

REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF EDUCATION

EDUCATION POLICY

SYLLABUS

FOR

PLATERS' THEORY N2

CODE NUMBER: 11022182

Examination Instruction no. 14/97

DATE OF IMPLEMENTATION
MAY 1997

DATE OF FIRST EXAMINATION
AUGUST 1997

PLATERS' THEORY N2**1. AIMS****1.1 GENERAL AIMS**

The student must, after having successfully completed the instructional offering Platers' Theory N2, have enough theoretical knowledge to meaningfully integrate into the training programme of the industry.

1.2 The student must

1.2.1 experience application of the theoretical learning content meaningfully through practical demonstration and by visual learning experiences; and

1.2.2 be equipped with knowledge about the following learning content:

Machines

Rolling and bending

Joining of steel profiles

General pipe work

Steel structures

Templates

Metals

Gas welding, cutting and plasma cutting

Arc welding

Calculations and planning

2. DURATION OF INSTRUCTIONAL OFFERING

The duration of the instructional offering is one trimester full-time or part-time.

3. EVALUATION

Students must be evaluated continually.

4. EXAMINATION

- 4.1 One three-hour examination paper, totalling 100 marks, will be written.
- 4.2 The student must obtain 40% in the examination to pass the instructional offering.
- 4.3 Levels of difficulty for knowledge, comprehension, application and analysis / synthesis / evaluation should be as follows:

Knowledge	Comprehension	Application	ASE
45	25	20	5

5. GENERAL INFORMATION

- 5.1 On completion of the course the student must be able to use the applicable SI-units, metric systems, recognised symbols, abbreviations and definitions correctly.
- 5.2 Emphasis must be placed on the correct use of technical language, engineering terminology, especially in the formation of definitions and concepts.
- 5.3 All calculations presuppose the use of standard formulae and the applicable computations.
- 5.4 Calculations are made only where so specified.
- 5.5 All calculations are limited correctly to a maximum of two decimals.
- 5.6 Neat, labelled drawings must be drawn when required. The student's artistic ability is not to be evaluated.
- 5.7 Where possible, all demonstrations must be carried out with the aid of actual components or true models.
- 5.8 Emphasis must be placed on practical demonstrations and audio-visual aids.

5.9 Standard drawing instruments and drawing sheets should be used for all developments.

6. CONTENTS

6.1 The modules for Platers Theory N2 consists of the following:

MODULE	THEME	WEIGHTED VALUE
1	Machines	10
2	Rolling and Bending	10
3	Joining of Steel Profiles	10
4	General Pipe Work	8
5	Steel Structures	6
6	Templates	6
7	Metals	8
8	Gas Welding, Cutting and Plasma Cutting	12
9	Arc welding	15
10	Calculations and Planning	15

6.2 The weighted value (WV) of a module

6.2.1 gives an indication of the percentage of the total content of the work which is covered by the module.

6.2.2 gives an indication of the percentage of the time available for the instructional offering which is to be spent on the module.

6.2.3 gives an indication of the percentage of the total of the marks for the examination paper, which is to be allocated to the module.

7. DETAILED SYLLABUS

MODULE 1: MACHINES

Learning Outcomes

On completion of this module the student should be able to:

1.1 Briefly describe the working principles, state the uses, name the main components as well as the safety precautions to be observed when using the following machines:

- * Guillotine
- * Bending rolls
- * Bending press (Brake press)
- * Reciprocating power saw
- * Radial power saw
- * Abrasive cutt-off machine
- * Nibbling machine
- * Drilling machine - Pedestal and Radial arm
- * Punching, shearing and cropping machine
- * Pedestal grinder
- * Angle grinder
- * Box and pan folder
- * Huck bolt machine

Didactic Guidelines

- * A visit to relevant workshops in industry would be a great advantage to enhance the learning situation.

