerkin- head.<br>➢ By Construction;<br>- Mono-pitch, Double pitch, Couple roof, Close couple, Single roofs, Double roofs Triple roofs, Trussed roofs |
| • select suitable roof types for specific situations.<br>• describe the different methods of roof construction.<br>• describe joints used in roof construction.<br>• explain roof terminologies.<br>• state functional requirements for roofs.<br>• identify ironmongeries used in roof construction. | • Selection of roofs for specific situations<br>• Roof components<br>• Construction of roofs<br>• Roof joints<br>• Roof terminologies<br>• Functional requirements of roofs<br>• Ironmongeries |

## Procedure

- Define a roof.
- Discuss the functional requirements of roofs.
- Illustrate the various type of roofs.
- Discuss the construction of roofs including roof joints and roof terminologies.
- Show or illustrate the different ironmongeries used in roof construction.

### Assessment Strategies

- Give exercises on the covered content e.g. classification of roofs by appearance and by construction.
- Ask learners to comment on the designs, construction and type of roofs.
- Ask learners to state functional requirements of roofs.

## Sub-Topic 2: Roof Coverings

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• identify different roof covering materials.<br>• state functional requirements of roof coverings.<br>• describe fixing methods of roof covering materials.<br>• state the advantages and disadvantages of the various roof covering materials. | • Roof covering materials<br>• Functional requirements of roof coverings<br>• Methods of fixing roof coverings<br>• Advantages and disadvantages of roof covering materials |

## Procedure

- Define roof coverings.
- Discuss the materials and methods of fixing roof coverings.
- Discuss functional requirements of roof coverings.
- Discuss the advantages and disadvantages of the different roof covering materials.
- Organise site visits for the learners to observe and discover different methods and covering materials used in roofing.

### Assessment Strategies

- Give exercises on the types of roof covering materials, their advantages and disadvantages.

- Ask learners to write reports about the different materials and methods of fixing roof coverings.

## Sub-Topic 3: Roof Openings

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define roof openings.<br>• identify types of roof openings.<br>• state functions of roof openings.<br>• describe construction methods of roof openings.<br>• state factors governing location of roof openings and ventilators. | • Definition of roof openings<br>• Types of roof openings<br>• Functions of roof openings<br>• Methods of roof opening construction<br>• Factors governing location of ventilators and openings on roofs |

### Procedure

- Define roof openings.
- Illustrate and explain the different types of roof openings.
- Discuss functions of different roof openings.
- Illustrate and explain the construction procedures.
- Discuss factors that determine the location of roof openings.
- Organise site visits for learners to observe and discover locations and types of roof openings.

### Assessment Strategies

- Give exercises on types of roof openings.
- Ask learners to write a report about the functions, location and construction of roof openings.

# Topic 8: Wooden Stairs Construction

Duration: 24 Periods

## Overview

This topic covers types of wooden stairs, their construction, regulations regarding stair construction and terminologies used.

## General Objective

By the end of this topic, the learner should be able to identify different stair types, describe methods of construction and understand terminologies used in stair construction.

## Sub-Topic 1: Type of Stairs (Wooden)

| Specific Objective | Content |
|---|---|
| The learner should be able to:<br>• define stairs.<br>• identify the different stair types.<br><br><br><br><br><br>• determine suitability of different stairs for use in specific situations. | <br>• Definition of stairs<br>• Stairs types:-<br>- Straight flight<br>- Quarter turn<br>- Half turn(dogleg stairs)<br>- Open well stairs<br>- Geometrical Stairs<br>• Application of stair types in different situations |

## Procedure

- Define stairs.
- Discuss the type of stairs.
- Discuss suitable applications of stairs for specific situations.
- Organise a visit to places/buildings with different stairs for learners to observe.

## Assessment Strategies

- Ask learners to describe the different type of stairs.
- Ask learners to state suitable applications for various type of stairs.
- Ask learners to write a report on what they observed about stairs while on a tour.

