

Owade Kennedy Jackob

Curriculum Vitae

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Personal Information

Nationality Kenyan

Gender Male

Languages English (Fluent), Swahili (Fluent), Luo (Native)

Research Interests

- **Convex and Nonsmooth Analysis:** Monotone operator theory, proximal algorithms, set-valued analysis, Clarke generalized gradients.
- **Optimization:** Convex and nonconvex optimization, Lagrange multiplier methods, KKT conditions, resource allocation problems.
- **Dynamical Systems:** Fractional-order systems, stability/bifurcation analysis, Lyapunov methods, operator theory for differential equations.
- **Mathematical Biology:** Multiscale modeling (within-host to population-level), epidemiological dynamics (HIV, Cholera), optimal control of infectious diseases.

Professional Membership

2024–Present **Member**, *European Mathematical Society*, Helsinki, Finland

2017–2026 **Member**, *Teachers Service Commission*, Nairobi, Kenya

Professional Training

2026 **OPSWAT ACADEMY**, *OPSWAT Cyber Security Fundamentals Associate & Network Security Associate*, Opswat Academy

2023 **Kakamega School of Professional Studies**, *Certificate in Computer Applications*, Kakamega, Kenya

Education

Feb 2019–Dec 2024 **Doctor of Philosophy in Applied Mathematics**, *Masinde Muliro University of Science and Technology (MMUST)*, Kakamega, Kenya

Thesis: Mathematical Model for Cholera Dynamics with Vaccination and Temperature-Dependent Parameters

Supervisors: Dr. Akinyi Colleta, Dr. Frankline Tireito

Key focus: Fractional-order dynamical systems, operator theory, nonsmooth analysis, existence and uniqueness proofs using fixed-point theorems.

2015–Dec 2018 **Master of Science in Applied Mathematics**, *MMUST*, Kakamega, Kenya

Thesis: Modeling the Role of Rehydration and Antibiotic Treatment on Reduction of Cholera Mortality

Supervisors: Dr. Akinyi Colleta, Prof. George Lawi

Key focus: ODE systems, Lyapunov stability, equilibrium analysis.

2010–July 2014 **Bachelor of Education Science (Mathematics and Physics)**, *MMUST*, Kakamega, Kenya
Second Class Honours, Upper Division

Academic Appointments

- 2026–Present **Lecturer, School of Education, UMMA University, Kajiado, Kenya**
Responsibilities:
- Teach and supervise undergraduate and postgraduate students.
 - Curriculum review for Bachelor of Education Science courses.
 - Contribute to the university's research agenda in applied mathematics.
- 2026–Present **School of Education, Department of Education Science, UMMA University, Kajiado, Kenya**
Responsibilities:
- Examination Coordinator.
- 2016–Present **Part-time Lecturer, Department of Mathematics, Masinde Muliro University of Science and Technology, Kakamega, Kenya**
Responsibilities:
- Teach undergraduate and graduate courses.
 - Supervise undergraduate projects and provide academic advising.
- 2019–Present **Part-time Lecturer, Department of Mathematics, Kaimosi Friends University, Kaimosi, Kenya**
- 2018–May 2020 **Part-time Lecturer, Department of Mathematics, Kibabii University, Bungoma, Kenya**

Summary of Taught Units

I have accumulated extensive teaching experience at the university level, having instructed a wide range of mathematics courses across three institutions: Masinde Muliro University of Science and Technology (2016–Present), Kaimosi Friends University (2019–To-Date), and Kibabii University (2018–May 2020). The complete list of units I have taught is as follows:

Undergraduate Courses

- MAT 321 – Ordinary Differential Equations I
- MAT 423 – Ordinary Differential Equations II
- MAT 421 – Partial Differential Equations I
- MAT 422 – Partial Differential Equations II
- MAT 428 – Mathematical Modeling
- MAT 323 – Numerical Analysis I
- MAT 201E – Engineering Mathematics I
- MAT 202E – Engineering Mathematics II
- MAT 301E/MAT 361 – Engineering Mathematics III / Fourier Series and Laplace Transform
- MAT 302E/MAT 362 – Engineering Mathematics IV / Differential Equations
- MAT 121 – Differential Calculus
- MAT 124/221 – Integral Calculus
- MAT 304 – Complex Analysis
- MAT 203 – Vector Analysis
- MAT 162 – Pure Mathematics II
- MAT 426 – Fourier Series
- MAT 122 – Elementary Applied Mathematics
- MAT 102 – Analytic Geometry
- BIT 311/MAT 322 – Operation Research I
- MAT 110 – Mathematics for IT
- MAT 100 – General Mathematics

Postgraduate Course

- MAT 851 – Ordinary Differential Equations I (Masters class)

Current Research

- Title** **Multiscale Mathematical Analysis of HIV/AIDS Dynamics: Quantifying the Impact of Community Health Promoters on Epidemic Control (Revised Manuscript Submitted in the Elsevier Journal of Results in Control and Optimization)**
- Summary** Developing a comprehensive multiscale framework integrating within-host dynamics, individual adherence, and population-level epidemiology. The work utilizes operator-based formulations, nonsmooth analysis, and convex optimization for resource allocation.

Contributions

- Formulated within-host dynamics as a nonlinear system analyzable via **monotone operator theory**.
- Incorporated nonsmooth elements (thresholds, saturation) requiring **Clarke generalized gradients** for stability analysis.
- Derived an **optimization framework** for Community Health Promoter (CHP) resource allocation, yielding KKT-based optimality principles.
- Quantified CHP impact on the basic reproduction number (R_0), showing a potential reduction of 25-40%.
- Validated model using empirical data from East African CHP programs (12,354 individuals across 128 communities).

