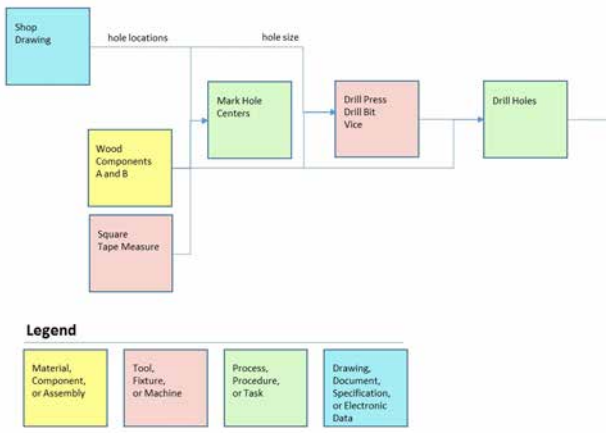

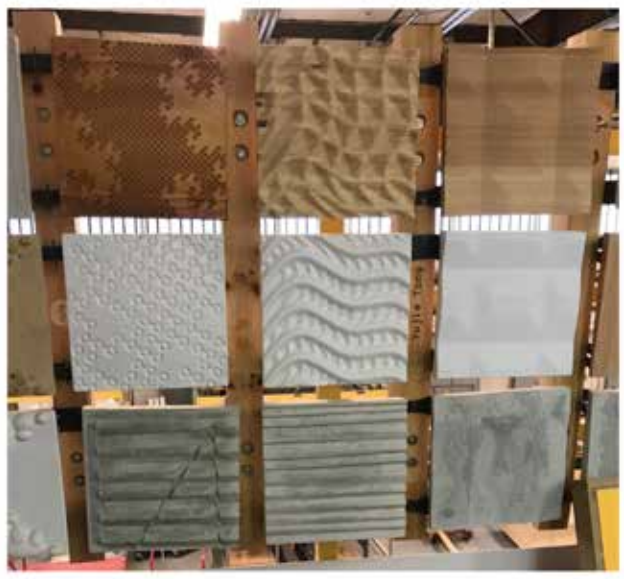

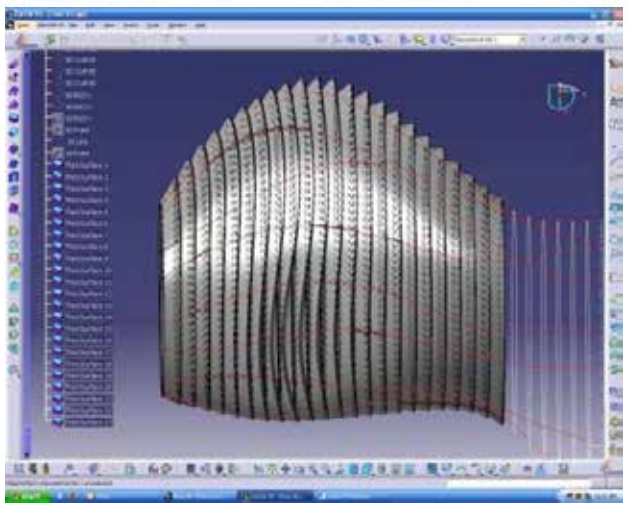

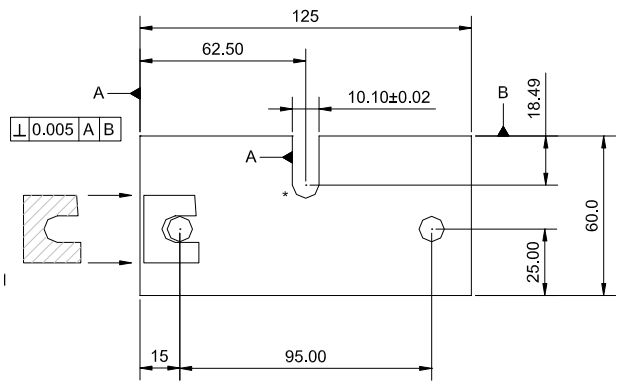

ARCH 6506 – Construction Materials, Systems and Fabrications Fall 2018
Tuesdays, Thursdays 12:00 - 1:15 Digital Fabrication Laboratory

Jacob Tompkins

Construction Materials, Systems, and Fabrications provides an introduction to fabrication in commonly encountered architectural and industrial materials. The course's primary goal is to tie knowledge of materials to techniques for fabrication and subsequently to an understanding of conventional and automated fabrication machines. The course is core for the MS degree in Digital Design and Fabrication (MS DDF) and is also open to M.Arch and M.I.D students. The course is open to undergraduate students on a space-available basis and preference is given to those students pursuing the undergraduate certificate in computational design.

The course focuses on material properties and material creation for four major classes of construction materials: wood, metals, organic polymers, and concrete. The semester is divided into segments where each material is discussed in detail along with methods of fabrication with these materials and along with an introduction to the machines that are used in their material creation and fabrication. The course will introduce the use of automated production machines, their internal operation, and the information used to drive the machines. As a final project students will complete an independent project that ties materials to fabrication to the use of both manual and automated machines.

The course will emphasize parametric representation of materials, construction assemblies, and processes. Students will be required to create functional descriptions of assemblies (e.g., parametric models) and process models for fabrication.

Course Objectives

This course builds knowledge of materials and fabrication techniques – both manual and digital, through materials explorations, parametric modeling of objects and processes, and the use of manual fabrication and CAD/CAM machines.

Key objectives are as follows:

1. Reiterate, reinforce and extend knowledge on basic material properties and construction techniques for common materials used in building construction (from what is assumed to be a basic knowledge from undergraduate materials + methods and structures courses).
2. Develop a knowledge structure that ties material fabrication techniques to material properties and form.
3. Introduce notational means for describing material creation and component assembly.
4. Extend this notation into computational frameworks for digital representation of fabrications and processes.
5. Introduce underlying file formats for communication with digital fabrication machines (g-code, STL).
6. Complete basic scripting for direct creation of fabrication instruction sets.
7. Use high-level CAD/CAM software for creation of fabrication instruction sets, and complete a design exercise using commercial CAD/CAM software.

Laboratory Assignments

The core of this course is a set of laboratory assignments – focusing on building material properties, fabrication machines, and data requirements fabrication decision making and machine operation. Each laboratory will have a preliminary analytical and computational component, and in-lab exercise, and a lab report. For each lab, students will design and fabricate a small simple object to be produced in the material system under consideration

1. Process Models for Fabrication
2. Solid Wood Processing
3. Metal Cutting, Bending and Welding
4. Three-axis CNC Machining
5. CNC Foam Cutting
6. Female Mold Production
7. Male Mold Production
8. Ultra High Performance Concrete
9. Vacuum Forming

Final Project

The final project will require a detailed design and prototyping of a small-scale wall assembly, with complete parametric fabrication drawings. The assembly will be assembled from the components made during the semester. In addition to the physical prototype, the digital models, process diagrams, and photo documentation will be submitted with the final project.