## Sub-Topic 2: Stair Construction, Regulations and Functional Requirements

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• describe the construction of the various stair types.<br>• design stairs.<br>• construct timber staircase.<br>• explain meanings of the terminologies used in stair construction.<br>• draw plans and elevations of stairs.<br>• state regulations/functional requirements governing stair construction. | • Stair construction<br>• Designing stairs<br>• Calculation of rise and going of stairs<br>• Construction of timber staircase<br>• Terminologies used in stair construction<br>• Elevations and plans of stairs<br>• Regulations in stair construction (functional requirements) |

### Procedure

- Discuss construction of stairs.
- Discuss design of stairs.
- Discuss construction of timber staircase.
- Explain the terminologies used in stair construction.
- Illustrate drawing of plans and elevation of stairs.
- Explain regulations and functional requirements for stair construction.

### Assessment Strategies

- Ask learners to explain suitability of different stair types/designs for specific application.
- Give exercises on drawing plans and elevations of stairs.
- Ask learners to specify functional requirements for private and public stairways.

SENIOR SIX TERM THREE

# Topic 9: Finishes

Duration: 40 Periods

## Overview

This topic covers the final application of selected materials to wooden surfaces to create desirable effects, enhancing the natural beauty, protection of timber and hiding its blemishes.

## General Objective

By the end of this topic, the learner should be able to identify the use and application of different wood finishes, and apply knowledge of wood finishes.

## Sub-Topic: Finishes

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define finishes.<br>• identify finishes and their characteristics.<br>• state functional requirements of finishes.<br>• identify health and safety hazards.<br>• observe precautionary measures.<br>• describe procedure of preparing surfaces for finishing.<br>• describe methods of preparing finishes.<br>• state qualities of a good finish.<br>• describe the methods of applying finishes.<br>• identify the finishing equipment. | • Definition of finishes<br>• Types of finishes and their characteristics<br>• Preparation of finishes<br>• Application of finishes<br>• Functional requirement of finishes<br>• Health and safety hazards<br>• Precautionary measures in using finishes<br>• Surface preparation for finishing<br>• Suitability of finish/Qualities of a good finish<br>• Application of finishes<br>• Finishing equipment and their care |

| Specific Objectives | Content |
|---|---|
| • describe care for finishing equipment.<br>• state advantages and disadvantages of various finishes. | • Advantages and disadvantages of finishes |

## Procedure

- Define finishes.
- Discuss the various types of finishes and their functional requirements.
- Discuss the safety and health precautions related to finishes.
- Explain the preparation and application of finishes.
- Show the equipment used in the application of finishes.
- Discuss the specific surface preparation in respect to a given finish.
- Discuss the care and maintenance of equipment used with finishes.
- Discuss advantages and disadvantages of individual finishes.

## Assessment

- Give exercises on the covered content e.g. types of finishes, methods of application, reasons for using finishes and care of finishing equipment.

# SECTION II: DRAWING AND DESIGNING

## SENIOR FIVE TERM ONE

## Topic 10: Design Theory

Duration: 26 Periods

### Overview

This topic deals with the design principles, elements of design and the design process.

### General Objective

By the end of this topic, the learner should be able to make self-designed products to solve problems that require careful consideration of design principles.

## Sub-Topic 1: Design Principles

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define design principle.<br>• identify the basic and broad principles of design.<br>• use design principles in the design process. | • Definition of design principle<br>• Design principles:<br>- Basic principles<br>- Broad principles |

### Procedure

- Define design principle.
- Explain the principles of design.
- Illustrate and demonstrate the principles of design.

### Assessment

- Give exercises on the basic and broad design principles.

