

STRUCTURES III

Introduction

This module unit involves the analysis and design of structural member encountered in Building Construction. It is designed to equip the trainee with knowledge, skills and attitudes necessary in the analysis of forces and design of structural elements.

The trainee should have a successfully completed Module II, Diploma in Construction with all the relevant sub-module units.

General Objectives

By the end of the module unit, the trainee should be able to:

- understand the behavior of structural materials
- understand principles of analyzing forces in determinate and indeterminate
- appreciate need for analysis in the design of building structural members
- generate structural drawings from the structural designs

Module Unit Summary and Time Allocation – (77 Hours)

Code	Sub Module Units	Content	Total Hours
35.3.01	Design of Structural Steel Work (BS449/BS5268)	<ul style="list-style-type: none">Structural Steel SectionsPrinciples of DesignAppropriate Section	14
35.3.02	Design of Structural Timber to BS 5268	<ul style="list-style-type: none">Definition of TermsProperties of Structural TimberDetermine the Appropriate Section of Timber	14
35.3.03	Three Moment Theorem	<ul style="list-style-type: none">Development of Three Moment ExpressionApplication of Three Moment in Simple Continuous Structural Members	15
35.3.04	Moment	<ul style="list-style-type: none">Definition	17

Code	Sub Module Units	Content	Total Hours
	Distribution	<ul style="list-style-type: none"> • Stating the Formula • Draw the Table • Application of the Formula in Analysis of Continuous Encastre, Simple Portal Frames Without Sway or Sinking Supports 	
35.3.05	Influence Lines	<ul style="list-style-type: none"> • Descriptions • Rolling Loads • Hinged Beams • Reactions 	17
Total			77

easytvet.com

DESIGN OF
STRUCTURAL
STEEL WORK TO
BS 4490/BS5950
Theory

35.3.01

35.3.01T0

Specific Objectives

By the end of the sub-module unit, the trainee should be able to:

- a) identify various steel sections used for design
- b) state the principles of design of steel sections
- c) determine the appropriate sections

35.3.01C

Competence

The trainee should have the ability to:

- i) calculate the loads for a roof truss
- ii) design ties, struts and trusses
- iii) design beams
- iv) design columns
- v) design structural connections

Content

35.3.01T1

Steel sections

- T- section
- I- section
- U – section
- Plates

35.3.01T2

Principles of design and columns

35.3.01T3

Beams
- properties of sections

- stress – bending
shear

- moments

- deflection

35.3.01T5

Connections
(rivets/welds)

- shear

- tear

- torsion

35.3.01T6

Appropriate sections

- cased/uncased

- axially loaded

- eccentrically
loaded

- shanks

- plates

- roof trusses

Practice

35.3.01P0

Specific Objectives

By the end of the sub-module unit, the trainee should be able to:

- a) identify various steel sections used for design
- b) explain the properties of structural steel
- c) calculate the loads for a roof truss
- d) design ties, struts and trusses
- e) design beams
- f) design columns
- g) design steel work connections
- h) detail structural steel work connections

35.3.01P1	<i>Content</i> Design of universal beams		
	- moment of resistance of		
	- beam sections		
	- buckling		
	- shear		
	- deflection		
35.3.01P2	Design of universal columns		
	- cased and uncased		
	- slender axially loaded		
	- eccentrically loaded		
35.3.01P3	Design of steel roof trusses		
	- ties, struts and trusses		
35.3.02	DESIGN OF STRUCTURAL TIMBER TO BS 5268		
	Theory		
35.3.02T0	<i>Specific Objectives</i> By the end of the sub-module unit, the trainee should be able to:		
	a) define terminologies used in structural timber design		
	b) explain the properties of structural timber		
35.3.02C	<i>Competence</i> The trainee should have the ability to:		
	i) calculate the loads on a roof truss		
			ii) design timber structural members for:
			- bending
			- shear
			- bearing
			- deflection
			- detail nailed and bolted connections
		35.3.02T1	<i>Content</i> Definitions of the terms:
			- basic stresses
			- grade stress
			- modification factor
			- permissible stress
			- Properties
			- grading of timber
			- fire resistance and protection
			Practice
		35.3.02P0	<i>Specific Objectives</i> By the end of the sub-module unit, the trainee should be able to:
			a) design structural timber members
			b) design timber connections
			c) determine the appropriate timber section
		35.3.02P1	<i>Content</i> Timber members
		35.3.02P2	Design of:
			- boards
			- frames
			- planks
		35.3.02P3	Timber connections

