**FACULTY OF ENGINEERING AND THE BUILT
ENVIRONMENT**

DEPARTMENT OF ARCHITECTURE, PLANNING AND
GEOMATICS

GEOMATICS DIVISION

Numerical Methods   Tutorial 1 (APG3013F)

Tutorial Objectives

After completing this tutorial student will be able to

  i)   Display an understanding of the use of matrices and error propagation in geomatics
        adjustment as learnt in the lectures for week 1.
  ii)   Apply their programming skills to support them in solving problems in geomatics
        adjustment

Question 1.

Design a program that accepts 10 values of a distance X and 10 height values Y as observed
by a geo-spatial engineer in an EDM calibration task.

  i)   The program must accept as input 10 values of X and 10 values of Y and proceed
        to compute and output the sample mean, sample variance and the standard
        deviation of each set of values separately.
  ii)   Thereafter compute the covariance XY between the values X and Y.
  iii)   Finally display each set of lengths X and those of Y on separate histogram plotting
        readings 1 to 10 on the x axis versus length on the y axis.
  iv)   If the function linking X to Y is $F_i(X)=X_i^3+2Y_i$, let the program compute the first
        derivative of F(X) first and then it outputs a list of the entries computed from dF(X)
        from 1 up to 10 input from this first derivative result

        Test your program on the following set of values
        [x]=[72.5   83.4 69.7 69.5 73.8 82.6 70.4 80.8 77.5 80.4]
        [y]=[1.72 1.84 1.68 1.65   1.72 1.81 1.66 1.77 1.75 1.80]

You will be required to write a short report on the task that includes the copied text from your
script and an attachment of the executable program and submit it on a link under
assignments in you Vula before the start of practical 3.