REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF EDUCATION AND CULTURE

ADMINISTRATION : HOUSE OF ASSEMBLY

POST-SCHOOL EDUCATION: TECHNICAL COLLEGES

NATIONAL EXAMINATIONS

(METALLIFEROUS MINING)

SYLLABUS

MINE PLANNING N3

(NEW SYLLABUS)

SUBJECT CODE ..2477.

DATE OF IMPLEMENTATION

September 1991

DATE OF FIRST EXAMINATION

November 1991

1. SUBJECT AIMS FOR MINE PLANNING N3

1.1 General subject aims

Mine planning N3, part of the N2 and N3 courses in Metalliferous Mining, provides the student with the theoretical knowledge that he needs to obtain the Certificate of Competency for Mine Overseers.

The student ought to be able to reconcile the theory with practical experience and have a thorough knowledge of the regulations pertaining to the mining operation at his level, as specified in the Mines and Works Act.

1.2 Specific subject aims

Upon completion of the modules the student must, through descriptions, sketches and solutions fulfil the learning outcomes for the following themes in Metalliferous Mining:

Geology
Mining Economics
Mine Planning
Mine Surveying

emphasising specific aspects of safety and mining regulations.

2. DURATION AND TIME OF TUITION OF INSTRUCTIONAL PRESENTATION

2.1 Duration

Full-time: One trimester

2.2 Time of tuition

75 hours

3. EVALUATION

3.1 National examination

One three-hour national examination paper of 100 marks, will be set. The pass mark for the examination paper is 40%.

3.2 Knowledge, application and insight are important aspects of this subject and the ratio should be approximately:

Knowledge 40%; Application 40%; Insight 20%

3.3 This subject is a pre-requisite for obtaining the Mine Overseers Certificate of Competency.

4. LEARNING CONTENT

NOTE: The weighting of the modules indicates the allocation of marks in the examination paper, as well as the time to be spent on each module.

MODULE	THEME	WEIGHT
1	GEOLOGY	(15)
	* The earth and its structure * Rock types and their origin * Simple mineralogy and the nature of minerals * Physical geology * Structural geology	
2	MINING ECONOMICS	(20)
	* Basic mining economics * Averaging and weighting of sampling results * Ore reserves * Ore flow * Grade control	
3	MINE SURVEYING	(20)
	* Basic surveying * Traversing * Plotting co-ordinated points on a plan and obtaining information from plans * Construction of plans and sections	
4	MINE PLANNING	(45)
	* Layouts * Production planning * Resource planning * Long term planning	

5. MODULES FOR MINE PLANNING N3

MODULE 1: GEOLOGY (15)

1. THE EARTH AND ITS STRUCYURE

Upon completion of this theme the student must be able to:

1.1 Describe a theory of the earth's origin with reference to one of the following-

* big bang theory
* Weizacher's theory

1.2 Describe the internal structure of the earth and give the approximate thicknesses of each component.

1.3 Describe-

* isostasy
* oregenesis
* plate tectonics

1.4 Describe the term seismology with particular reference to-

* the three types of waves
* the Richter scale
* the working of a seismograph sketch

2. ROCK TYPES AND THEIR ORIGIN

2.1 Igneous rocks

Upon completion of this theme the student must be able to:

2.1.1 Define-

* igneous rocks
* vulcanism

2.1.2 Describe-

* nature of magma
* types of volcanoes
* products of volcanoes
* mode and occurrence of igneous rocks
* classification of igneous rocks (tabulation)
* five common igneous rocks

2.2 Sedimentary rocks

Upon completion of this theme the student must be able to:

2.2.1 Define sedimentary rocks.

2.2.2 Describe the formation of the following deposits-

* marine
* continental
* aeolian
* glacial
* deltaic
* fluvial
* residual
* estuarine

