Seasonal School on Circuit and System for Wearable Technology

Dedann Kimathi University of Technology

Program Schedule

Day 1: Introduction to Wearable Technology and Circuit Design (17/11/2023)

Morning Session:

- 09:00 AM - 09:30 AM: Registration and Welcome Address
- 09:30 AM - 10:30 AM: Overview of the Seasonal School and Technical Theme
- 10:45 AM - 12:00 PM: *Keynote Speech: "Emerging Trends in Wearable Technology" by Dr. Shadrach Mambo, Walter Sisulu University*

Afternoon Session:

- 01:30 PM - 03:00 PM: Introduction to Circuit Design for Wearable Devices, Clinton Oduor
- 03:15 PM - 04:30 PM: Basics of Sensors and Actuators in Wearables, John Muchiri, Plinalabs
- 04:45 PM - 06:00 PM: *Hands-on Workshop: Prototyping a Simple Wearable Circuit, by Bob Afwata, Facuslense Electronics Ltd*

Day 2: Energy Harvesting and Wireless Communication for Wearables (18/11/2023)

Morning Session:

- 09:00 AM - 10:30 AM: Energy Harvesting Techniques for Wearable Devices, Fidel Makatia, Texas A&M University
- 10:45 AM - 12:00 PM: Power Management and Optimization Strategies, Prof. Ciira Maina, DeKUT

Afternoon Session:

- 01:30 PM - 03:00 PM: Wireless Communication Protocols for Wearable Technology, Allan Koech, Autodesk
- 03:15 PM - 04:30 PM: Bluetooth Low Energy (BLE) and Zigbee for Wearables
- 04:45 PM - 06:00 PM: *Lab Session: Setting Up a BLE Communication Link*, Latiff Cherono, Gearbox Europlacer

Day 3: Data Processing, Interfaces, and Challenges (24/11/2023)

Morning Session:

- 09:00 AM - 10:30 AM: Data Processing and Signal Analysis for Wearable Devices by Prof. Ciira Maina, DeKUT
- 10:45 AM - 12:00 PM: Human-Machine Interfaces and Interaction Design, Clinton Oduor, Amini

Afternoon Session:

- 01:30 PM - 03:00 PM: Ethical and Privacy Considerations in Wearable Technology, Felix Kinaro, Autodesk
- 03:15 PM - 04:30 PM: *Hands-on Workshop: Designing a Wearable User Interface*
- 04:45 PM - 06:00 PM: *Panel Discussion: Challenges and Future Directions in Wearable Tech, Marvin Ngesa, Safaricom*

Day 4: Industry Insights and Research Showcase (25/11/2023)

Morning Session:

- 09:00 AM - 10:30 AM: Collaboration Between Academia and Industry, Dr. Shadrach Mambo
- 10:45 AM - 12:00 PM: Innovations in Wearable Technology by Latiff Cherono, Gearbox Europlacer

Afternoon Session:

- 01:30 PM - 03:00 PM: Research Showcase: Presentations from Attendees
- 03:15 PM - 04:30 PM: Poster Session: Sharing Research Projects and Ideas
- 04:45 PM - 06:00 PM: Closing Ceremony and Certificate Distribution

Speakers

Prof. Ciira Maina - *Lecturer*, Dedan Kimathi University of Technology

Prof. Ciira Maina is an Associate Professor at Dedan Kimathi University of Technology in Nyeri, Kenya. With expertise in electrical engineering, bioacoustics, IoT, machine learning, and data science, he is a leading figure in academia and research.

His academic journey includes a PhD from Drexel University, USA, and a postdoctoral position at the University of Sheffield. Since 2013, he's been at Dedan Kimathi University, where he teaches and leads the Centre for Data Science and Artificial Intelligence (DSAIL).

Prof. Maina's contributions extend beyond academia. He chairs Data Science Africa, promoting collaboration across the continent. His work exemplifies bridging academia and industry, inspiring the next generation of engineers and researchers.

