Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

Applied Mathematics

GENAP502

Apply Mathematical Analysis, Statistics and Probability

Competence

RQF Level: 5

Learning Hours 60

Credits: 6

Sector: ALL SECTOR EXCEPT HOSPITALITY AND TOURISM, ARTS AND CRAFTS

Trade: **All trades except Fashion design, Fine and Plastic Art, Music and Performing Arts, Food and Beverages Operations, Front Office and Housekeeping operations, Tourism**

Module Type: General

Issue Date: May 2023

CURRICULUM: **GENAP502**-TVET CERTIFICATE 5 - ALL SECTORS EXCEPT HOSPITALITY AND TOURISM, ARTS AND CRAFTS

Purpose statement	This general module describes the knowledge, skills and attitudes required to apply mathematical analysis, statistics and probability. At the end of this module, the learner of Level Five will be able to apply fundamental of integral, interpret measures of dispersion for bi-variate data and fundamental of probability.					
Delivery modality	**Training delivery**		**100%**	**Assessment**		**Total 100%**
	Theoretical content		30%	Formative assessment	30%	50%
	Practical work:		70%		70%	
	• Group project and presentation	20%				
	• Individual project /Work	50%				
			Summative Assessment			50%

Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
1. Apply fundamentals of integrals	**1.1** Primitive functions are properly determined based on definition.
	1.2 Definite integrals are properly calculated based on definition.
	1.3 Definite integrals are properly applied through sketching and calculations
2 Interpret measures of dispersion for bivariate data	**2.1** Measures of dispersion are properly determined according to definitions and calculations
	2.2 Bivariate data measures are appropriately identified based on definitions and calculations.
	2.3 Regression line is appropriately determined based on calculations and plotting.
3. Apply fundamentals of probabilities	**3.1** Counting techniques are appropriately applied based on a given experiment
	3.2 Probabilities are properly computed based on definition and counting techniques
	3.3 Conditional probability is correctly calculated in line with given experiment.

Course content

Learning outcomes	**At the end of the module the learner will be able to:** 1. Apply fundamentals of integrals 2. Interpret measures of dispersion for-bivariate data

	3. Apply fundamentals of probabilities
Learning outcome 1: Apply fundamentals of integrals	**Learning hours: 20**
Indicative content	

- **Determination of primitive functions**
  - ✓ Application of properties
    - The derivative of the indefinite integral
    - The integral of differential of a function
    - Factor out constant function from integral sign
    - The indefinite integral of the algebraic sum of two functions
    - Immediate primitive
  - ✓ Techniques of integration
    - Integration by change of variable
    - Integration by simple fractions/ irreducible
    - Integration by parts
- **Calculation of definite integrals**
  - ✓ Methods of integration
    - Integration of definite integrals by change of variable
    - Integration of definite integrals by decomposition
    - Integration of definite integrals by parts
- **Application of definite integrals**
  - ✓ Calculation of area
  - ✓ Calculation of volume
  - ✓ Calculation of the length of curved surface

Resources required for the learning outcome	
Equipment	Computer, Projector
Materials	Reference books, Didactic materials such as manila paper, Marker pen
Tools	Hand-out notes, Internet
Facilitation techniques	• Demonstration and simulation • Individual and group work • Practical exercise • Individualized • Trainer guided • Group discussion
Formative assessment methods	• Written assessment

Learning outcome 2: Interpret measures of dispersion for-bivariate data	**Learning hours: 20**
Indicative content	

- **Determination of the measures of dispersion**

  - ✓ Definition of measures of dispersion
    - Variance
    - Standard deviation
    - Coefficient of variation
  - ✓ Calculation of measures of dispersion
    - Variance
    - Standard deviation
    - Coefficient of variation
- **Identification of bivariate data measures**
  - ✓ Description of bivariate data
    - Correlation
    - Covariance
    - Coefficient of correlation
  - ✓ Calculation of the linear correlation of bivariate data
    - Correlation
    - Covariance
    - Coefficient of correlation
- **Determination of regression line**
  - ✓ Definition of terminologies
    - Scatter diagram
    - Regression lines
  - ✓ Calculations of regression line parameters
    - coefficients of regression line
    - Equation of regression line of y on x
    - Equation of regression line of x on y
  - ✓ Graph plotting
    - Scatter diagram
    - Regression lines

Resources required for the indicative content	
Equipment	Computer , projector
Materials	Reference books , Didactic materials such as manila paper, Marker pen
Tools	Hand-out notes, , Internet, Geometric instruments (Ruler, T-square)
Facilitation techniques	• Demonstration and simulation • Individual and group work • Practical exercise • Individualized • Trainer guided • Group discussion
Formative assessment methods	• Written assessment

Learning outcome 3: Apply fundamentals of probabilities	Learning hours: 20

Indicative content

- **Application of counting techniques**
  - ✓ Venn diagram
  - ✓ Tree diagram
  - ✓ Multiplication principle
  - ✓ Permutations
  - ✓ Combination
- **Computation of probabilities**
  - ✓ Definition of terminologies
    - Random experiment
    - Sample space
    - Events
    - Complementary event
    - Probability of event under an equally likely event
    - Inclusive events
    - Mutually exclusive events
  - ✓ Calculation of probabilities
    - Simple event
    - Complementary event
    - Event under an equally likely event
    - Inclusive events
    - Mutually exclusive events
- **Calculation of the conditional probability**
  - ✓ Conditional probability
  - ✓ Independent events
  - ✓ Probability by tree diagram

Resources required for the indicative content

Equipment	computer, project
Materials	Reference books, Didactic materials
Tools	Hand-out notes, Internet
Facilitation techniques	• Demonstration and simulation • Individual and group work • Practical exercise • Individualized • Trainer guided • Group discussion
Formative assessment methods	• 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.
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9. Ngezahayo, E. P. (2017). *Advanced Mathematics for Rwanda Secondary Schools*. Learners' Book Senior Five. Kigali: Fountain.
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