PREFACE

The present work entitled "Design and Development of an ARM Processor based Embedded system for the measurement and monitoring of Green house Parameters" submitted in partial fulfillment for the award of degree of Master of Philosophy in Electronics comprises the design of an ARM processor based embedded system to measure and monitor the Temperature, Humidity and CO2 gases.

The embedded system design which is meant for a specific requirement is always a fascinating task for an electronics engineer. After the advent of Microcontrollers the design features have drastically changed as compared to Microprocessor based embedded system. Keeping in view these advanced features the author has used a 32-bit ARM Processor to design the present embedded system. This 32-bit ARM processor has specific advantages of speed and compactness. After the industrial revolution, the burning of fossil fuels and a huge number of human activities have significantly increased the concentration of carbon dioxide (CO2) year by year. It is widely concluded that the increase of the CO2 concentration is a major reason to cause global warming. Therefore, it would be quite interesting to understand how the CO2 concentration changes over temporal and spatial domains at a very fine-grained size. In addition to this there is a drastic increase in temperatures day by day. So, these three parameters like Temperature, Humidity and CO2 forms the important Green house parameters. Greenhouse monitoring is an essential one for variable climate changes. GSM technology is the rapidly developing wireless technology during recent years. Starting from telecommunication and industrial controls, it is now being applied in environmental monitoring and agriculture. The old wired greenhouse network would make the measurement system expensive and vulnerable. Moreover, the cabled measurement points are difficult to relocate once they are installed. This dissertation propose modem greenhouse measurement system using ambient intelligence, the GSM-SMS and sensors are used to sense climate parameters and transmit data through wireless communication.

The work is presented in four chapters. The first chapter is devoted to general introduction to embedded systems and the design aspects. It also emphasizes on the green
house effects and its importance and the effect of CO2 on the human health etc. This chapter also deals with the measurement of green house parameters and a brief literature survey related to the present work. This chapter also explains the scope of the present work in brief.

The second chapter presents the hardware details of the proposed design with the block diagram. It explains the salient features of ARM processor (LPC 2129) and the basic features of sensors like Temperature sensor LM35, Humidity sensor HS-SY-220 and CO2 Sensor MG811. It also explains the features of GSM modem for sending the SMS to the remote mobile. The interfacing of various sensors to the ARM processor along with their signal conditioning circuits is also given in this chapter.

The third chapter is dedicated to the software details. It gives the complete description of Keil software and the programming techniques using the Philips Flash Magic tool. This chapter also presents the embedded C program developed in the present work.

The fourth and the last chapter present the results and conclusions. The standardization of the sensors and the other details are presented. The measured values are presented graphically and the minimum, maximum and average values of the Temperature, Humidity and CO2 are presented. The photographs showing these results are also shown. The conclusions drawn from the present work are presented in this chapter. The conclusions also throw a light on the limitations of the present work and the future scope of the work is discussed in detail.