MODULE 2: ROLLING AND BENDING

On completion of this module the student should be able to:

- 2.1 Give a brief description of the theory of bending and the use of plate rolling machines. Make use of free-hand drawings to detail the explanation.
- * pinch rolls
 - * vertical rolls
 - * horizontal rolls
 - * pyramid rolls
 - * rolled section rolls
- 2.2 Make use of free-hand drawings and explain the allowances for the material thickness to be considered when manufacturing the following:
- * Angle-iron rings
 - * Angle-iron frames
 - * Channel-iron rings
 - * Channel-iron frames
- 2.3 Calculate the length of material required to manufacture:
- * Angle-iron rings
 - * Angle-iron frames
 - * Channel-iron rings
 - * Channel-iron frames
- inside and outside of containers/cylinders
- 2.4 Make use of free-hand drawings to explain the method to be followed when straightening :
- * Thin plate
 - * Steel sections
- using heat applications as well as by cold working.

MODULE 3: JOINING OF STEEL PROFILES

On completion of this module the student should be able to:

- 3.1 Illustrate, by means of freehand drawings, the method of joining the following steel profiles used in construction work:
 - * Angle-iron to angle-iron
 - * Angle-iron to I or H profiles
 - * Angle-iron to a channel iron
 - * Channel iron to channel iron
 - * Channel iron to I or H profiles
- 3.2 Illustrate, by means of freehand drawings, the method of reinforcement and/or welding the joints on the steel profiles mentioned in 3.1.
- 3.3 Illustrate, by means of freehand drawings, the connection between steel profiles by means of a gusset support.
- 3.4 Illustrate, by means of freehand drawings, the connection between steel profiles using bolted or welded construction.
- 3.5 Explain by means of a freehand drawing what is meant by an assembly aid and a jig.
- 3.6 Describe the purpose of an assembly aid and of a jig.
- 3.7 Compare the advantages and disadvantages of using an assembly aid and a jig.
- 3.8 Describe the practical manufacturing of an assembly aid.

Didactic Guidelines

- * True models of the above joints will enhance the learning situation.
- * Students should visit a construction site.

MODULE 4: GENERAL PIPE WORK

On completion of this module the student should be able to:

- 4.1 Identify and compare the functions of the following main parts of a contour marker:
 - * V-shaped frame
 - * Protractor
 - * Triple jointed swivel arm
 - * Locking screw

- 4.2 Identify and compare the function of the following main parts of a centre finder:
 - * V-shaped frame
 - * Protractor
 - * Spirit level
 - * Centre punch

- 4.3 Describe with the aid of a free-hand drawing how to determine the "saddle depth" of a T-piece of unequal diameters.

- 4.4 Describe with the aid of a free-hand drawing how to determine the centre to face (C - F) distance on a pipe bend.

- 4.5 Describe with the aid of a free-hand drawing what is meant by the term "two holes top" when referring to flanges. Also indicate what is meant by pitch circle diameter (PCD) and pitch (P).

- 4.6 Calculate the angle and length of segments required for sets and bends when given the centre to face distance.

- 4.7 Describe the method used to fabricate a pipe reducer given the diameter of both pipes.

MODULE 5: STEEL STRUCTURES

On completion of this module the student should be able to:

5.1 Identify the following terms from a given drawing:

- * Wall plates
- * Pitch
- * Tie beam
- * King post
- * Queen post
- * Rafter
- * Purlins
- * Purlin cleat
- * Gusset plates
- * Strut
- * Inclined tie
- * Heel
- * Ridge
- * Rise
- * Slope
- * Fixed foot-piece
- * Shoe plate
- * Eave / overhang
- * Riveted, bolted or welded construction
- * Landing
- * Margin
- * Toe

5.2 Calculate the following with respect to roof trusses making use of the theorem of Pythagoras.

- * Rise
- * Slope
- * Pitch

Didactic Guidelines

- * A true model of a roof construction will assist in the explanation of the terms.

