**Design Engineer Intern – Garmin (May 2023 to August 2023)**

In my final internship, I traveled to Olathe, Kansas to spend my Summer at Garmin headquarters. During this three-month period, I had the opportunity to work as a design engineer, working on both a prototype power supply design and an FPGA test interface in the Avionics business unit. During the first two months, while I was designing a power supply design, I was tasked with determining load shedding estimations and decomposing power and lightning surge DO-160 requirements. During the last month, I was able to work with the FPGA team in Avionics, and develop a new design for a QSPI test interface, that would verify a FPGA image on another piece of hardware. To do this, I updated the QSPI module to interface with a Read/Write standard, from an existing AXI Lite interface. This design was then synthesized and verified on an Artix-7 FPGA, viewable on an oscilloscope.

Tasks:

* Updated a QSPI entity to communicate with a CPU using a defined Read/Write interface, from an AXI Lite interface
* Designed a Bus Functional Model using VHDL to read and write QSPI transactions with FPGA interface
* Defined pinout and timing constraints in Vivado to synthesize Artix-7 Xilinx FPGA
* Simulated new and existing circuit designs in LTSpice for prototype power supply design
* Designed prototype power supply design for transponder using Cadence Allegro

Skills/Tools Developed:

* FPGA Synthesis using Vivado
* Loading FPGA image in Quartus Prime
* Simulating testbench in Active-HDL
* Revision Control using Git for FPGA Codebase
* Developed QSPI Bus Functional Model and Testbench in VHDL
* Schematic Capture and PCB Layout in Cadence System Capture/Allegro
* Circuit Simulations in LTSpice

**Systems Engineer Intern - Collins Aerospace (May 2022 to December 2022)**

For my second internship in college, I went to Collins Aerospace in Cedar Rapids, Iowa for an 8 month long co-op. This job started in the Summer of my Junior year, and carried through the Fall semester of what would have been the start of my Senior year. In this job, I worked with a systems engineering team to conduct verification and documentation updates for Collins’ CH-47F Chinook program. This job included testing new software developed by subsystem teams for the Chinook platform, alongside testing new hardware that was developed both by Collins and other aerospace companies. This meant that most of my days were spent reading documentation and understanding test procedures, which I was expected to follow one to one. While I did lots of step by step verifications, I also performed my own type of ad-hoc testing, based off of the existing verification procedures and documentation which was available to me. I would have to write down step by step the test cases I created and would have to get them checked off with our team lead before the verification could be approved.

Tasks:

* Updated documentation on CH-47F Chinook that satisfies customer needs and requirements
* Verified software and hardware updates through a suite of system wide tests
* Inspected current and new subsystem designs that are integrated into the Chinook system
* Performed system verifications before software release that verify system integration
* Involved in a 4-week software release test event, including both ad-hoc and step by step procedure verification

Skills/Tools Developed:

* Revision control with Subversion for data specs and mission data
* Updated documentation in DOORS
* Agile workflow

**Software Engineer Intern - Workiva (May 2021 to August 2021)**

During my first internship, after I completed my sophomore year of college, I joined Workiva over the Summer to develop a combination of front and back end code. During this job, our team used an agile workflow to develop and fix bugs for their admin management pages that were used to control different organizations for the products Workiva provided. This job taught me a lot about working in a team environment and the agile workflow, since it was my first exposure to industry engineering since I began college.

Tasks:

* Responsible for designing Java software which managed roles for admin users of organizations
* Verified developed code against an automated test suite and debugged stack errors
* Collaborated with 10+ developers in an agile work flow to continuously enhance and fix old designs

Skills/Tools Developed:

* Coded in Java for back-end development
* Coded in Dart for front-end web design
* Agile workflow
* Debugged existing code base

**Intro to Computer Architecture Teaching Assistant – Iowa State University (August 2023 – May 2024)**

During my graduate degree, I got the opportunity to teach the sophomore/junior level introductory computer architecture course, which I took the semester prior to teaching it. In this course, students learn how to create the basic building blocks to create a single cycle, software pipelined, and hardware pipelined 5-stage MIPS processor. The MIPS instruction set architecture is very similar to RISC-V that is common today. I personally really enjoyed this course, and it is a big reason I chose to focus on digital VLSI design as part of my master’s program at Iowa State. By working as a Teaching Assistant for the class, I was able to help show other students why digital design can be so rewarding, and to push them towards more digital design through my efforts of graduate research.

