



Robotic Assembly of a Timber Frame Module, ETH Zurich, 2017 (Photo Credit: Gramazio Kohler Research)

Systems Engagement: Robotic Timber Assembly

Class Instruction Mode: Hybrid

This course investigates a conceptual framework for the digital practice of [timber] architecture, which positions digital manufacturing as an integral part of the computational design process. In particular, this course places assembly—the act of putting together discrete elements (e.g., combining timber studs to form a timber frame wall)—as the main generative driver for computational design to bridge the gap between the act of design and the act of making. This conceptual framework requires breaking a building down into sub-assemblies and developing automated assembly procedures to manufacture them. The process requires the implementation of custom algorithms, representation schemes, and digital workflows beyond the built-in functionalities of commercial Computer-Aided Design (CAD) software programs to generate, store, and seamlessly transfer design data to automated assembly routines. Moreover, this process requires the development of custom tools (e.g., end-effectors) and robotic fabrication procedures to manufacture timber sub-assemblies.

The state-of-the-art robotic fabrication facilities at Taubman College provide the necessary infrastructure for this course. Students will work with two KUKA KR60 industrial robotic arms to construct a novel timber pavilion as a real-world case study building. This case study will both assist in exploring the architectural potentials of robotic fabrication technologies and provides the means to rethink architectural production by implementing seamless digital design-to-fabrication chains. The main topics covered in this course include algorithms and data structures, analysis and optimization methods, digital design-to-fabrication workflows, custom tools and fabrication procedures for timber frame construction, robotic fabrication of timber frame sub-assemblies, and onsite assembly.

ARCH 708 – Systems Engagement is required for students in the Master of Science in Digital and Material Technologies (MS_DMT) program. It is also offered to doctoral students, who can register for the course at *Arch 825 – Doctoral Area Seminar-BT*. Interested Master of Architecture students should contact the instructor (aaadel@umich.edu) to check seat availability.