MODULE 6: TEMPLATES

On completion of this module the student should be able to:

- 6.1 Describe with the aid of free-hand drawings the following types of templates:
- * Box template
 - * Flange template
 - * Web/rib template
 - * Strip template
 - * Steel bush template
 - * Contour template
- 6.2 Make a detailed free-hand drawing of a template from a given drawing indicating the following information on the template:
- * Drawing number
 - * Job number
 - * Item number
 - * Size of holes
 - * Number off
 - * T.S.U.
 - * O.S.U.
 - * Material size/thickness
- 6.3 Name the uses, advantages and disadvantages of a template.
- 6.4 Name the uses, advantages and disadvantages of templates made of the following materials:
- * Solid timber
 - * Cardboard
 - * Thin metal
 - * Hardboard
 - * Template paper

MODULE 7: METALS

On completion of this module the student should be able to:

7.1 Briefly describe how to identify ferrous and non-ferrous metals.

7.2 Briefly describe the following heat treatment processes used on carbon steel.

- * Normalising
- * Annealing
- * Hardening
- * Tempering
- * Case-hardening

7.3 Explain the effect on steel when alloyed with the following elements:

- * Nickel
- * Chrome
- * Manganese
- * Silicon
- * Carbon
- * Tungsten
- * Vanadium

MODULE 8: GAS WELDING, CUTTING AND PLASMA CUTTING

On completion of this module the student should be able to:

- 8.1 Briefly describe the effect of the following on the quality of an oxy-acetylene gas weld:
- * Gas pressures
 - * Flame setting
 - * Nozzle type
 - * Dirty nozzle
- 8.2 Briefly describe the effect of the following on the quality of a gas cut surface:
- * Gas pressures
 - * Cutting speed
 - * Nozzle height from plate
 - * Nozzle type
 - * Dirty nozzle
- 8.3 Identify and state the use of:
- * Flame cutting nozzles
 - * Flame cleaning nozzles
- 8.4 State the adverse effects of the following when gas cutting or welding:
- * Oxide on the surface
 - * Flakes (scale)
 - * Oil or grease
 - * Paint
 - * Laminated plates
- 8.5 Explain the difference between oxy-acetylene gas welding and brazing.
- 8.6 Explain the use of a straight line cutter, profile cutter and a plasma cutter.

MODULE 9: ARC WELDING

On completion of this module the student should be able to:

9.1 Briefly describe the following welding terms with the aid of a given drawing:

- * Angle of bevel
- * Backing bar
- * Backing strip
- * Deposited metal
- * Electrode
- * Gap
- * Heat affected zone
- * Penetration
- * Parent metal
- * Run
- * Spatter
- * Reinforcement
- * Toe
- * Weld face
- * Weld sequence
- * Weld zone

9.2 Reproduce the international welding symbols as used by the SABS Code of Practice for Welding for the following joints:

- * Bead
- * Fillet
- * Square butt
- * Single V-butt
- * Single bevel butt
- * Single U-butt
- * Single J-butt
- * Double V-butt
- * Double U-butt
- * Plug or Slot
- * Stud
- * Surfacing

- 9.3 Briefly describe, with the aid of given drawings, the meaning and use of symbols regarding the following:
- * Relationship of basic symbol reference line and arrow
 - * Arrow location
 - * Symbol indicating fillet weld at arrow side of joint
 - * Symbol indicating fillet weld at other side of joint
 - * Fillet weld at both sides of joint
- 9.4 Briefly describe, with the aid of given drawings, the meaning and use of the following two basic types of joints in welding:
- * Butt joints
 - * Fillet joints
- 9.5 Briefly describe the following general problems and their causes which occur in most welding processes:
- * Undercut
 - * Poor penetration
 - * Excessive build-up
 - * Bead too wide and flat
 - * Bead too small
 - * Bead too wide and excessive build-up

Didactical Guidelines

- * Demonstrations of the processes and the use of true models will enhance the students insight and the learning situation.

MODULE 10: CALCULATIONS AND PLANNING

On completion of this module the student should be able to:

- 10.1 Determine the weight of profiles and plates with the aid of given weight tables
- 10.2 Prepare a material list and weights from given structural drawings