

# CHRISTOPHER CROSS

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## EDUCATION

### Iowa State University

*Bachelor of Science in Electrical Engineering, Minor in Mathematics*

Ames, IA

*Anticipated May 2027*

**GPA:** 3.0/4.0 | **Relevant Coursework:** Linear Systems, Automatic Control Systems, Control System Simulation, Signals & Systems, Embedded Systems

## TECHNICAL SKILLS

**Software & Analysis:** MATLAB, Simulink, QUARC, Python, C, state-space modeling, pole placement, least-squares estimation  
**Industrial Control:** Studio 5000, ladder logic, Allen-Bradley Compact GuardLogix PLC, safety I/O (DCS), counters and timers  
**Controls & Hardware:** PID tuning, Quanser SRV02 servo platform, Crazyflie quadcopter, Arduino, inductive/IR/capacitive/proximity sensors, solenoid actuators

## PROJECTS

### Rotary Inverted Pendulum Control | MATLAB, Simulink, QUARC, Quanser SRV02

Spring 2026

- Derived a four-state state-space model of a rotary inverted pendulum in MATLAB from physical and actuator parameters, then computed open-loop poles and confirmed instability from a right-half-plane pole.
- Verified controllability through a full-rank controllability matrix and designed a state-feedback gain by pole placement using a companion-form transformation, cross-checking the result against MATLAB's placement routine.
- Deployed the balance controller to Quanser hardware through Simulink and QUARC real-time, adding switch logic to engage control only near upright, and held peak deflection to  $8.3^\circ$  against a  $15^\circ$  spec at 4.3 V against a 10 V limit.
- Built an energy-based swing-up controller, validating the potential-energy subsystem to within 0.15% of the analytical value and tuning gain and acceleration limits until the pendulum swung up and handed off cleanly to balance control.

### Quadcopter Stabilization & Navigation | MATLAB, Python, Crazyflie

Spring 2026

- Estimated six dynamic parameters of a Crazyflie quadcopter by least-squares regression in MATLAB, deriving moments of inertia and thrust/drag coefficients from 19 logged flight states and confirming rotor inertia was negligible in the flight model.
- Tuned PID gains on all three translational axes to hold step response under 10% overshoot, then validated the controller against a multi-waypoint trajectory.
- Characterized stability limits by perturbing tuned gains, documenting immediate destabilization from a unit proportional-gain increase against stable but degraded tracking from a derivative increase.
- Configured proximity-sensor obstacle avoidance in Python, setting trigger distance and retreat velocity thresholds and verifying evasion response in live flight tests.

### PLC Factory Automation Cell | Studio 5000, Ladder Logic, GuardLogix PLC

Spring 2026

- Programmed ladder logic in Studio 5000 for a 5069-L320ERS2 Compact GuardLogix PLC driving a conveyor sorting and assembly cell, mapping 17 standard and safety I/O points between sensors and solenoid actuators.
- Built sorting logic from latched inductive/IR sensor states to divert plastic rings into a hopper while passing metal pegs, adding up/down counters and a delay timer to fix a queue race condition and hold capacity at five rings.
- Added reject logic using a one-shot and capacitive sensor to release only completed assemblies, plus a dual-channel (DCS) emergency stop that latched the conveyors off until manually reset.

### CyMOS CMOS Fabrication Process | Cleanroom, Photolithography, Thermal Oxidation/Diffusion

[In Progress]

- Fabricated a CMOS device wafer through a full six-mask-level cleanroom process (p-well, PMOS S/D, NMOS S/D, gate oxide, contact vias, metal), tracking process parameters and test-wafer measurements on a process traveler.
- Grew field and gate oxides by wet/dry thermal oxidation, formed p-well, PMOS S/D, and NMOS S/D regions via solid-source boron/phosphorus deposition and drive-in diffusion, and calculated predicted BOE etch times from calibration test-wafer oxide thickness ahead of each photolithography step.
- Deposited aluminum contacts by electron-beam evaporation, defined the interconnect layer by PAN etch, and sintered to form ohmic contacts.

## WORK EXPERIENCE

### Iowa State University – Tech Lending

*Student Employee*

Ames, IA

*Dec 2022 – Feb 2023*

- Managed technology equipment inventory, handling checkouts and returns for a fluctuating volume of student customers.
- Explained technology options to customers in non-technical terms and coordinated with coworkers through high-traffic periods.

## LEADERSHIP & INVOLVEMENT

### Iowa State University

- Genre Music Club – Member Aug 2021 – May 2023
- Vietnamese Student Association – Member Aug 2022 – Present
- Asian Student Union – Member Aug 2022 – Present
- Hip Hop Club (Dub H) – Member Aug 2021 – Dec 2021