35.3.02P4

- nails
 - bolts
- Timber sections
- breadth
 - width

35.3.03

THREE MOMENT THEOREM

Theory

35.3.03T0

Specific Objectives
By the end of the sub-module unit, the trainee should be able to:

- develop the three moment expression
- apply the three moment theorem in simple continuous structural members without sinking supports

35.3.03C

Competence
The trainee should have the ability to:

- design the appropriate structural member
- determine the applied moments on a member

Content

- 35.3.03T1 Three moment expression
- uniformly distribute load
 - concentrated load
 - cantilever

35.3.03T2 Application in simple continuous structural members

- three supports with cantilevers
- more than three supports

Practice

35.3.03P0

Specific Objectives
By the end of the sub-module unit, the trainee should be able to:

- determine the design moments in a given beam
- plot the bending moments and shear force diagram for the structural members

35.3.03T1

Content
Design moments

- hogging
- sagging

35.3.03T2

Plotting the diagrams

- bending moment
- shear force

35.3.04

MOMENT DISTRIBUTION METHOD

Theory

35.3.04T0

Specific Objectives
By the end of the sub-module unit, the trainee should be able to:

- a) differentiate between determinate and indeterminate structures
- b) derive the expression for moments in continuous structural sections.
- c) determine the moments in continuous structural sections

35.3.04C

Competence

The trainee should have the ability to:

- i) analyze beams to obtain shear forces, moments and reactions
- ii) sketch shear force and bending moment diagrams
- iii) analyze partial frames and sketch bending moment and shear diagrams

Content

35.3.04T1

Differences

- determinate
- indeterminate

35.3.04T2

Expressions

- moment distribution
- three moment
- influence line

35.3.04T3

Moments

- hogging
- sagging

Practice

35.3.04P0

Specific Objectives

By the end of the sub-module unit, the trainee should be able to:

- a) to analyse beams, to obtain shear forces, moments and readings
- b) sketch shear force and bending moment diagrams

35.3.04P1

35.3.04P2

35.3.04P3

Content

Beams

Shear forces

Bending

35.3.05

INFLUENCE LINES

Theory

35.3.05T0

Specific Objectives

By the end of the sub-module unit, the trainee should be able to:

- a) describe influence lines
- b) determine the loads on a simple beams with and without hinges
- c) determine the applied moments on a simply supported beam

35.3.05C

Competence

The trainee should have the ability to:

- i) sketch the shear force and bending moment diagrams
- ii) determine the applied rolling loads

- Content*
- 35.3.05T1 Influence lines
35.3.05T2 Loads
- rolling
 - reactions
- 35.3.05T3 Applied moments
- Hinged
 - Non-hinged

Practice

- 35.3.05P0 *Specific Objectives*
- By the end of the sub-module unit, the trainee should be able to:
- sketch the shear force and bending moment diagram
 - determine applied rolling loads

- Content*
- 35.3.05P1 Shear force
35.3.05P2 Bending moments

35.3.05P3 Rolling loads

Suggested Teaching/Learning Methods

- Field trips
- Class works

Suggested Teaching/Learning Resources

- Realia
- Bridges

Suggested Assessment Methods

- Oral tests
- CATS
- Assignments

Tools and Equipment

- Computer software
- Scientific calculator