Tasks:

* Taught and graded multiple 2-hour lab sections on a weekly basis
* Recorded feedback for weekly homework assignments for 70+ students per semester
* Demonstrated best coding practices (VHDL) for utilized digital design tools (ModelSim)
* Held weekly office hours to further support students on a per-need basis

Skills/Tools Developed:

* Taught VHDL Programming best practices for synthesizable designs
* RTL verification, debugging, and synthesis using ModelSim
* Optimized individual designs for system level integration and testing
* Fostering student engagement by connecting coursework to other classes and interests

**Embedded Systems Teaching Assistant – Iowa State University (January 2023 to May 2023)**

As my second time as a teaching assistant, I chose to help teach Embedded Systems 1, which I took as a class in the Spring semester of my Sophomore year. During this class, students are exposed to their first steps to embedded programming in C, done on the application of a Roomba cleaning robot. On top of the robot is a development board with an ARM microcontroller, LCD display breakout, and Wi-Fi UART module, enabling the students to simulate a Mars space mission as a final project. Each week, we cover something new such as outputting data to the LCD display over UART, controlling the movement and sensors of the Roomba, or filtering data from an IR sensor. Since I took this class online during Covid-19 in my sophomore year, it has been very satisfying and engaging to help teach students how to move and control the robots in person.

Tasks:

* Teach 2-hour labs weekly
* Grade lab and homework assignments with relevant course material to the labs
* Collaborate with other teaching assistants and the professor to create an effective learning environment
* Hold office hours to engage with students one on one to answer questions and demo code

Skills/Tools Developed:

* C Programming
* Working with GPIO ports, UART, and ADC’s
* Debugging embedded systems on a Roomba platform
* Mentoring students and teaching best coding practices
* Creating effective learning strategies

**Fluids and Heat Transfer Lab Technician – Iowa State University (August 2021 to January 2022)**

Between being a teaching assistant for my Embedded Systems 1 and Digital Logic class, I worked as a lab technician for the Fluids and Heat Transfer labs in the Mechanical Engineering department. The reason for this was because I was allowed to work more than 10 hours and could do more hands on work with the students during the lab times. While there was a dedicated Graduate TA working with me in the lab, it was my job to help students more with interfacing the lab equipment and how to receive effective data. In the Heat Transfer labs, students were expected to collect data with LabVIEW programs or a FLIR camera to measure the heat dissipation of several different metals and objects. In the Fluids labs, students were expected to measure the flow rates of different pipe systems as different conditions were altered.

Tasks:

* Managed several mechanical engineering labs and performing routine maintenance on equipment
* Collaborated with coworkers to set up upcoming labs and material
* Supported students by verifying measured data points and regression models

Skills/Tools Developed:

* Helped students’ interface LabView to collect appropriate data
* Guided students on best coding practices in MATLAB
* Condensed useful information down to a short announcement to enable students to get more done in the limited lab time.

**Digital Logic Teaching Assistant – Iowa State University (January 2021 to May 2021)**

In my sophomore year, during the Spring semester, I had the opportunity to become a teaching assistant for the first time. I was very excited to teach Digital Logic, since I took the class the previous semester and really enjoyed the “building block” aspect of digital design. During my time as a teaching assistant, I would help students to design combinational logic, sequential logic, and state machines over the course of the semester. It was very satisfying to see the students grow and learn, and slowly increase the rate at which they could develop more and more complex systems. This job helped to show me how much I enjoyed working with HDL and what possibilities could be open to me down the line further on.

Tasks:

* Engaged with students to teach introductory digital design circuits
* Prepared 2 weekly recitations and labs each week for 20 students
* Held 1 office hour each week to help guide students through labs
* Proctored 3 exams online with 60+ students throughout the semester

Skills/Tools Developed:

* Simulated digital circuits with Quartus Prime and Modelsim
* Developed HDL code in Verilog
* Helped students debug digital design modules from examining waveforms
* Reviewed old material and assignments to create effective learning strategies through recitations