



FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL ENGINEERING

FINAL YEAR PROJECT REPORT

**MODEL FOR ENHANCING WIRELESS SENSOR NETWORK
ENERGY EFFICIENCY THROUGH GENETIC ALGORITHM-
DRIVEN OPTIMIZATION**

By

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**This Final Year Project Report is submitted to the Department of Electrical
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award of the degree of Bachelor of Science in Electrical Engineering of
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ABSTRACT

This study presents a model to enhance energy efficiency in Wireless Sensor Networks (WSNs) using a Genetic Algorithm (GA)-based optimization technique. The research addresses the problem of excessive energy consumption in WSNs, which significantly limits their performance and operational lifetime. The primary objective is to develop an optimized clustering and communication model that reduces energy usage while ensuring reliable data transmission. The methodology involved a simulation of clustered WSNs with visibility constraints and varying energy levels, integrating GA to compute optimal routing paths. The results showed that the GA-optimized model outperformed traditional random and all-sensor selection methods in conserving energy and improving network lifetime. The study concludes by recommending the adoption of evolutionary algorithms like GA in the design of energy-aware WSN protocols.

DECLARATION

I, MUKISA ROBERT, do hereby declare that this Project report is my original work and has never been published and/or submitted for any other degree award to any other University or institution of higher learning.

Signed 

Date 02 June 2025

APPROVAL

This is to certify that the project report under title "Model for enhancing WSN energy efficiency through genetic algorithm-driven optimization" has been written under our supervision and is now ready for examination.

Sign 

Date 17/11/2028

Eng. Kilama George.

DEDICATION

I dedicate this report to my beloved dad Mr. SIKUKU PETER, my sponsor Mr Wafula Peter Kazindu siblings; Geoffrey, Rebecca Juliet Hariet, and my course mates.

Thank you all

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LIST OF ACRONYMS

BS	Base Station
CH	Cluster Head
GA	Genetic Algorithm
HMI	Human Machine Interface
LEACH	Low-Energy Adaptive Clustering Hierarchy
ICT	Information and Communications Technology
ID	Identity
IDE	Integrated Development Environment
IOT	Internet of Things
OS	Operating System
PCB	Printed Circuit Board
SDG	Sustainable Development Goal
SN	Sensor Node
Wi-Fi	Wireless Fidelity
WSN	Wireless Sensor Network

Reference List and Appendices

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