

**HIGHER TECHNICAL INSTITUTE**

**ELECTRICAL ENGINEERING DEPARTMENT**

**DIPLOMA PROJECT**

**DEVELOPMENT OF AN ADD-ON CIRCUITS FOR  
MULTIMETERS**

by

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**DEVELOPMENT OF AN ADD-ON  
CIRCUITS FOR MULTIMETERS**

**Project Report submitted by  
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## ABSTRACT

In Chapter 1 the author tries to studies the various types of Add-on circuits for multimeters. So, different methods of measuring the following facilities: voltage, current, resistance, capacitance, inductance, frequency are represented in Chapter 1. Their mode of operation is explained briefly.

After the decision about the methods to be used for constructing each circuit, the author proceeds in Chapter 2, in the selection and design of the circuits.

Chapter 3, deals with the development and construction of the printed circuit boards. The method and also the circuits in their general form is represented.

Chapter 4 describes the different methods for calibration very briefly. The calibration of each one of the circuits is also represented. Different types of errors are mentioned.

Chapter 5 presents the results and the testing methods. All results are represented and also the contitions under they were obtained. Finally the comments on the Add-on circuits are discused.



## INTRODUCTION

The main object of this project is to select, design, develop, construct, test and calibrate Add-on circuits for multimeters.

After many considerations the Add-on circuits constructed include the following facilities:

1. Voltmeter circuit, measuring from 0V to 1V.
2. Ammeter circuit, measuring from  $1\mu\text{A}$  to 1mA.
3. Ohmmeter circuits, one measuring from zero up to  $10\text{ M}\Omega$  and the other used for measuring milliohms up to hundred ohms.
4. Frequency meter circuit, measuring 0 - 500 KHz.
5. Capacitometer circuit , measuring any type of capacitor up to  $10\ \mu\text{F}$ .
6. Inductance meter circuit, measuring up to 10 mH.

The different multimeters available in the market may or may not be reliable for measuring accurate values. The Add-on circuits are used for measuring as accurate as possible, for fast measuring in the lab and for extending the scaling of the meters.

Various methods for calibration are used, for setting the circuits to be ready for measuring as accurate as possible any time they are needed. Improvements of the circuits, either in the method of calibration or on the circuits themselves are proposed according to the results obtained. For the results recorded, a very accurate meter was used, for determining exactly the errors the different circuits might have. Also the conditions under which the results were obtained are reported too.

The Add-on circuits are very useful for measuring various types of units needed where a good multimeter is not available.