



Republic of Rwanda
Ministry of Education



RTB | RWANDA
TVET BOARD

Applied Mathematics

GENEA402

Apply Elementary Mathematical Analysis

Competence

RQF Level: 4

Learning Hours



Credits: 6

Sector: ARTS AND CRAFTS

Trade: Fashion design, Fine and Plastic Arts, Music and Performing Arts

Module Type: General

Issue Date: May 2023

CURRICULUM: GENE A402-TVET CERTIFICATE 4 - ARTS AND CRAFTS

COPYRIGHT: © Rwanda TVET Board, 2023

| Purpose statement | This general module describes the knowledge, skills and attitude required to apply elementary mathematical analysis. At the end of this module, the learner will be able to apply numerical and graphical methods to display data; analyze algebraic functions and apply fundamental of differentiation. | | | | |
|--------------------------|--|-------------|----------------------|----------------------|-------------------|
| Delivery modality | Training delivery | 100% | Assessment | | Total 100% |
| | Theoretical content | 30% | Formative assessment | 30% | 50% |
| | Practical work: | 70% | | 70% | |
| | <ul style="list-style-type: none"> Group project and presentation | 20% | | Summative Assessment | 50% |
| | <ul style="list-style-type: none"> Individual project /Work | 50% | | | |
| | | | | | |

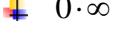
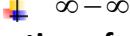
Elements of Competency and Performance Criteria

| Elements of competency | Performance criteria |
|--|--|
| 1. Apply numerical and graphical method to display data | <p>1.1 Ungrouped quantitative data is adequately plotted based on established conditions</p> <p>1.2 Measures of central tendency are accurately determined according to definitions and calculations</p> <p>1.3 Measures of dispersion are correctly determined in accordance with to definitions and calculations</p> |
| 2 Analyze algebraic functions | <p>2.1 The domain and range of algebraic function are accurately determined based on existence condition.</p> <p>2.2 Symmetry (parity) of algebraic function is adequately identified based on definitions of key words (even and odd).</p> <p>2.3 Limits of a function are correctly determined based on theory of calculating limits.</p> <p>2.4 The asymptotes are accurately determined based on limits calculation.</p> |
| 3 Apply fundamentals of differentiation | <p>3.1 Derivative is properly determined by using definition.</p> <p>3.2 Derivative of a function is adequately interpreted by illustrating a curve with its tangent and secant line.</p> <p>3.3 Derivative is appropriately applied based on definitions and calculation</p> <p>3.4 Curve of an algebraic function is accurately sketched based on the table of variation</p> |

Course content

| | | |
|--|---|---|
| Learning outcomes | | At the end of the module the learner will be able to: <ol style="list-style-type: none"> 1. Apply numerical and graphical methods to display data 2. Analyze algebraic functions 3. Apply fundamentals of differentiation |
| Learning outcome 1: Apply numerical and graphical methods to display data | | Learning hours: 10 |
| Indicative content | | |
| <ul style="list-style-type: none"> • Plotting ungrouped quantitative data <ul style="list-style-type: none"> ✓ Pie diagrams ✓ Horizontal bar charts ✓ Vertical bar charts • Determination of measures of central tendency <ul style="list-style-type: none"> ✓ Mode ✓ Mean ✓ Median • Determination of measures of dispersion <ul style="list-style-type: none"> ✓ Range ✓ Variance ✓ Standard deviation ✓ Coefficient of variation | | |
| Resources required for the learning outcome | | |
| Equipment | Black/white board, computer, projector | |
| Materials | Reference books ,Geometric instrument, piece of chalk/ markers | |
| Tools | Hand-out notes , Manilla paper, scientific calculator, Internet | |
| Facilitation techniques | <ul style="list-style-type: none"> • Demonstration and simulation • Individual and group work • Practical exercise • Trainer guided • Documentary Research | |
| Formative assessment methods | <ul style="list-style-type: none"> • Written assessment | |

| | |
|--|---------------------------|
| Learning outcome 2: Analyze algebraic functions | Learning hours: 20 |
| Indicative content | |

