

During my internship at Beckhoff, I developed a strong foundation in advanced industrial automation and smart control systems through a combination of structured training, independent learning, and hands-on project work. Early in my placement, I completed a series of TwinCAT-specific training courses, including PLC, Motion Control, and HMI modules, as well as a certification in Object-Oriented Programming (OOP) in TwinCAT. These gave me the skills to program and integrate PLCs with mechanical systems, primarily using IEC 61131-3 structured text, while also gaining exposure to other programming languages such as ladder logic. The HMI training further expanded my skill set by giving me additional experience with HTML and JavaScript, which I applied to develop intuitive human-machine interfaces. Collectively, these experiences strengthened my technical expertise, deepened my understanding of software-hardware integration, and enhanced my ability to independently learn and apply new concepts.

One of the major projects I worked on was the development of a CNC machine using NCI in TwinCAT. I analysed and modified existing code, ultimately achieving a system capable of tracing the Silverstone path. This project required me to apply my Motion Control and PLC training to a complex, real-world machine. In addition to refining the core logic, I designed and developed a complete HMI from scratch. The interface included a control page, an axis monitoring system, scope pages for analysing parameters such as speeds and velocities, and a 3D visualisation built with custom HTML and JavaScript. I also integrated EtherCAT diagnostics (ecDiag) to provide real-time troubleshooting and system feedback. Through this project, I not only strengthened my technical skills but also demonstrated the value of combining motion control, PLC programming, and user interface design into a cohesive and fully functional system.

In addition to this larger project, I was involved in several smaller developments that further broadened my experience. I created a PLC program to monitor office conditions using door sensors, implementing time-based logic to improve out-of-hours security and monitoring. I also contributed to the development of the XTS demonstration sequence by assisting with the design and editing of its state machine. These tasks enhanced my ability to apply PLC logic in various contexts and demonstrated how automation can be adapted to different situations.

I also supported demonstration activities by designing and 3D-printing custom attachments for the XTS and XPlanar systems. These components improved the clarity of demonstrations for the sales team and gave me the opportunity to apply mechanical design skills gained during my degree to a practical, customer-facing context. Another project involved using TwinCAT data analytics to log and monitor the energy usage of electrical systems by tracking voltage and current. This experience gave me hands-on practice with industrial data collection and analysis.

Beyond technical development, I also gained valuable experience engaging with both customers and internal teams. I worked closely with the sales team to explain my projects and received useful feedback from their perspective, which helped me better understand the commercial and customer-facing side of engineering. I also presented my work to a range of audiences—including customers, the sales team, the marketing team, and technical groups—which strengthened my communication and presentation skills.

In particular, these experiences taught me how to adapt complex technical concepts for both technical and non-technical audiences.

Overall, my internship at Beckhoff gave me valuable technical training, project experience, and professional development. I strengthened my programming and automation skills, gained exposure to customer-facing and business operations, and developed transferable abilities in communication, documentation, and problem-solving. The experience provided me with both a strong technical foundation and a broader appreciation of how engineering expertise is applied within a business environment.