## Sub-Topic 2: Design Elements

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define design elements.<br>• identify design elements.<br>• illustrate the design elements.<br><br>• Apply design elements in design process | <br>• Definition of design elements<br>• Design elements<br>• Freehand, non-freehand sketches, scaled and dimensioned drawings<br>• Uses of design elements |

## Procedure

- Discuss the design elements.
- Illustrate the procedure of using design elements.
- Ask learners to practise the use of design elements through sketching.
- Ask learners to do more exercises on the use of design elements.

## Assessment Strategy

- Give exercises on the application of design elements.

SENIOR FIVE TERM TWO

## Sub-Topic 3: Design Process

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• define design process.<br>• identify design problems.<br>• investigate and research on the design problems.<br>• make preliminary sketches to arrive at the best solution.<br>• produce working drawings or models.<br>• acquire knowledge of design construction.<br>• test and evaluate a design. | • Definition of design process<br>• Design process like:<br>- Problem identification<br>- Design brief<br>- Investigation and research<br>- Sketches and notes<br>- Working drawings<br>- Model construction<br>- Test<br>- Evaluation |

### Procedure

- Define a design process.
- Discuss the design process.
- Illustrate sketching of possible solutions and choosing the best alternative to develop a working drawing.
- Demonstrate the making of the model.
- Test the model and write an evaluation report.

### Assessment Strategies

- Ask learners to write a statement of the problem.
- Ask learners to state a design brief.
- Give learners the task of coming up with individual modules basing on the design principles.

SENIOR FIVE TERM THREE

# Topic 11: Design and Drawing

Duration: 40 Periods

## Overview

This topic deals with the application of principles of design to specific working drawings in furniture and other wooden constructions.

## General Objective

By the end of this topic, the learner should be able to design and make working drawings for furniture and other wooden constructions.

## Sub-Topic 1: The concept of Design and Drawing

| Specific Objectives | Content |
|---|---|
| The learner should be able to: | |
| • effectively use drawing equipment. | • Use of drawing equipment |
| • solve further design and drawing problems. | • Exercises on design and drawing |
| • apply suitable scales in working drawings. | • Selection of suitable scales 1:2, 1:5, 1:10, and 1:1, 2:1 |
| • make good and proportional sketches. | • Sketches and proportionality |
| • make sectional and exploded views of wooden articles. | • Sections and exploded views |
| • convert two dimensional drawings to three dimensions and vice versa. | • Conversion of isometric and oblique projections to orthographic projection and vice versa |
| • prepare working drawings. | • Working drawings |

## Procedure

- Discuss use of drawing equipments to consolidate drawing techniques.
- Explain and illustrate tasks related to design and drawing problems.
- Explain and illustrate the use and application of scales.
- Lead learners to practise conversion of two to three dimensional drawings and vice versa.

## Assessment Strategies

- Ask learners to design a piece of furniture, e.g. office chair, office desk, kitchen cabinet, etc.
- Give exercises in specific tasks like changing from orthographic to isometric projection.

SENIOR SIX TERM ONE

## Sub-Topic 2: Design Task I (Chair/Table Construction)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• make progressive production sketches of articles.<br>• include missing details on given drawings.<br>• design articles from given data.<br>• apply design principles in problem solving.<br>• design simple furniture (tables and chairs). | • Progressive construction sketches of articles<br>• Inclusion of missing details to given drawings.<br>• Designing articles from given data<br>• Aspects of practical workability<br>• Design of tables and chairs |

### Procedure

- Make and discuss the sketches including missing details.
- Discuss safety, strength, size, cost and practical workability of the articles.
- Guide learners to make progressive constructional sketches leading to a complete working drawing of an article

### Assessment Strategy

- Give assignments to learners to make working drawings to given specifications.

SENIOR SIX TERM TWO

## Sub- Topic 3: Design Task II (Carcase Construction)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• make progressive freehand production sketches of a cabinet.<br>• include missing details on given drawings.<br>• work from given data to design articles.<br>• apply design principles in problem solving.<br>• design a bookshelf with sliding glazed shutters. | <br>• Progressive construction sketches of a cabinet<br>• Completion of missing details to given drawings<br>• Design of articles from given data like; safety, strength, size etc<br>• Consider aspects of practical workability of the article<br>• Bookshelf with sliding glazed shutters |

### Procedure

- Make and discuss the sketches including missing details.
- Guide learners to make progressive constructional sketches leading to a complete working drawing of an article.