- **Determination of the domain and range of algebraic function**
 - ✓ Existence condition
 - ✓ Domain of definition of a function
 - ✓ Range of a function
- **Identification of symmetry of algebraic function**
 - ✓ Even function
 - ✓ Odd function
- **Determination of function limits**
 - ✓ Finite limits
 - ✓ Infinite limits
 - ✓ Limit at infinity
 - ✓ Remove of indeterminate cases
 - 
 - 
 - 
 - 
- **Determination of asymptotes**
 - ✓ Rational functions

Resources required for the indicative content

| | |
|------------------------------|---|
| Equipment | Black/white board, computer, projector |
| Materials | Reference books, , piece of chalk/ marker s |
| Tools | Manilla paper, scientific calculator, Hand-out notes, Internet, Geometric instrument |
| Facilitation techniques | <ul style="list-style-type: none"> • Demonstration and simulation • Individual and group work • Practical exercise • Trainer guided • Group discussion |
| Formative assessment methods | <ul style="list-style-type: none"> • Written assessment |

| | |
|---|--------------------|
| Learning outcome 3: Apply fundamentals of differentiation | Learning hours: 30 |
| Indicative content | |

- **Determination of derivatives**
 - ✓ Derivative of function at a given point
 - ✓ Derivative of a polynomial function
 - ✓ Derivative of a rational
 - ✓ Successive derivatives
- **Interpretation of derivative of a function**
 - ✓ Geometric interpretation
 - ✓ Kinematical meaning of a derivative
- **Application of derivative**
 - ✓ Determination of equation of tangent and normal lines at a given point
 - ✓ Increasing and decreasing intervals for a function
 - ✓ Maximum and minimum points of a function
 - ✓ Concavity, inflection point on a graph
- **Sketching curve of algebraic function**
 - ✓ Establishing required parameters
 - Variation table
 - Additional points
 - ✓ Sketching graph of polynomial function
 - ✓ Sketching graph of rational function

Resources required for the indicative content

| | |
|------------------------------|---|
| Equipment | Black/white board, Hand-out notes, Reference books, Internet |
| Materials | Reference books ,piece of chalk/ markers |
| Tools | Manilla paper, scientific calculator, Hand-out notes, Geometric instrument ,Internet |
| Facilitation techniques | <ul style="list-style-type: none"> • Demonstration and simulation • Individual and group work • Practical exercise • Trainer guided • Group discussion |
| Formative assessment methods | <ul style="list-style-type: none"> • Written assessment |

References:

1. A. J. Sadler, D. W. S. Thorning (1987). *Understanding Pure Mathematics*, Oxford University Press.
2. Arthur Adam, Freddy Goossens and Francis Lousberg (1991). *Mathematisons 65*, DeBoeck, 3rd edition.
3. David Rayner (2000). *Higher GCSE Mathematics*, Oxford University Press.
4. DPES- RWANDA (1990). *Complexes 5th*, Livre de l'élève. IMPRISCO-Kigali.
5. Frank Ebos, Dennis Hamaguchi, Barbana Morrison & John Klassen (1990), *Mathematics Principles & Process*, Nelson Canada A Division of International Thomson Limited.
6. George B. Thomas, Maurice D. Weir & Joel R. Hass (2010), *Thomas' Calculus Twelfth Edition*, Pearson Education.

7. J CRAWSHAW, J CHAMBERS (1984). *A concise course in A-Level statistics with worked examples*, Stanley Thornes (Publishers) LTD.
8. Ngezahayo, E. P. (2017). Advanced Mathematics for Rwanda Secondary Schools. Learners' Book Senior Six. Kigali: Fountain.
9. Ngezahayo, E. P. (2017). *Advanced Mathematics for Rwanda Secondary Schools*. Learners' Book Senior Five. Kigali: Fountain.
10. Ngezahayo, E. P. (2016). *Advanced Mathematics for Rwanda Secondary Schools*. Learners' Book Senior Four. Kigali: Fountain.
11. Peter Smythe (2005). *Mathematics HL & SL with HL options, Revised Edition*, Mathematics Publishing Pty. Limited.
12. Shampiona, A. (2005). *Mathématiques 6*. Kigali: Rwanda Education Board