



FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL ENGINEERING

FINAL YEAR PROJECT REPORT

**A SMART RAINWATER HARVESTING, CONTROL AND TREATMENT SYSTEM
FOR SAFE WATER DRINKING.**

CASE STUDY: BUSITEMA UNIVERSITY

By:

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A FINAL YEAR PROJECT REPORT SUBMITTED TO THE FACULTY OF ENGINEERING
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ABSTRACT:

This project presents the design and implementation of a Smart Rainwater Harvesting, Control, and Treatment System aimed at providing a reliable, safe, and sustainable source of drinking water (Smith & Johnsson, 2023). The system is specifically developed to address the water quality and accessibility challenges commonly faced in Ugandan communities, especially in institutions such as schools and health centers. The system integrates a rainwater collection unit, a filtration stage for removing physical debris, and an intelligent boiling treatment mechanism that eliminates microbiological contaminants. A microcontroller (Arduino Uno) acts as the central processing unit, receiving inputs from various sensors including flow switches, temperature sensors, and water level sensors (Garcia & Patel, 2020). It automates water flow through solenoid valves, activates the heater to boil water, and regulates treated water transfer into a clean storage tank. Real-time system status is displayed using an LCD and LED indicators for easy user interaction and monitoring. This approach ensures that collected rainwater is not only harvested efficiently but also made safe for drinking through boiling—a method recognized globally for effective microbial disinfection (World Health Organisation, 2019). The system minimizes manual operation, reduces health risks from untreated water, and operates in an energy-conscious and cost-effective manner (Kumar, 2023). The proposed system offers the following key benefits:

1. Improved water safety through reliable boiling treatment.
2. Automated water control for enhanced operational efficiency.
3. Minimal chemical usage, reducing environmental impact.
4. Scalability and adaptability for rural homes, schools, health centres, and refugee settlements.
5. Low maintenance and simple operation suitable for low-resource settings (Nguyen et al., 2022).

DECLARATION

I, AUGUSTINE ENERU, hereby declare that this research report titled "A smart rainwater harvesting, control and treatment system for safe water drinking." is my original work and has not been submitted to any other University or institution for academic Award of a diploma or degree. All outside sources used have been correctly cited and credited.

Date.....18th / 06 / 2025.....

Signature.....*Augustine Eneru*.....

DEDICATION

I dedicate this report to my dear mother, Miss. Jane Itiamat, and the family of Edeket Augustine, who have always supported me in every step I take and continuously encouraged me through various situations i also extend this dedication to my fellow classmates who challenged me to broaden my knowledge and improve the quality of this project. Further dedication goes to my supervisors, Eng. George Kilama and Miss. Tusiimire Patience, for their invaluable guidance, mentorship, and encouragement throughout the course of this project.

Finally, with deep appreciation, I dedicate this work to the staff and Department of Electrical and Electronics Engineering Busitema University, for granting us the opportunity to undertake innovative projects and supporting me in the successful execution of this final year project.

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Foremost, I thank the Almighty God for the life and protection He has granted me

I whole heartedly thank my supervisor, Eng. Kilama George for the knowledge, sense of direction, Advice, and his precious time he has rendered to me to see that I remain on the right track.

And special thanks go to my co-supervisor Miss. Tusiimire Patience for the tireless efforts inserted to deliver to us the students the necessary knowledge for academic excellence.

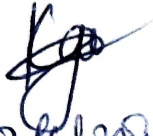
I extend sincere appreciation to fellow students for the encouragement.

Lastly, my mother, Mrs. Jane Edeket, thanks for the daily prayers and advice and financial support

APPROVAL.

I hereby confirm that this project report was written and compiled by AUGUSTINE ENERU and is ready for submission to the Department of Electrical and Electronics Engineering, Faculty of Engineering and Technology of Busitema University.

Supervisor: Eng. Kilama George

Signature: 

Date: 

Supervisor: Miss Tusiimire Patience

Signature: 

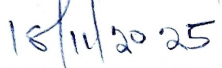
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Table of Contents

ABSTRACT:.....	i
DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
APPROVAL.	v
LIST OF TABLES:.....	ix
LIST OF ACRONYMS:	x
1.0 CHAPTER ONE	1
1.1. INTRODUCTION	1
1.2 Background.....	1
1.3 Research gap	4
1.4 Problem statement.....	4
1.5 Objectives.	4
1.5.1Main objective	4
1.5.2 Specific Objectives.	4
1.6 Significance:	5
1.7 Justification:	5
1.8 Scope of the study:.....	6
1.8.1 Conceptual Scope:.....	6
1.8.2 Geographical Scope:	6
1.8.3 Time Scope:	6
1.8.4 Conceptual Framework	6
2.0 CHAPTER TWO: LITERTURE REVIEW	8
2.1 Introduction.....	8
2.1.1 Key aspects:	8
2.1.2 Software Stack:	10
2.1.3 Integration:	13
2.1.4 Related Works:.....	15
2.1.4Proposed Smart Rainwater Harvesting with Boiling Treatment.....	16
3.0 CHAPTER THREE: METHODOLOGY:	17
3.1 INTRODUCTION:	17
3.2 Component Selection and Procurement:.....	17

3.3 OPERATION ACTIVITIES THAT WERE CARRIED OUT.	18
3.5 PARTS OF THE SMART RAINWATER HARVESTING, CONTROL AND TREATMENT SYSTEM.....	19
CHAPTER FOUR.....	21
4.0. RESULTS AND DISCUSSIONS.....	21
4.1 Specific Objective One:	21
4.1.1 Criteria Used to Select Design Parameters	21
4.1.2 System Design	21
4.1.3 Sensor Selection.....	21
4.1.4 Microcontroller Selection	22
4.1.5 List of Selected Components	22
4.2 Specific Objective Two:.....	23
4.3. Specific Objective Three:.....	23
4.3 Specific Objective four:.....	24
CHAPTER FIVE	25
5.0 CONCLUSIONS AND RECOMMENDATIONS	25
5.1 CONCLUSION.....	25
5.2 RECOMMENDATIONS	26
5.3 CHALLENGES	27
5.3 REFERENCES:.....	28
6.0 APPENDICES:	30

LIST OF FIGURES:

Figure 1.1:Conceptual framework.....	6
Figure 1.2: an electrical circuit diagram.....	7
Figure 2.1: A temperature sensor.....	9
Figure 2.2 shows an LCD.....	9
Figure 2.3: shows an Arduino microcontroller.....	10
Figure 2.4: Shows a Water heater.....	11
Figure 2.5: Shows a water flow valve.....	12
Figure 2.6: Shows a relay module.....	12
Figure 2.7: Shows a water flow switch.....	13
Figure 2.8: Shows a steam pressure valve.....	14
Figure 6.1: Shows the prototype.....	30
Figure 6.2: Component assembly.....	30
Figure 6.3: shows an LCD displaying the temperature reading and the heaters status.....	30

LIST OF TABLES:

Table 2.1: Showing the different components and their integration techniques.....	14
Table 3.1: Table showing the list of selected components.....	22

LIST OF ACRONYMS:

SDGs:	Sustainable Development Goals.
GSM:	Global System for Mobile Communication.
IDE:	Integrated Development Environment
UV -WTS:	Ultra Violet Water Treatment System.
DBPs:	Chlorine Disinfection By-products.
LCD:	Liquid Crystal Display screen
pH:	Potential of Hydrogen
DNA:	Deoxyribonucleic Acid.
RWH:	Rain water Harvesting

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