Leo Gabriel

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Mechatronics Engineer with a love for machine design and tinkering. Actively involved co-op student, quick learner, and enthusiastic worker. Seeking my 6th and final co-op for the Summer 2024 semester!

EDUCATION

BASc in Mechatronics Engineering
University of Waterloo

09/2020 - 04/2025

- Real Time Operating Systems, Electromechanical Machine Design, Power Electronics, Microprocessor Systems

EXPERIENCE

Electromechanical Design Intern
Atomic Semi

05/2024 - Present

- Design, construction, automation, and instrumentation of several process engineering tools for semiconductor manufacturing

Mechatronics Engineer
Cornell Lab of Atomic and Solid State Physics

09/2023 - 12/2023

- Led mechanical, software, and electrical design and production of micron-precision protein cryogenic freezing robot
- Designed and implemented system to deposit nanoliter drops at a 200µm target moving at 2m/s
- Ported processing to STM32, improving sensor polling frequency by over 500x to 10µs
- Implemented mechanical and software system to improve performance and efficiency of plunging robot

Mechatronics Design Intern
Questat Inc

01/2023 - 04/2023

- Owned project to conceptualize, design, and build a film processing machine to automate laser cutting of custom parts on the production line
- Developed a C++/Python real-time system with TCP/IP communication between multiple microcontrollers and an HMI
- Machined custom parts for machine and fixturing
- Presented & documented project for staff use and development

Mechatronics Engineering Co-op
UTEX Scientific Instruments

05/2022 - 09/2022

- Designed a 9-axis gantry-mounted ultrasonic testing system
- Compared quoted mechanical and control systems parts from different vendors and determined the optimal implementation
- Precisely modeled the system in Solidworks combining off-the-shelf and custom-designed parts

IoT Device Technician
eleven-x

09/2021 - 12/2021

- Designed & 3D printed a pan and tilt manipulator to rapidly test radar sensors and programmed custom C and Python controls
- Wrote scripts to improve the efficiency of time-consuming tasks using Python, VBA, and mySQL, saving hours of work every day
- Recommended new sensors according to client requirements
- Discovered & solved bugs in parking detector sensors & algorithm

SKILLS & INTERESTS

SolidWorks | FDM/SLA 3D Printing | GD&T | Python | C++ | C | Arduino | Assembly | Machining | Automation | Machine Design | Robotics | AutoCAD | PCB Design | SQL | JavaScript | MongoDB | Excel/VBA

PERSONAL PROJECTS

ATmega Piano (2023)
- Stretched the limits of the ATmega328P MPU to emulate a piano
- Generated chord waveforms on the fly due to memory limitations

Pasta Machine (2023)
- Designed sturdy and capable pasta machine that can be built for less than the cost of a comparable commercial model
- Discovered process for consumer-grade aluminum part anodization
- Machining & CNCing aluminum and stainless steel parts

3D Printed Clock (2023)
- Designed a clock with the intention of being composed of 100% 3D printed parts
- Exposed planetary gears with the goal of being an aesthetic desk piece
- Minute, hour, and date tracking

Automated Blinds and Thermostat (2023)
- ESP32 hosting a server running a REST API, connected to stepper motors using TMC2209 drivers to raise and lower blind with a custom sprocket
- Blinds used as a gentle alarm to allow gradual light in the mornings
- Adapted system to change a thermostat on command or a schedule

Mecanum Drivetrain (2020)
- Designed, built, and wired an omnidirectional drivetrain
- Model designed in SolidWorks, along with technical drawings for machining
- Generated G-code using SolidWorks CAM for CNC mill

Barn Door Star Tracker (2021)
- Constructed a custom tripod to track and photograph celestial movements over time
- Used SolidWorks to design parts for 3D printing & construction
- Soldered a linear voltage regulator circuit for motor speed control
- Tested and iterated on design to improve stability

Java 3D Procedural Map Generator (2020)
- Used Java and open-source libraries to build a procedural map generator
- Generated 3D cylindrical/4D toroidal noise for 2D/3D maps and globes
- Exported 3D maps as point clouds to make meshed models in MeshLabs, an open source mesh processing software

Bottl'd Canada (2019)
- Set up recycling donation boxes around my community
- Designed, prototyped and iterated on greenhouse design
- Partnered with the CN Tower to build a custom greenhouse to be displayed on the public lawn (on hold due to COVID-19)

EXPERIENCE

Environmental Sensor Development Technician
Wetland Soils & Greenhouse Gas Exchange Lab

01/2021 - 05/2021

- Designed and tested an automatic CH4 & CO2 sensor system, drastically reducing sensor costs while maintaining high precision
- Developed a solar-powered Raspberry Pi power system and Python script to photograph forest canopies on low power
- Used VBA, Python, and PowerShell scripts to automate tedious tasks, saving the research team hundreds of hours a year