### Assessment Strategy

- Ask learners to make working drawings of different cabinets, with sliding glazed shutters, open, hinged doors (paneled)

# SENIOR SIX TERM THREE

## Sub-Topic 4: Design Tasks III (Cushioned Dressing Stool)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• make progressive production sketches of stools / tables.<br>• include missing details on given drawings.<br>• work from given data to design articles.<br>• apply design principles in problem solving.<br>• design a dressing stool with cushioned seat. | • Progressive construction sketches of articles<br>• Completion of missing details to given drawings<br>• Designing articles from given data like; safety, strength, size<br>• Aspects of practical workability of the article<br>• Dressing stool with cushion seat |

### Procedure

- Make and discuss the sketches of an article including missing details.
- Guide learners to make progressive constructional sketches leading to a complete drawing of an article.

### Assessment Strategies

- Give project assignment to learners to make working drawings for a dressing stool with cushion.
- Give exercises to learners to produce sectional and exploded elevations of a stool with cushioned seat.

# SECTION III: PRACTICAL

## SENIOR FIVE TERM ONE

## Topic 12: Car Case Construction

Duration: 80 Periods

### Overview

This topic addresses all aspects of practical work and procedures that include materials, material list, costing, safety, tools and machines, interpretation of working drawings, layout, construction and finishing.

### General Objective

By the end of this topic, the learner should be able to make a complete functional item.

### Sub-Topic 1: Jewel Box

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• interpret working drawings.<br>• make material list.<br>• cost articles.<br>• prepare and mark out pieces.<br>• cut joints and assemble the article.<br>• observe safety and precautionary measures.<br>• prepare surface to receive finish.<br>• prepare and apply finish. | • Working drawing<br>• Material list<br>• Costing<br>• Preparation and marking out of pieces<br>• Cutting of joints and assembly of article<br>• Safety with tools, machines and equipment<br>• Surface preparation<br>• Finish preparation and application |

### Procedure

- Discuss the working drawings, materials, tools and safety.
- Explain construction procedures.
- Demonstrate the procedures in the job construction.
- Guide learners to observe and adopt correct working procedures.

## Assessment Strategies

- Assess the sequential progression of the learners in the job construction.
- Assess the finished article (functionality, quality, strength, accuracy and beauty).

SENIOR FIVE TERM TWO

## Sub-Topic 2: Bedside Cabinet

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• interpret working drawings.<br>• make material list.<br>• cost the article.<br>• prepare and mark out pieces.<br>• cut joints and assemble the article.<br>• prepare surface to receive finish.<br>• prepare and apply finish. | • Working drawing<br>• Material list<br>• Costing<br>• Preparation of pieces<br>• Marking out and cutting of joints<br>• Assembling the article<br>• Surface preparation<br>• Surface finishing |

## Procedure

- Discuss the working drawings, materials, tools and safety.
- Explain and illustrate the construction procedures.
- Demonstrate the procedures in the job construction.
- Guide learners to observe and adopt the working procedures.

## Assessment

- Assess the sequential progression of the learners in the job construction.
- Assess the finished article (functionality, quality, strength, accuracy and beauty).
- Ask learners to outline safety precautions associated with job creation.

SENIOR FIVE TERM THREE

# Topic 13: Frame Construction

Duration: 40 Periods

## Overview

This is a practical approach using all relevant processes, tools and equipment in producing an office table.

## General Objective

By the end of this topic, the learner should be able to make a complete functional office table.

