REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF EDUCATION

SYLLABUS

FOR

MATHEMATICS N2

NATIONAL CERTIFICATE

CODE NUMBER

16030192

DATE OF IMPLEMENTATION

MAY 1997

DATE OF FIRST EXAMINATION

AUGUST 1997

Eksamination Instruction no. 1/97

1. SUBJECT AIMS AND OBJECTIVES FOR MATHEMATICS

1.1 AIMS

Students should understand the mathematical principles taught in each module in such a way that they will be able to apply these principles in Engineering Science or the trade theories which they study.

1.2 OBJECTIVES

To teach the student in such a manner that, on completion of all the modules in Mathematics N2, he will be able to

* apply the mathematical principles mastered by him to his specific trade theory;
* use the correct mathematical terminology and to identify the appropriate formulae;
* use the correct SI units and derived units;
* commence with the study of Mathematics N3;
* apply the basic mathematical principles he has mastered in the working-place and in everyday life;
* reason logically when seeking solutions to mathematical and scientific problems; and
* function effectively in his working environment and to make sense of the extended technology that he is confronted with.

2. DURATION OF INSTRUCTIONAL OFFERING

The duration of this instructional offering is one trimester full-time or one trimester part-time which includes revision, tests and examinations.

3. EVALUATION

Candidates should be evaluated on a regular basis by conducting class tests on completion of each module.

4. EXAMINATION

4.1 Reproducing, application, analysing and evaluation are important aspects in order to determine the levels of difficulty in this subject, and the division thereof should be as follows:

REPRODUCING	APPLICATION	ANALYSING	EVALUATION
55	20	15	10

4.2 A paper of 3 hours to the value of 100 marks is set at the end of each trimester.

4.3 Only content classified as **LEARNING OUTCOMES** will be examined.

5. GENERAL INFORMATION

5.1 In order to bring the student, where possible, into contact with the situation in practice, problems must be taken from the practical situation.

5.2 The correct use of the suitable technical terminology must be stressed, especially in formulating definitions and principles.

5.3 Calculation answers must be approximated to three decimals. Approximation may not take place during calculations - only the final answer must be approximated.

5.4 When a standard formula is used in a calculation, the formula must be written down first before the values in the formula are substituted. If any manipulation is applied it must be clearly indicated.

5.5 Pocket calculators may be used in solving mathematical problems. Basic instruction must be offered in the practical use and operational abilities of the calculator.

5.6 The weighted value (WV) indicates the time which should be spent to conclude a division (module) as well as the approximate weight the division (module) will carry in the examination.

5.7 Exposition of subject matter

The theme is preceded by the word **MODULE**, followed by a number indicating its chronological position. Decimal numbers indicate the **CONTENT** to be dealt with, and extended decimal numbers identify the expected **LEARNING OUTCOMES**.

6. SUBJECT MATTER

MODULE	WEIGHTED VALUE	
6.1 Exponents and logarithms	(15)	
6.2 Factorisation, HCF, ICM and algebraic fractions	(20)	
6.3 Equations, word problems and manipulations of technical formulae	(14)	
6.4 Algebraic graphs	(12)	
6.5 Measuring of angles, angular and circumferential velocity and sectors of circles	(12)	
6.6 Trigonometry	(15)	
6.7 Mensuration	(12)	(100)

7. DETAILED SYLLABUS

MODULE 1 : EXPONENTS AND LOGARITHMS

1.1 EXPONENTS

On completion of this topic, the student should be able to:

1.1.1 Reproduce the laws for exponents and their derivatives
1.1.2 Apply the laws for exponents and the derivatives in simplifying algebraic expressions
1.1.3 Solve exponential equations, limited to single term equations, e.g.