For more information, visit:

- Dedan Kimathi University of Technology
- DSAIL
- Data Science Africa

Dr. Shadrach Mambo - *DSP* - Walter Sisulu University

Dr. Eng. Shadrach Mambo, a lecturer in the Department of Electrical and Electronics Engineering at Walter Sisulu University, is a distinguished academic and professional with expertise in Electronics Engineering. He holds a PhD in Engineering from Universite Paris Est Creteil, France, and a D'Tech in Engineering from Tshwane University of Technology, South Africa. His specialization lies in Digital Image Processing and Digital Signal Processing. Dr. Mambo is an active member of various engineering associations, including Engineers Board of Kenya (EBK), Institute of Engineers of Kenya (IEK), and IEEE.

With a career spanning diverse roles, Dr. Mambo has served as Dean of the School of Engineering and Technology at Kenyatta University and held positions as a Lecturer, including Chairman of Electrical and Electronics Engineering Department. He has also contributed significantly to curriculum development, particularly in the field of Biomedical Engineering. He has supervised students at both undergraduate and postgraduate levels, and his impactful research focuses on Medical Image Registration techniques, resulting in numerous published papers and conference presentations.

Throughout his career, Dr. Mambo has been recognized for his dedication to teaching, mentorship, and research. His involvement in professional collaborations, community engagements, and administrative leadership positions further highlights his commitment to academia and engineering advancements.

Latiff Cherono - *Electronics Manufacturing Manager*, Gearbox Europlacer

Eng. Latiff Cherono has a strong background in Lean Manufacturing, Continuous Process Improvement, and Manpower Management. He currently serves as the Electronics Manufacturing Manager at Gearbox, leading an initiative to establish world-class electronic manufacturing in Kenya. With over a decade of experience, he has successfully implemented Lean Manufacturing principles, including Value Stream Mapping, Kaizen Events, and Level Load Production Scheduling.

He has an extensive history of roles and accomplishments, including being a Lean Consultant at Training Leadership Consulting, where he specialized in Lean Deployments in the Manufacturing Sector. He founded the Lean East Africa Network (LEAN) to provide business improvement services in the region and partnered with Training Leadership Consulting to expand its reach.

Eng. Cherono has also held roles at various companies, including United Technologies, where he excelled in Operations Supervision, Manufacturing Engineering, and implementing improvements in production efficiency. His experience extends to ASIMCO Technologies Limited, where he supervised automotive product lines and successfully applied Constraint Management principles to optimize production.

He is passionate about fostering the growth of manufacturing capabilities in Africa, as demonstrated by his involvement in discussions about local electronics manufacturing and collaborations with Raspberry Pi to manufacture electronic devices in Africa. Eng. Latiff Cherono's extensive experience and expertise in Lean Manufacturing and process improvement make him a valuable asset in driving efficiency and growth in manufacturing operations.

John Muchiri - *Lead Hardware/Firmware Engineer*, Phinalabs

Muchiri John is the Co-Founder and Lead Hardware/Firmware Engineer at Phinalabs Technologies, where he specializes in research and design of STEM, IoT, and industrial products. He has experience in embedded systems research, design, manufacturing, and testing of products in the renewable energy and electric mobility sectors as the Lead Engineer at CHAJI. He also co-founded Warefab, focusing on embedded systems engineering. He holds a Bachelor of Science degree in Mechatronics Engineering from Dedan Kimathi University of Technology (DeKUT).

In addition to his professional work, Muchiri John is actively involved in the IEEE Circuits and Systems Society (CASS) Kenya Chapter as the Technical Activities Lead, where he creates awareness and conducts workshops for engineering university students. He is passionate about open-source technology, energy, circuit design, hardware engineering, and software engineering. Muchiri John's GitHub repository showcases his hacks and projects related to embedded systems.