## Sub-Topic 1: Office Table

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• interpret working drawings.<br>• make material list.<br>• cost the article.<br>• prepare and mark out pieces.<br>• cut joints and assemble the article.<br>• prepare surfaces to receive finish.<br>• prepare and apply finish. | • Working drawing<br>• Material list<br>• Costing<br>• Preparation of pieces<br>• Marking out and cutting of joints<br>• Assembling the article<br>• Surface preparation<br>• Surface finishing |

## Procedure

- Discuss the working drawings, materials, tools and safety.
- Explain the construction procedures.
- Demonstrate the procedures in the job construction.
- Guide learners to observe and adopt the working procedures.

## Assessment Strategies

- Assess the sequential progression of the learners in the job construction.
- Assess the finished article (functionality, quality, strength, accuracy and beauty).
- Ask learners to calculate production cost of a finished article.

SENIOR SIX TERM ONE

# Topic 14: Projects

Duration: 40 Periods

## Overview

This topic requires the learner to design and make individual projects guided by the teacher.

## General Objective

By the end of this term, the learner should be able to design and make a complete functional item.

## Sub-Topic 1: Project I (Project of students' choice but guided by the Teacher)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• design and make a piece of furniture.<br>• select appropriate materials.<br>• select appropriate tools, equipment and machines for making the project.<br>• make joints and assemble parts.<br>• prepare and apply finish.<br>• practise safety and health precautions. | • A piece of furniture<br>• Selection of materials<br>• Tools, equipment and machines<br>• Measuring and marking out<br>• Joints cutting and assembly of parts<br>• Preparation and application of finishes<br>• Issues of health and safety |

## Procedure

- Guide learners on the criteria of project selection (basing on materials, tools availability, cost and time frame to complete the project).
- Discuss learners' individual projects.
- Discuss and guide the project progress.

## Assessment Strategies

- Assess the sequential progress of the learner in project execution.
- Assess and evaluate the finished articles.

# SENIOR SIX TERM TWO

## Sub-Topic 2: Project II (Project of students' choice but guided by the teacher)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• design and make a project.<br>• select appropriate materials.<br>• prepare and mark out pieces.<br>• select appropriate tools and machines<br>• cut joints and assemble the article.<br>• prepare surface to receive finish.<br>• prepare and apply finish.<br>• practise safety and health precaution. | <br>• A piece of furniture<br>• Select appropriate materials<br>• Preparation of pieces<br>• Tools and machines<br>• Marking out and cutting of joints<br>• Assembly of parts<br>• Preparation of work surfaces<br>• Preparation and application of finishes<br>• Issues of health and safety |

## Procedure

- Guide learners on the criteria of project selection (basing on materials, tools availability, cost and time frame).
- Discuss learners' individual projects.
- Guide and discuss the project progress.

## Assessment Strategies

- Assess the sequential progress of the learner in project execution.
- Assess and evaluate the finished articles.

SENIOR SIX TERM THREE

## Sub-Topic 3: Project III (Project of students' choice but guided by the teacher)

| Specific Objectives | Content |
|---|---|
| The learner should be able to:<br>• design and make a project.<br>• select appropriate materials.<br>• prepare and mark out pieces.<br>• select appropriate tools and machines<br>• cut joints and assemble the article.<br>• prepare surface to receive finish.<br>• prepare and apply finish.<br>• practise safety and health precaution. | • A Project<br>• Selection of materials<br>• Preparation of pieces<br>• Tools and machinery<br>• Measuring and marking out<br>• Cutting and assembly of joints<br>• Preparation of surfaces for finishing<br>• Preparation and application of finishes<br>• Health and safety |

### Procedure

- Guide learners on the criteria of project selection (basing on materials, tools availability, cost and time frame).
- Discuss learners' individual projects.
- Guide and discuss the project progress.
- Organise remedial lessons on concepts that are raised by the learners.

### Assessment Strategies

- Assess the sequential progress of the learner in project execution.
- Assess and evaluate the finished articles.

