Chair of Carbon Composites
TUM School of Engineering and Design
Technical University of Munich

Term Project / HiWi

PCB Development and PLC Interface for a Modular Continuous Fiber Robotic 3D Printing Printhead

Continuous fiber 3D printing enables the manufacturing of high-performance composite structures with tailored fiber reinforcement. At the Chair of Carbon Composites, a modular robotic printhead has been developed for continuous fiber deposition and thermoplastic extrusion. The system integrates multiple motors, heaters, sensors, and cutting mechanisms that are currently controlled by a programmable logic controller (PLC) mounted on the printhead. To further improve system integration and reliability, new electronics and control interfaces are required. This student project focuses on the development of dedicated PCBs for the printhead modules and the extension of the existing PLC control architecture. The goal is to improve signal handling, hardware integration, and communication between sensors, actuators, and the control system. The developed hardware and software will be tested on the robotic continuous fiber 3D printing system at the chair.

Figure 1: KUKA robot and 3D printing printhead at TUM-LCC.

Figure 2: Control cabinet of the PLC.

Research focus of the thesis

- Electronics and PCB development
  - Design and development of custom PCBs for printhead components
  - Integration of temperature sensors, encoders, and other signals into the control system
  - Implementation of signal conditioning and power distribution
- PLC interface and control system development
  - Extension of existing PLC architecture for reliability
  - Implementation of interfaces between PCB hardware and PLC control
  - Documentation

Qualifications:

- Experience in electronics development or PCB design
- Basic knowledge of embedded systems or PLC programming
- Interest in robotics, automation, and additive manufacturing
- Handson mindset and willingness to work in hardware

Starting date: April 2026

For more details please contact:
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