



**FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRICAL AND ELECTRONICS
ENGINEERING**

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

By

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**This Final Year Proposal Report is submitted to the Department
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ABSTRACT

Wireless Sensor Networks (WSNs) are important and key applications in modern monitoring and data acquisition tasks. Their finite energy sources are a key challenge towards network lifetime extension and optimal operation in WSNs. This research puts forward a model enhancing energy efficiency in WSNs based on a Genetic Algorithm-driven optimization technique. The model makes intelligent node and routing-path selection in order to achieve energy minimization while providing accurate data and coverage. The performance of the GA-based model is compared as against random and all-node selection methods with different network size and blocked nodes' probabilities in the network. Simulation demonstrates the GA-based method outcompeting random and all-node selection methods in terms of energy savings and network lifetime extension. This research benefits the design and development towards more sustainable and energy-efficient WSNs, especially in dynamic constraint and energy-constrained environments.

DECLARATION

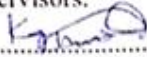
I, **Wafula Denis**, attest that the work presented in this project report entitled "Model for Enhancing Wireless Sensor Network Energy Efficiency Through Genetic Algorithm-Driven Optimization" is my own work and hasn't been submitted before to obtain any degree or diploma from any institution or university of higher learning.

Signed: 

Date: 01/06/2025

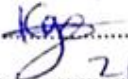
APPROVAL

This report entitled "Model for Enhancing Wireless Sensor Network Energy Efficiency Through Genetic Algorithm-Driven Optimization" is submitted in partial fulfillment of the award requirement for the degree of Bachelor of Science in Electrical Engineering and approved by the supervisors.

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DEDICATION

I pay tribute to my precious sponsor Higher Education Students Financing Secretariat (HESFS) for their unfaltering encouragement, prayer, and support in the course of my academic pursuit. Particular appreciation also extends to my parents whose love and sacrifices have served as my main pillar of fortitude and inspiration.

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ABBREVIATIONS /ACRONYMS

BS	Base station.
CH	Cluster head
ICT	Information and communications technology
ID	Identity
IDE	Integrated Development Environment
IOT	Internet of things
GA	Genetic Algorithm
HMI	human machine interface
LEACH	Low-Energy Adaptive Clustering Hierarchy
NODE	sensor node
OS	Operating system.
PCB	Printed Circuit Board
SN	Sensor Node.
SDG	Sustainable Development Goal
Wi-Fi	Wireless Fidelity
WSN	Wireless sensor network

REFERENCE LIST AND APPENDICES

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