2.2.3 Define diagenesis.

2.2.4 Explain the terms cementation and compaction.

2.2.5 Name the four classes of sediments, explain briefly how they are formed and give examples of each-

* mechanically formed
* organically formed
* chemically formed
* residual deposits

2.2.6 Classify sedimentary rocks by use of a tabulation.

3. SIMPLE MINERALOGY AND THE NATURE OF MINERALS

Upon completion of this theme the student must be able to:

3.1 Define the term mineral.

3.2 Define the following physical characteristics of minerals which serve to identify them and give examples of each-

* crystal form
* colour
* streak
* lustre
* density
* cleavage and fracture
* hardness - Moh's table
* tenacity
* fusibility
* flexibility

3.3 Define and give examples of the following minerals-

* native elements
* oxides
* sulphides
* carbonates
* sulphates and phosphates
* halides

4. PHYSICAL GEOLOGY

Upon completion of this theme the student must be able to:

4.1 Define the following-

* weathering
* corrasion
* corrosion
* mass wasting
* denudation

4.2 Describe the atmospheric chemical work and give examples of oxidation, carbonatisation and hydration.

4.3 Describe the work of the atmosphere under the following headings and give examples:

4.3.1 Chemical work -

* oxidation
* carbonisation
* hydration

4.3.2 Mechanical work -

* wind erosion
* transportation
* deposition

4.3.3 Temperature -

* insolation
* freeze and thaw
* lightning

4.4 Describe the work of rain and temperature in promoting-

* chemical weathering
* mechanical weathering

4.5 Describe the work of running water under the following headings and give examples-

* erosion
* transportation
* deposition

4.6 Define ground water and explain its mechanical and chemical work.

4.7 Define the following terms-

* water table
* oxidation
* carbonatisation
* hydration
* cementing material

4.8 Describe how sink holes are formed in limestones.

4.9 Describe the work of oceans and define the terms-

* littoral deposits
* shoal water deposits
* differential coast erosion

4.10 Describe the work of ice under the following headings and give examples-

* glacial erosion
* glacial transportation
* glacial deposition

5. STRUCTURAL GEOLOGY

Upon completion of this theme the student must be able to:

5.1 Describe the natural process of sedimentation and define the terms-

* stratification
* pseudo-stratification
* bedding planes
* laminae

5.2 Describe how inclined strata are formed.

5.3 Define the terms-

* true dip
* apparent (minor) dip
* strike
* outcrops

5.4 Describe how to find strike and dip of a stratum.

5.5 Name and describe the elements of a fold and illustrate a fold with a sketch.

5.6 Describe the types of fold and make a sketch to illustrate them.

5.7 Define a fissure and a fault.

5.8 Make a sketch to illustrate the elements of a fault.

5.9 Describe the following types of faults and make sketches to illustrate them-

* gain and loss
* rotational fault
* thrusting

5.10 Describe and draw diagrams to show the following effect of faulting on outcrops-

* normal dip
* normal strike fault
* oblique fault
* faulted dome
* reverse fault
* strike-slip fault

5.11 Describe erosion of structures under the following headings and illustrate the process by means of a sketch-

* angular unconformity
* disconformity

MODULE 2: MINING ECONOMICS (20)

1. BASIC MINING ECONOMICS

Upon completion of this theme the student must be able to:

1.1 Define sampling.

1.2 Describe the object of sampling.

1.3 List and define the standard terms used in mine valuation.

1.4 Describe the sampling methods used in-

* a gold mine underground
* other ore bodies including coal
* a shaft
* a stock-pile

2. AVERAGING AND WEIGHTING OF SAMPLING RESULTS

Upon completion of this theme the student must be able to:

2.1 Calculate the averages for regular and irregular sampling intervals and prepare sampling reports.

2.2 Calculate averages by means of weighting for-

* sections
* distances
* factors (area, tons and contents)
* dips of reef bodies

3. ORE RESERVES

Upon completion of this theme the student must be able to:

