

Advanced Digital Manufacturing and Robotics  
Arch 4050/6050/6306  
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**Premise:**

The use of digital manufacturing and robotics is quickly becoming an engrained part of our profession. The understanding of how these machines function will inevitably become an essential component to an Architect's understanding of how advanced buildings are manufactured both in-situ and in a factory. In the short term Robotics offers a rich territory for exploring new capacities for old materials, and the application of new materials for old capacities. Robotics and automation have long been used for the production of other large scale prefabricated objects, automobiles, aircraft, etc... Their use in large-scale building manufacturing is yet to be widely developed, though many are working to explore the possibilities (*ICD/ITKE University of Stuttgart, Gramazio and Kohler- ETH Zurich, and University of Michigan*, amongst others). The use of robotics in conjunction with advanced tooling affords designer's the possibility to manufacture most any object which can be conceived and in turn most any building imaginable through scalability.

**Objectives:**

This course will explore the use of advanced machinery including robotics for the production of architectural space and effects. The course will address the use of machines at two scales:

- Exploring the method by which materials can be affected by new precise methods of machining.
- Exploring new methods for prefabrication of building componentry using advanced machining.

**Method:**

The first ¼ of the semester will be spent engaged with case studies of ongoing research around the world, while also understanding programming logics of the KUKA robotic programming language and teaching tool, in addition to the *KUKA PRC* plug-in for Grasshopper developed by *Robots in Architecture* at *TU Wein*.

The second ¼ of the semester, working in groups, students will create a built version of one of the case study examples.

The third ¼ of the semester, students will work to design their own end-effector or tool for the robotic arm.

The final ¼ of the semester will be spent working to create an installation or mock up using their own tools.