Bob Afwata - *Firmware Engineer*, Facuslense Electronics Ltd

Bob Afwata is a Firmware Engineer at Focuslense Electronics Limited in Kenya. He has a Bachelors of Science degree in Electrical and Electronics Engineering from Kenyatta University. Bob possesses a comprehensive skill set, including proficiency in programming languages such as C, C++, Rust, QT5, Arduino, and Python. He is experienced in working with microcontrollers like Stm32 and Esp32, and has expertise in Real-Time Operating Systems (RTOS) such as FreeRTOS, Zephyr, and mbed. His capabilities extend to Embedded Linux systems, including Uboot, Buildroot, Yocto, and ARM assembly.

Bob's knowledge encompasses various technical domains, including device drivers, PCB design using tools like Kicad and Altium, 3D printing, Solid Works, and sketching for product design. He is also well-versed in wireless networks, covering technologies like BLE, GSM, and Sigfox.

His career highlights include serving as a Part-time Lecturer at Jomo Kenyatta University of Agriculture and Technology, teaching subjects like computer programming, IoT, microcontrollers, sensors, and robotics. At Intel Corporation, Bob excelled as an Innovator, presenting on IoT gateways, virtual reality, augmented reality, and game engine development.

Bob Afwata's professional journey also encompasses roles such as Senior Engineer at Focus Lense Electronics, where he led a team in research and development, firmware development, and CAD design. He gained valuable experience as an Electrical and Electronics Engineering Intern at Gearbox Kenya, involving PCB design, manufacturing, 3D printing, and product development. Furthermore, his tenure as a Firmware Engineer at BRCK contributed to his expertise in embedded systems development.

With his educational background, technical prowess, and hands-on experience, Bob Afwata is well-equipped to contribute significantly to the CASS Seasonal Schools for Wearable Technology.

Marvin Ngesa - *Device Manager - Enterprise Solutions and IoT*,Safaricom

Marvin Ngesa is a skilled professional with a diverse range of experiences in the technology and telecommunications sectors. He currently serves as a Device Manager for Enterprise Solutions and IoT at Safaricom PLC, where he plays a pivotal role in defining and leading the device and product strategy. His work includes focusing on products that intersect hardware, machine learning, and cloud experiences. Marvin excels in collaborating with business, network, and engineering teams to unlock value from device-generated data and create data-driven solutions. He also manages device lifecycles and prioritizes product backlogs, showcasing his expertise in product management and strategy. Marvin's involvement as an Arm Ambassador reflects his commitment to knowledge sharing. He provides valuable workshops and training for developers, extending his influence in areas like IoT, 5G, AI, and computer vision. He further

demonstrates his dedication as the founder of Nairobi AI, a meetup platform that nurtures technological discussions and hands-on workshops in Nairobi. In his role as an IoT Solutions Engineer at Liquid Intelligent Technologies, Marvin contributed significantly to IoT solution design and implementation. His accomplishments include developing end-to-end solutions, building IoT data pipelines, and collaborating with various cloud platforms. Marvin's expansive experience also covers roles as an Intel AI Ambassador, RNPO and RAN Engineering Intern at Huawei Technologies, and a researcher and team lead at TechX DeKUT. He has a strong background in machine learning, signal processing, electronics, and telecommunications. His entrepreneurial spirit is evident through his consultancy, IoT Extreme Ideas Lab, which focuses on engineering services for startups and educational content. With a wealth of skills including machine learning, data engineering, electronics, and project management, Marvin Ngesa has showcased his versatility and dedication to pushing the boundaries of technology in various domains.

Fidel Makatia, *PhD Student*, Texas A&M University

Fidel Makatia is a Software Engineer with expertise in Flutter, C#, and C++. He holds a First Class Honors degree in Electrical and Electronic Engineering. He is a Developer Advocate at Autodesk and has received the 2021 Larry K. Wilson Regional Award. He is also the 2023 IEEE Circuit and System Society Board of Governors Young Professional representative. He focuses on innovation, technology, entrepreneurship, and artificial intelligence.