3.1 Define-

* ore reserves
* block factor

3.2 Evaluate ore reserve blocks.

3.3 Calculate block factors.

4. ORE FLOW

Upon completion of this theme the student must be able to:

4.1 Draw an ore flow diagram showing the route of the ore from underground to the final product.

4.2 Calculate ore flow sheets.

4.3 Calculate and define-

* Mine Call Factor (MCF)
* recovery Factor
* residue Value

5. GRADE CONTROL

Upon completion of this theme the student must be able to:

5.1 Name the main principles of grade control.

5.2 Name the sources of survey discrepancy and describe their effects on grade control and give examples.

5.3 Define the term "Quality control".

5.4 Explain by means of specimen calculations how grade can be manipulated with special regard to:

* Planning for required grade
* Effect on the following -

    stoping
    waste
    resue mining

5.5 Describe how gold accounting can be used as a management tool by providing an overall record of results in bothphysical and monetary values. Give examples.

MODULE 3: MINE SURVEYING (20)

1. BASIC SURVEY

Upon completion of this theme the student must be able to:

1.1 Perform survey calculations of-

* right angled triangles
* any triangle using -

  Sine Rule
  Cosine Rule
  Tan Rule
  Equation Rule
  The "S" formula for angular calculations

* the area of triangles using -

  $\frac{1}{2}$ Base x Perpendicular Height
  $\frac{1}{2}$ (a x b x Sine C)
  the "S" Formula

1.2 Name the units of measurement used in the existing system for linear, area, volume, angular and circular measurements.

1.3 Describe the principles of stope measuring, field book recordings including abbreviations, stope sheet plotting, entry sheets and indexing work.

1.4 Describe the principles of development measuring and plotting.

2. TRAVERSING

Upon completion of this theme the student must be able to:

2.1 Explain the concepts-

* horizontal plane
* vertical plane
* inclined plane
* define a level surface

2.2 Name and define the two main co-ordinate systems used on the mines:

* Gauss Conform System
* Goldfields (Local) System

2.3 Define and calculate-

* directions
* quadrant angles

2.4 Calculate the elevation and co-ordinates of a survey station.

3. CO-ORDINATED POINTS

Upon completion of this theme the student must be able to:

3.1 Describe how co-ordinated points are plotted on a plan.

3.2 Describe how co-ordinates are obtained for a given point on the plan.

4. PLANS AND SECTIONS

Upon completion of this theme the student must be able to:

4.1 Describe the construction, specify the scale, explain the purpose and show the conventional signs of:

* a topographical map
* underground and surface working plans
* rescue plans
* ventilation plans
* geological plans

4.2 Name the documents, plans and data kept for production planning and recording.

MODULE 4: MINE PLANNING (45)

1. LAYOUTS

Upon completion of this theme, the student must be able to:

1.1 Draw a layout of the development required to open up and mine a stoping connection on a 1:200 or 1:1000 scale plan.

1.2 Draw a section through the underground workings on a 1:200 or 1:1000 scale plan.

2. PRODUCTION PLANNING

Upon completion of this theme, the student must be able to:

2.1 Plan the monthly production for a stope on a 1:200 scale stope sheet by means of-

* drawing in the face, sweepings and gulley positions

* tabulate -

face length
face advance
m^2 broken
m^2 swept
planned stope width
tons broken

2.2 Plan the monthly production of a development end on a 1:200 scale development sheet by means of-

* drawing in the face position on plan and section when necessary

* tabulate -

metres advanced
tons broken

3. RESOURCE PLANNING

Upon completion of this theme, the student must be able to:

3.1 Plan the labour resources required to meet the production objectives for stoping and development given the following information-

* stoping method
* dip
* stoping width
* face length

4. LONG TERM PLANNING

Upon completion of this theme, the student must be able to:

4.1 List the reasons for doing a two-year production plan.

4.2 List the sequence of events when doing a two-year plan.