(i) $x^{\frac{1}{2}} = 4$
(ii) $3.2^x = 24$

1.2 LOGARITHMS

On completion of this logic, the student should be able to:

1.2.1 Define a logarithm
1.2.2 Give three laws of logarithms, e.g.

(i) $\log_a xy = 10g_a x + \log_a y$
(ii) $\log_a x/y = 10g_a x - \log_a y$
(iii) $\log_a x^m = m.\log_a x$
iv) $\log_a b = \log_c b/\log_c a$

1.2.3 Simply logarithmic expressions by using the laws of logarithms, e.g.

(i) $\log_8 2 + \log_8 4$
(ii) $\log_2 8 \times \log_8 6$

1.2.4 Do calculations by using logarithms which are limited to simple multiplication, division, involution and evolution by means of a pocket calculator. e.g.

$$\frac{A^x \times \sqrt{B}}{C \times D}$$

1.2.5 Change the radix of a logarithm to, for example, 2, 8, e or 10.

DIDACTIC GUIDELINE
ONLY POCKET CALCULATORS MAY BE USED TO DETERMINE THE VALUE OF LOGARITHMS

MODULE 2: FACTORISATION, HCF, LCM AND ALGEBRAIC FRACTIONS

2.1 FACTORISATION

On completion of this topic, the student should be able to:

2.1.1 Factorise a polynomial by taking out a common factor as a first step followed by taking out a binomial as common factor as a second step e.g.

$3a + 3b + 5ac + 5bc$ or $3a + 3b - 5ac - 5bc$
$= 3(a + b) + 5c(a + b)$ $= 3(a + b) - 5c(a + b)$
$= (a + b)(3 + 5c)$ $= (a + b)(3 - 5c)$
(Grouping is limited to a maximum of four terms)

2.1.2 Factorise a quadratic trinomial of which the coefficient of x^2 is any whole number.

2.1.3 Factorise the difference to two squares.

2.2 HIGHEST COMMON FACTOR AND LOWEST COMMON MULTIPLE

On Completion of this topic, the student should be able to:

2.2.1 Determine the HCF and LCM of two, three or four algebraic expressions by making use of factorisation, keeping the limitations mentioned in 2.1 in mind.

2.3 ALGEBRAIC FRACTIONS

On completion of this topic, the student should be able to:

2.3.1 Do multiplication and division of fractions by using factorisation, keeping the set limitations in mind (fractions into fractions are excluded)

2.3.2 Add and subtract algebraic fractions by first factorising the numerator and denominator. No change in signs must be required to simplify the LCM, and the numerator of fractions may not exceed a binomial.

MODULE 3: EQUATIONS, WORD PROBLEMS AND MANIPULATION OF TECHNICAL FORMULAE

3.1 LINEAR EQUATIONS

On completion of this topic, the student should be able to:

3.1.1 Solve linear without fractions.

3.2 QUADRATIC EQUATIONS

On completion of this topic, the student should be able to:

3.2.1 Solve quadratic equations according to a specified method, i.e. factorisation or the quadratic formula. In the case of factorisations as set out in Module 2 will apply. In the case of the quadratic formula the coefficient of x^2 may be larger than +1 (only integers).

DIDACTIC GUIDELINE

Students should be shown the derivation of the quadratic formula, although the derivation will not be examined.

3.3 SIMULTANEOUS LINEAR EQUATIONS

On completion of this topic, the student should be able to:

3.3.1 Solve simultaneous linear equations with two unknown quantities. No fractions may occur in the equations.

3.4 WORD PROBLEMS

On completion of this topic, the student should be able to:

3.4.1 Set and solve linear equations from word problems. (Fractions in the equations are excluded).

3.5 MANIPULATION OF TECHNICAL FORMULAE

On completion of this topic, the student should be able to:

3.5.1 Change the subject of a given formula to any other subject. The following applications are ***excluded***:

(i) Manipulation by factorisation

(ii) Manipulation by using the quadratic formula

(iii) Manipulation by using the laws of logarithms

3.5.2 Determine the value of a new subject by substituting the values of the known quantities in the equation.

MODULE 4: ALGEBRAIC GRAPHS

4.1 LINEAR GRAPHS

On completion of this topic, the student should be able to:

4.1.1 Calculate the function values in a specific point for a given linear equation

4.1.2 Draw a linear graph with the aid of the following:

(i) gradient ordinate (offset) method;

(ii) gradient and Y-intercept method; and
(iii) X and Y intercept method.