Fidel has been a key player in technology transformation, leading a team of students to develop Kenya's first locally designed ventilator and a nanosatellite project for agricultural use. He has experience as a Graduate Research Assistant at Texas A&M University, where he specializes in Mixed-Signal IC Design, Analog Circuit Design, and Digital IC Design. He has taken active roles in IEEE Circuits and Systems Society (CASS) and IEEE Signal Processing Society.

Fidel is known for his involvement in various organizations, including being a Chairperson, ambassador, and lead in multiple technology-related clubs and societies. He is a student of Doctor of Philosophy (PhD) in Electrical and Electronics Engineering at Texas A&M University and a Bachelor's degree in Electrical and Electronics Engineering from Kenyatta University, where he graduated with First Class Honors. He is passionate about using technology to transform society and has made significant contributions in various technical fields.

Allan Koech - *Developer Advocate*, Autodesk

Allan Koech is an accomplished Developer Advocate at Autodesk, based in Nairobi, Kenya. He is dedicated to the Media and Entertainment Industry, providing support for 3ds Max and Shotgrid software. Allan's expertise extends to his role as an Engineering Student with the IEEE Engineering in Medicine and Biology Society. Over the course of three years, he has actively contributed to

this field, demonstrating his commitment to the advancement of engineering and technology. In addition to his full-time commitments, Allan has excelled as a freelancer and held the role of Chief Innovation Officer at AFECS, a period during which he showcased his innovation-driven leadership. His involvement with various IEEE societies, including Vice Chair of IEEE CASS Kenyatta University and Chairperson of IEEE Photonics Society Kenyatta University, underscores his active engagement in fostering technical communities. Allan's dedication to engineering is evident in his roles within the IEEE Communications Society, IEEE Kenyatta University Student Branch, and MIT Hacking Medicine. His diverse experiences reflect a profound commitment to technological progress and a drive to make a meaningful impact in Nairobi, Kenya, and beyond.

Clinton Oduor - *Machine Learning Engineer*, Amini

Clinton Oduor is a skilled Machine Learning Engineer and technology advocate known for his expertise in geospatial ML and innovative solutions. He currently excels at Amini, specializing in geospatial ML and ML infrastructure using tools such as MLflow, DVC, and TensorFlow. As a TinyML Kenya Lead, he passionately fosters engagement within the technology community, promoting TinyML technologies. Clinton is an active contributor to Edge Impulse's Expert Network, showcasing his proficiency in edge device ML model development.

His notable achievements include co-founding Rhions Lab Limited, an AI and IoT-driven initiative combating wildlife challenges, earning recognition like Microsoft's AI for Earth Grant. As a Hackster Ambassador, he has demonstrated his public speaking prowess, delivering talks on impactful COVID-19 tech solutions. Clinton holds a Bachelor's Degree and excels in AI, IoT, and embedded systems. His dynamic presentation skills and commitment to wearable technology make him an ideal candidate for a speaker position at the Cass Seasonal School for Circuit and Systems for Wearable Technology.

Felix Kinaro - *Developer Advocate*, Autodesk

Felix O Kinaro is an AI and IoT enthusiast and visionary CEO/Co-founder of Morfie LTD. With a strong background in Software Engineering and Cloud Computing, he excels as a Developer Advocate at Autodesk and leads ERP Systems development at Morfie LTD. Felix's expertise includes Data Analysis, Cloud Computing, C++, and more. He has contributed to hybrid learning software development at ICT Authority and specialized in IoT and firmware systems at Chipmetrics. Notably, he played a pivotal role in developing a digital speed limiter for vehicles during his time as an Embedded System Developer at Dedan Kimathi University and Technology. Felix holds a Siemens Mechatronics Systems Certification and a Bachelor's degree in Computer Science from Dedan Kimathi University of Technology. His passion for technology-driven solutions and innovation shines through his dynamic career journey.