Research Supervision

2025–Present **MSc Supervisor, Masinde Muliro University of Science and Technology**

Student: Nicholas Okuku Alele

Thesis: Modeling the Spread of Microplastic Pollutants in Aquatic Systems Using Advection-Diffusion Equation.

Relevance: PDE-constrained problems, operator splitting methods, numerical analysis.

2025–Present **MSc Supervisor, Masinde Muliro University of Science and Technology**

Student: Caleb Ariko - **Commonwealth Shared Scholarship for the 2026/27 - CSC Reference: 11064219-CSS-KE-26, MSc Climate and Environmental Science**

Thesis: An AI-Driven Model for High-Resolution Flood Prediction for Enhancing Climate Resilience in Kenya.

Relevance: Optimization algorithms, training dynamics, nonsmooth problems, machine learning.

Publications

Peer-Reviewed Journal Articles

- [1] **Owade Kennedy Jakob** & Colletta Akinyi. (2025). Dynamics of the Fractional-Order Between-Host Cholera Model With Temperature-Dependence. *Abstract and Applied Analysis*, Wiley. <https://onlinelibrary.wiley.com/doi/10.1155/aaa/2312040>
- [2] **Owade, K. J.**, Okaka, A., & Tireito, F. (2024). A Between-Host Cholera Mathematical Model Incorporating Temperature Dependence. *African Journal of Empirical Research*, 5(3).
- [3] **Owade Kennedy Jakob**, Okaka Akinyi, & Frankline Tireito. (2023). A Mathematical Model on the Dynamics of In-Host Infection Cholera Disease with Vaccination. *Discrete Dynamics in Nature and Society*. <https://onlinelibrary.wiley.com/doi/10.1155/2023/1465228>
- [4] **Jackob, K. O.** (2020). Determination of the Equilibrium Point According to a Temporal Model of Rehydration in a Population with Cholera in Logistic Growth. *Journal of Advances in Mathematics and Computer Science*, 35(4), 1-12.
- [5] Nathan, O. M., & **Jackob, K. O.** (2020). Mathematical Modeling and Analysis of Mathematics Anxiety Behavior on Mathematics Performance in Kenya. *Journal of Advances in Mathematics and Computer Science*, 35(5), 45-58.
- [6] Nathan, O. M., & **Jackob, K. O.** (2019). Stability Analysis in a Mathematical Model of Corruption in Kenya. *Asian Research Journal of Mathematics*, 15(2), 1-11.
- [7] **Owade Kennedy Jakob**, Akinyi Colleta, & Owuor George Lawi. (2019). Modeling the Role of Rehydration and Antibiotic Treatment on Reduction of Cholera Mortality. *IOSR Journal of Mathematics*, 15(6), 38-48.

In Progress

- [1] **Owade, K. J.** Multiscale Mathematical Analysis of HIV/AIDS Dynamics: Quantifying the Impact of Community Health Promoters on Epidemic Control. (Revised Manuscript Submitted: *Elsevier Journal of Results in Control and Optimization (RICO)*)

Technical Skills

Analytical	Convex and Nonsmooth Analysis, Operator Theory (Monotone Operators), Dynamical Systems, Stability/Bifurcation Analysis, Lyapunov Methods, Functional Analysis, PDE Theory, Fractional Calculus
Optimization	Convex optimization, KKT conditions, Lagrange multiplier methods, Proximal algorithms, Augmented Lagrangian methods
Programming	MATLAB (Advanced), Python (NumPy/SciPy, PyTorch - Advanced), R (Advanced)
Numerical Methods	Finite difference methods, Runge-Kutta methods, Parameter estimation (MLE, nonlinear mixed-effects), Sensitivity analysis (Sobol indices)
Technical Writing	L^AT_EX (Advanced)

Awards & Recognition

- 2026 **Certificate of Excellence in Reviewing**, *Willey (Environmental Microbiology Reports - Under Review)*
- 2025 **Certificate of Excellence in Reviewing**, *Vacunas (Elsevier)*
- 2025 **Certificate of Excellence in Reviewing**, *Asian Journal of Research in Infectious Diseases*
- 2025 **Certificate of Excellence in Reviewing**, *Asian Research Journal of Mathematics*
- 2025 **Certificate of Excellence in Reviewing**, *Journal of Advances in Mathematics and Computer Science*
- 2015/2016 **Graduate Internship Grant**, *Association of African Universities*
Received grant of \$1,000 for a 3-month internship.

Talks and Presentations

- 2026 **Multiscale Mathematical Analysis of HIV/AIDS Dynamics**, *UMMA University Research Colloquium*, Kajiado, Kenya
Scheduled presentation on optimization of Community Health Promoter programs.

Community Service

- 2020–Present **Secretary and Head of Linkages**, *BodaBoda Medical Ventures Ltd*
 - Provide structural management, coordination, and research expertise for a social enterprise.
 - Develop organizational strategy and stakeholder linkages to support youth empowerment.

Referees

- **Dr. Akinyi Colleta**
Senior Lecturer, Department of Mathematics
Masinde Muliro University of Science and Technology
Mobile: +254722340628
Email: letticol@yahoo.com
- **Dr. Frankline Tireito**
Senior Lecturer, Department of Mathematics
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Mobile: +254720515162
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- **Dr. David Angwenyi**
Senior Lecturer, Department of Mathematics
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Declaration

I, the undersigned, certify that the information provided correctly describes my qualifications, experience, and personal details.

***Last updated on March 24, 2026**