# Appendix: Tools and Equipment

## Individual Bench Tools

Assuming a maximum class size of 20 learners, these tools should be stored in a bench rack, free standing or fixed to the bench. The most important factors being that they should be easily accessible for use and checking. The rack should be easily cleaned and so constructed as to prevent damage to edged tools.

Technical or Jack planes
Iron Jack planes, easily adjusted, subject to less maintenance than the bench plane 51mm cutter or alternatively: Best beech with boxwood bottom 356 x 51mm.

| | |
|---|---|
| Best quality tenon saws, beech handled | 254mm |
| Bevelled edge, boxwood handled firmer chisels | 25mm |
| Bevelled edge, boxwood handled firmer chisels | 19mm |
| Firmer chisels, boxwood handled | 6mm |
| Firmer chisels, boxwood handled | 12mm |
| Plastic handled chisels | |
| Marking gauges | |
| Ever true try squares | 152mm |
| Best beech mallets | 114mm |

Warrington pattern No. 2 hammers (ash handled)
Marking knives, hardwood handled
Best beech bench hooks
Beech cutting boards or other suitable hard wearing hardwood
Stainless steel rules marked 3mm, 16mm plain on reverse.
Hand banister brushes.
Woodworkers' vices
Bench stops

## General Tools

These should be stored in specially fitted cupboards and drawers, particularly the special planes and other valuable equipment easily damaged or lost.

Many of the common tools can be stored in wall racks or on shadow boards; again the important feature is that they should be easy to access and instantly checked. A place for everything is a must in any school or Technical College workshop.

For ease of checking, the tools are grouped under activity headings, apart from the general list which immediately follows. References to source of supply are made as far as possible in order to identify the type of tool suggested.

## Planes

Smoothing planes
Plough plane
Improved rebate plane
Technical Jack plane
Shoulder rebate plane 16mm
Shoulder rebate plane 19mm
Shoulder rebate plane 32mm
Bench rebate plane 54mm
Side rebate plane
Router plane
Block planes
Bull nose rebate plane
Combination plane
Try plane
Jointed plane

## Miscellaneous Tools

Firmer gouges, out cannel, round ash handled 6mm
Firmer gouges, out cannel, round ash handled 12mm
Firmer gouges, out cannel, round ash handled 19mm
Firmer gouges, in cannel, round ash handled 6mm
Firmer gouges, in cannel, round ash handled 10mm
Firmer gouges, in cannel, round ash handled 12mm
Firmer gouges, in cannel, round ash handled 12mm
Spoke shaves, flat face
Spoke shaves, round face
Spoke shaves, chamber
Bevel edged firmer chisels, boxwood handled 3mm
Bevel edged firmer chisels, boxwood handled 6mm
Bevel edged firmer chisels, boxwood handled 10mm
Bevel edged firmer chisels, boxwood handled 12mm
London pattern sash mortise chisels, boxwood handled 6mm
London pattern sash mortise chisels, boxwood handled 8mm
London pattern sash mortise chisels, boxwood handled 10mm
London pattern sash mortise chisels, boxwood handled 12mm
Plastic handled chisels (in sets of 6mm to 25mm blades)

| | |
|---|---|
| Number stamps 9 | 3mm |
| Number stamps 27 | 3mm |
| Wrecking bar | 610 x 19mm |

## Boring Equipment

Boring bits are best stored in cases which can be supplied by the manufacturers or in purpose made racks, so designed to protect the cutting edges from damage, against one another. Either of these can be safely stored in lockable cupboards:

- Power drill and floor model, 4 speed ½ hp motor, No volt release stop / start switch or foot switch, 150mm capacity chuck, safety guard.
- Super braces, nickel plated with ball bearing head hand drill.
- Jennings pattern auger bit 5mm
- Jennings pattern auger bit 6mm
- Auger bits, Jennings pattern 9mm, 9.5mm, 11mm, 12mm, 14mm, 16mm, 19mm, 22mm, 25.4mm or alternatively: Boxed set 6mm to 25mm by 0.4mm.
- Wood bit for brace 6mm
- Wood bit for brace 8mm
- Wood bit for brace 10mm
- Dowel sharpener
- New pattern centre bits 6mm, 8mm, 10mm, 11mm, 12mm, 14mm, 16mm, 19mm, 22mm, 25mm and 32mm.
- Shell bits 3mm, 4mm, 5mm
- Cobra pattern bits 3mm, 10mm, 5mm

