

**UNIVERSITI TEKNOLOGI MARA  
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**THE DEVELOPMENT OF LOW  
COST NON-INVASIVE GLUCOSE  
MONITORING**

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## ABSTRACT

International Diabetes Federation (IDF) estimated that there are 285 million people that affected by diabetes. It is a metabolic pathological condition of concern, which vital organs of body can be affected if not diagnosed and treated on time. Currently used glucose measuring method is invasive which require finger pricking. Users who are afraid of needle found out that this currently use method is difficult to use. In addition, this method causes pain for users because of the need of blood extraction from their finger. Users need to regularly check as well as monitor their blood glucose level so that further action to prevent and mitigate the sudden increase in blood glucose level. Frequently pricking can cause calluses on the skin. The needle that is used to extract blood need to change every time users check or monitor their blood glucose level. Risk of infection disease also can occur if the needle is contaminated or used more than once. There are certain number of test strip and needle given in the blood glucose meter. If the test strip and the needle are used up, users need to buy the new test strip as well as the needle to monitor and check their blood glucose level. New test-strip and new needle also required in each test which results in increase in expenses during the monitoring process. Continuous glucose monitoring does exist but it requires the blood glucose sensor to be implanted under the skin which can cause traumatized during the implant process. It also needs to be replaced every week which is also cause a lot of money and might be expensive for some users. This paper proposes a new non-invasive system that overcome all the weaknesses of current invasive system. The designed consists of TCRT5000 infrared sensor and a finger is placed on the sensor for measuring the blood glucose. The sensor consists of two parts. The first part is the transmitter and the second part is the receiver. Phototransistor receives the signal and changes the light energy into electrical energy. Filter circuit is designed to filter out the noise as well as the non-inverting amplifier is designed to remove high frequency components. Arduino Uno acts as an interface between sensor and display unit. The voltage value obtained from the sensor then is converted into glucose value in milligrams per decilitre. The glucose value displayed on the liquid crystal display (LCD) provided. Results show that there is correlation between glucose value and voltage value from the sensor.

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# CHAPTER 1 INTRODUCTION

## 1.1 OVERVIEW

This chapter concisely describes the overview of glucose, insulin, type 1 and type 2 diabetes, OGTT test, current invasive method and non-invasive method that been use nowadays. Further details about the problem statements, objectives and scope of work are presented.

## 1.2 RESEARCH BACKGROUND

Glucose is the simple element that consists of three elements which is carbon, hydrogen and oxygen. The main source of energy in human body is produced by carbohydrate which can be taken from glucose. During the conversion of glucose, energy is released for use in the cells [1]. Therefore, it can be concluded that glucose provide energy to maintain cellular function to the body.

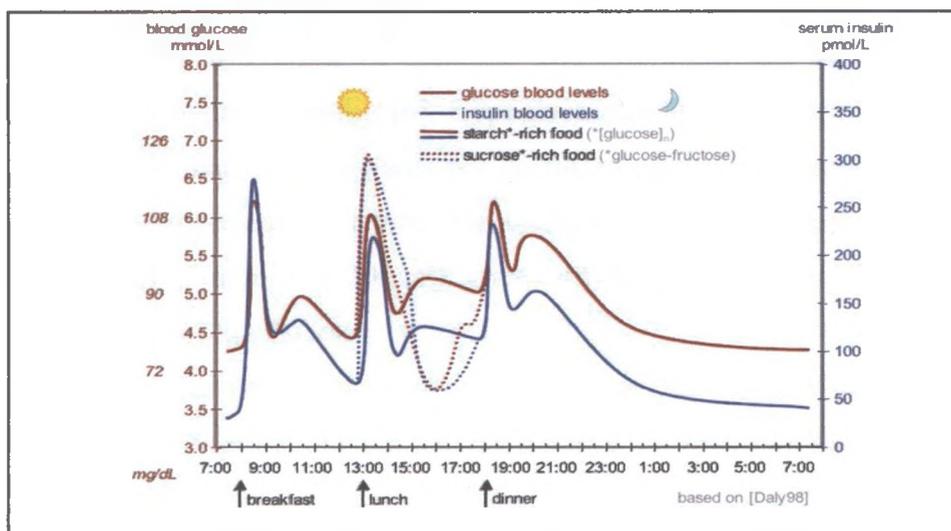


Figure 1.1: Effect of blood glucose level after meal [1].