

**UNIVERSITY OF NAIROBI**  
COLLEGE OF BIOLOGICAL AND PHYSICAL SCIENCES  
Faculty of Science

**Bachelor of Science**

**Course: Meteorology**

**SMR103: Quantitative Methods and Computer Applications in Meteorology I**

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**Published by University of Nairobi,**

**P.O. BOX 30197, 00100 Nairobi**

**Printed by College of Education and External Studies, University of Nairobi**

**P.O. BOX 92, Kikuyu**

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## ***INTRODUCTION***

This study unit is level 1 course on Quantitative Methods and Computer Applications for learners taking undergraduate program in any science based fields such as B.Ed Science, B.Sc. Meteorology and B.Sc. Physics.

In this course, I have introduced the basic concepts of statistics, vectors, index and complex numbers. Application of these concepts in the study of meteorological variables is provided. Use of statistics in data handling and analysis, for instance, is made much faster by the use of a computer. An effort is, therefore, made to introduce a computer, including a description of its main components and how to run programs in BASIC language.

In order to successfully complete this course, a student will be required to complete the practical in the accompanying practical manual.

In section one of the unit, the basic concepts of statistics are given.

The essence of statistics in meteorology is to use statistical techniques in summarizing and organizing weather records.

In section two, an introduction to vectors is given. Use of vectors in meteorological representations is also discussed. It is noted that physical measurements are mainly of two kinds:

- i. Scalars – which have magnitude but no associated direction for example mass, volume and energy
- ii. Vectors – which have both magnitude and associated direction for example displacement, velocity and force

In section three, the concept of Index and Complex numbers are introduced.

An index number is a commonly used term for fluctuation in a group of related variables over a period of time. It is intended to obtain a figure that faithfully represents the 'net' result of the change in the consistent variables.

In section four, we will discuss the applications of computers in the collection and storage of all sorts of meteorological data into a database. The need of updating and editing such databases is also explained.

Data base management systems (DBMS) include the software for the manipulation of a collection of data in a database. It enables the defining, feeding, handling and managing of databases.

The success of database will be determined mainly by the possibility of fast, and ready access to data. Ready access can be achieved through the writing of user-friendly software to update, retrieve, handle, edit and sort the information available.

In section five, we shall discuss the main components of a computer. These are:

- (i) The Central processing Unit (CPU)
- (ii) The Input Unit and
- (iii) The output unit.

Fundamental definition of a program is given and its basic structure is outlined. This section also introduces the mathematics of computer programming and the use of algorithms and flow-charts. Basic concepts of MS-DOS are also given in this section.

In section six, we define the BASIC programming language is defined. We shall also introduce the writing of a program in BASIC language.

### ***General Course Unit Objectives***

The aim of this unit is to equip students with knowledge and skills in computational meteorology



### ***Course Unit Objectives***

At the end of this unit, you should be able to:

1. Organize and summarize meteorological data using statistical methods
2. Solve problems on vectors, index numbers and complex numbers
3. Apply concepts of vectors, index numbers, and complex numbers to atmospheric motions
4. Identify and list parts of a computer without reference to a manual
5. Define MS-DOS and explain the associated commands
6. Write and run computer programs in BASIC language
7. Apply statistical packages to analyze meteorological data