Doweling Jig
Flat bits 6mm, 8mm, 10mm, 12mm, 16mm, 19mm, 22mm, 25mm, 29mm, 31mm, 35mm, 38mm
Rose counter sinks 6mm
Expansive bit (Firm grip) 22 – 75
Forstner pattern 6mm, 19mm
Centre bits, 6mm to 38mm
Snail horn counter sink for wood 6mm
Rose head countersink for wood 6mm
Dowel bit 127mm long for short accurate diameter boring 5mm
Dowel bit 6mm
Dowel bit 8mm
Dowel Bit 10mm
Straight shank twist drills for wood 1.5mm to 6mm diameter

## Blackboard Equipment

| | |
|---|---|
| Blackboard tee square, single bevel | 1219mm |
| Blackboard compasses | 381mm |
| Blackboard dividers | 381mm |
| Blackboard set square 45° | 381mm |
| Blackboard set square 60° | 381mm |

Blackboard duster

## Curving and Wood Sculpture

### Carving Tools

Carver's mallet (beech)
Bench hold fasts complete with collars
Wood rasps, half round 203mm
Wood rasps, half round 254mm
Wood rasps, round 203mm
Wood rasps, round 254mm
Wood rasps, flat 203mm
Wood rasps, flat 254mm
Cabinet rasps, half round 203mm
Cabinet rasps half round 254mm
Cabinet rasps smooth 203mm
Cabinet rasps smooth 254mm
Riffler files, assorted 203mm

### Finishing Tools

Cork rubbers 114 x 64mm
Steel scrapers 152 x 64mm
Cabinet scrapers
Box scrapers
Scraper sharpener
Paint brushes 25mm
Paint brushes 6mm
Stopping knife 114mm

### Gluing up Equipment

A table covered with Formica for ease in cleaning, 152.4 x 101.6 x 76.2mm high, made up with predrilled angle material is invaluable for use as a gluing- up table. This table can be arranged to house the sash- cramps and also a box for wood cramping pieces.
Sash cramps 610mm

Sash cramps 914mm
Sash cramps 1219mm
Sash cramps 1829mm
G- cramps 76mm
G- cramps 102mm
G - cramps 152mm
G - cramps 203mm
G-cramps 254mm
Cramp heads
Rack cramps 152mm
Corner cramps 51mm
Corner cramps 114mm

## Maintenance Equipment

Oilstones are best kept on a special table with zinc top and fitted with a removable dust cover. Space underneath the table can be for the storage of oil, oil can, and oilstone slips. Floor model horizontal grinder, complete with plane iron and gouge grinding attachments. Fully motorised with no volt release switch gear; 203*51*25mm India oilstone; fine 203*51*25mm India oilstone, medium; Leak proof oilcans
Carborundum oilstone 203*51*25mm fire oilstone slip, round edge 114*44*1.6mm oilstone gouge slip 152*51*25*12*10mm
Edge tool honer
Pliers saw set
Saw sharpening vice

## Marking Out

Sliding bevels with brass lever locking nut 190mm
Sliding bevel with brass lever locking nut 229mm
Miter squares 254mm
Hard wood mortise gouges with head thumb screw
Shockproof try squares 305mm
Cutting gauges, polished finish, plastic thumb screw
Wing compasses, Lancashire pattern 305mm.
Panel gouge 711mm
Folding rule (box wood) 51mm
Steel rule 76mm
Steel measuring tape 152mm
Bevel edge, steel straight edge 914mm
Pencil compasses with reversible points
Roofing square 610 x 457mm
Spring dividers 152mm
Trammel heads