4.2 PARABOLA

On completion of this topic, the student should be able to:

4.2.1 Draw the parabola (for a = ±1 only) by means of the table method or the following pre-calculations:

(i) The Y-intercept of the parabola

(ii) The roots of the parabola

(iii) The axis of symmetry of the parabola

(iv) The co-ordinates of the turning point of the parabola.

4.3 SOLUTIONS

On completion of this topic, the student should be able to:

4.3.1 Read values from the graphs in 4.1 and 4.2

4.3.2 Do graphic solutions of two equations of which both are linear or one is quadratic and the other linear.

MODULE 5: MEASURING OF ANGLES, ANGULAR AND PERIPHERAL VELOCITY AND SECTORS OF CIRCLES

5.1 Measuring of ANGLES

On completion of this topic, the student should be able to:

5.1.1 Write down the relation between degrees and minutes

5.1.2 Convert degrees and minutes to degrees and a decimal of a degree and vice versa.

5.2 RADIANS

On completion of this topic, the student should be able to:

5.2.1 Define a radian

5.2.2 Indicate the relationship between degrees and radians

5.2.3 Convert 1 radian to degrees

5.2.4 Convert degrees and minutes to radians and radians to degrees and minutes.

5.3 ANGULAR VELOCITY AND PERIPHERAL VELOCITY

On completion of this topic, the student should be able to:

5.3.1 Define the concepts angular and peripheral velocity

5.3.2 Convert revolutions per minute to revolutions per second and vice versa

5.3.3 Express angular velocity in radians per second

5.3.4 Convert peripheral velocity to angular velocity and vice versa

5.3.5 Do calculations with angular and peripheral velocities.

5.4 CIRCLE SECTORS

On completion of this topic, the student should be able to:

5.4.1 Explain what the **concept circle** means

5.4.2 Calculate the area of a circle sector when the following are known:

(i) The angle and radius of the sector

(ii) The angle and arc length of the sector

(iii) The radius and arc length of the sector.

5.4.3 Calculate the radius and the arc length of the circle sector as well as the angle which is subtended by the arc length

5.5 CHORDS IN A CIRCLE

On completion of this topic, the student should be able to:

5.5.1 Describe what the concepts **chord** and **circle segment** mean

(i) diameter of a circle when the length of the chord and the height of segment are given;

(ii) length of the chord when the diameter of the circle and the height of the segment are known; and

(iii) height of the segment when the diameter of the circle and the length of the segment are known.

MODULE 6: TRIGONOMETRY

6.1 TRIGONOMETRIC RATIOS

On completion of this topic, the student should be able to:

6.1.1 Define the six trigonometric ratios in terms of the unit circle

6.1.2 Write down the six trigonometric ratios in terms of the sides of a given right-angled triangle with a given angle of reference in any of the four quadrants

6.1.3 Solve a right-angled triangle with the aid of trigonometric functions

6.1.4 Calculate inaccessible elevations and depressions by means of trigonometric functions (combinations of two right-angled triangles are included and all calculations are limited to right-angled triangles)

6.1.5 Convert degrees and minutes to degrees and vice versa.

6.2 GRAPHS OF TRIGONOMETRIC FUNCTIONS

On completion of this topic, the student should be able to:

6.2.1 Draw trigonometric graphs from a table with 0° to 360° intervals. The following types of graphs are included.

(i) $y = \sin x$; $y = \cos x$

(ii) $y = a.\sin x$; $y = a.\cos x$ - change amplitude

(iii) $y = \sin x \pm c$; $y = \cos x \pm c$ - move the graph up/down

6.2.2 Read values from the above-mentioned graphs.

MODULE 7: MENSURATION

7.1 SURFACE AREA AND VOLUME

On completion of this topic, the student should be able to:

7.1.1 Calculate the surface area of the following objects:

(i) Cone
(ii) Cylinder
(iii) Sphere

7.1.2 Calculate the volume of the following objects

(i) Cone
(ii) Cylinder
(iii) Sphere

7.1.3 Determine the area of an irregular figure using the mid-ordinate rule.

DIDACTIC GUIDELINE

The calculation of area and volume should be based on practical examples, where possible.