ABSTRACT

This Thesis describes the philosophical concepts, adopted by the Author, in a developing Country, of an analysis of existing micro-meteorological and instrumentation domains through which he arrives at techniques for design, development and manufacture of three instruments capable of the measurement of Ambient Temperature, Rainfall and Humididty. The procedures demonstrate a method used to make electronic instruments without advanced technological inputs, and at the same time utilising readily available material in the construction and packaging of the instruments.

The electronic instrument for the measurement of Ambient Temperatures is designed to operate in the range $0^{o}C$ to $50^{o}C$, within an error of $\pm 0.2^{o}C$. It uses as its transducer the junction characteristics of a semiconductor and it is covered with a number of conical shields.

The electronic instrument for the measurement of Relative Humididty is designed to function as a Psychrometer. Transistors are used as the wet and dry transducer elements, while readily available materials are used to construct the radiation shields. The electronic control circuits stimulate the algorithm for Relative Humidity stored in a Read Only Memory. Relative Humidity is measured in the range 30% RH to 90% RH, aiming at an error of $\pm 5\%$ RH.

The electronic instrument for the measurement of rainfall, departs from the traditional dual tipping bucket mechanism by the introduction of novel design of a system of buckets radially displaced around a central shaft on which the buckets rotate. The instrument is capable of measuring rainfall in the range of up to 25.4 cm per hour with an error of ±15% of accumulated catch. The instrument's capability for measuring intense rainfall activity makes it suitable for the monitoring of flash floods and the initiation of flash flood alarms.

This design and development program will provide another solution to obtaining low-cost instrumentation, capable of being applied in basic research or the solutions of investigative problems in the microclimate.