**Nailing**
Push pins
Tacks
Pin hammers, cross pein, ash handled
Nail hammer with adze eye and hickory handle
Brad punches, square head, knurled grip 1.6, 2.4, 4.8mm
Black drop forged tower pincers with knob and claw 152mm
Black drop forged tower pincers with knob and claw 178mm

## Sawing Equipment

Beech bow saws with twine stretcher 254mm
Beech bow saws with twine stretcher 305mm
Coping saws, with swivel blade holder
Dove tail saws, brass back beech handled 305mm
No. 1 beech miter box
No. 2 beech miter box 254mm
Beech miter block

## Screw Fixing Equipment

Turn screw bit 8mm
Turn screw bit 10mm
Turn screw bit 6mm
Screw drivers, cabinet screw driver, round blade
Screw driver, round blade 152mm
Screw driver, round blade 203mm
Screw driver, split proof handle, round blade 102mm
Screw driver, split proof handle, round blade 152mm
Screw driver, electricians 102mm
Handled bradawls, beech handled, bradawls, beech handled, blade pinned, Nos. 1 to 6.
Nylon screw chucks
Twist gimlets, square tang, steel handled, Nos. 3, 4, 5, 6 and 7.

## Spares

A small reserve of replacement handles should always be requisitioned:
Box wood chisel handles No.1
Box wood chisel handles No.2
Box wood chisel handles No.3
Tenon saw handles 254mm
Hand saw handles 610mm
Technical jack plane handles

## Timber Conversion

A small sawing table, about 60mm high, with a slot running down the centre is by far the best device for sawing plywood or hardboard.

Tilt arbour circular saw, 1 ½ hp motor, and locked switch with spare cross cut and rip blades, floor model 254mm
Planer with 1 hp motor, locked switch, floor model 152mm
Beech sawing trestles
Sawing table
Hand saws, 7 pts to the 25.4mm cross cut 610mm
Hand saws, 5 pts to the 25.4mm rip tooth 660mm
Hand saws, 12 pts to the 25.4mm cross cut, all best quality, skew back, and beech handled 508mm.

## Veneering and Inlaying

Veneering hammers
Glue kettle
Small ripping press
Router
Shoulder rebate
Block plane
Shooting board
Miter board
Toothing plane

## Wood Turning

The turning tools should be stored in a rack separate from the lathe, preferably free standing with sufficient room to store the edged tools so that the cutting edges will not strike each other or other metal parts. Attachments should be so placed as to be easily checked and kept free from dust and shavings. Tools used should be immediately returned to the rack and not placed on the bed of the lathe, since they may roll off and injure the operator.

127mm wood turning lathes, 1 hp motor, no volt release switch, 762mm between centers, motor fully covered, belt adjustment. Complete with end turning attachment, long and short tee rests left and right hand face plates 152mm, one fork centre, one plain center.

Face plates, left hand 152mm
Face plates, right hand 152mm
Long-hole boring attachment for 5mm and 10mm hole

Screw chuck with replaceable screw, left hand 32mm
Screw chuck with replaceable screw, left hand 76mm
Screw chuck with replaceable screw, right hand 32mm
Screw chuck with replaceable screw, right hand76mm
Cup chuck
Cup centre, with replaceable solid centre
Shell auger 762mm long 8mm
Shell auger 762mm long 10mm
Drill chuck with suitable arbour 12mm
Turning chisels 25mm
Turning chisels 19mm
Turning gouges 6mm
Turning gouges 12mm
Turning gouges 25mm
Turning chisels, long and strong 10mm
Turning chisels, long and strong 19mm
Turning gouges, long and strong 10mm
Turning gouges, long and strong 19mm
Scraping tools, round nose 12mm
Scraping tools, round nose 25mm
Scraping tools diamond point 12mm
Parting tools

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