Fall 2018
Tuesday & Thursday 2:00 pm-3:15 pm
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Office Hours: By appointment
School of Architecture, UNC Charlotte

Subtractive **M**anufacturing **S**tudies

Premise

From parametric design to site models, many designers seek methods of model making that are cheaper and saves time. This independent study will focus on subtractive manufacturing techniques, such as CNC milling and Laser Cutting. This exploration will deal with the programming side and the materialistic side of manufacturing.

Objective

The objective of the independent study is to explore different types of materials and their reactions to subtractive manufacturing. Learning and exploring different techniques to explore how forms can be creates that would be near impossible through traditional means.

Method

Class will meet on Tuesdays and Thursdays for discussion and progress. This will consist of planning and executing the projects out, although most of the execution will be done outside of class time.

The midterm will consist of a series of models that will be displayed and photographed for documentation.

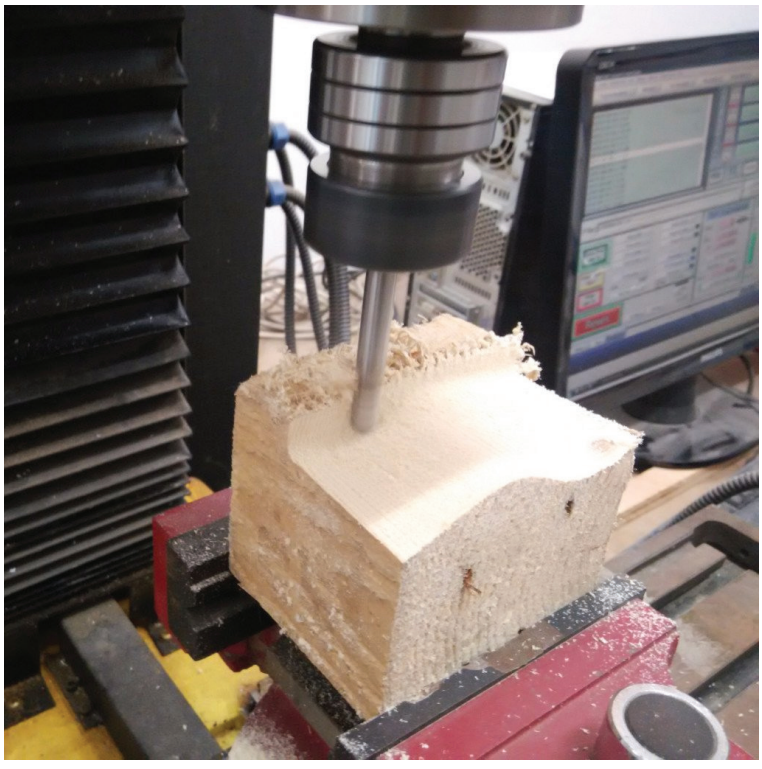
Prerequisites

A basic knowledge of Rhino, RhinoCAM, and Grasshopper

NAAB Criteria

A.2- Design Thinking Skills
A.4 Architectural Design Skills
B.4 Technical Documentation

Schedule	
Week 1	CAD Modeling and process
Week 2	CAD Modeling and process
Week 3	CAD Modeling and process
1 Small scale Model	
Week 4	Developing material palette for milling
Week 5	Test out samples to mill
Week 6	Test out samples to mill
Week 7	Test out samples to mill
Week 8	Test out samples to mill
Week 9	Finalize Tests
3 small scale models with 1 large scale	
Week 10	CAD Modeling and process
Week 11	CAD Modeling and process
Week 12	CAD Modeling and process
Week 13	CAD Modeling and process
Week 14	CAD Modeling and process
Week 15	CAD Modeling and process
Week 16	CAD Modeling and process
3 large scale models with drawings	



Content

Introductory Project:

Proposal: Draft a 1-2 page response inspired by the listed readings and journals researched from outside web sources about other subtractive manufacturing and other options that could potentially be explored. This assignment will be influenced and referenced by ***CNC Milling for Makers: Basics - Techniques - Applications*** by Christian Rattat.

Project 1:

Proposal: Model a design that would take advantage of 3-axis milling. This should include something that has some curvature to test out the resolution you can get with different bits.
Deliverables: 5-10 study models defining the resolution between different bits.

This assignment will be influenced and referenced by ***CNC Milling in the Workshop*** by Marcus Bowman

Deliverables: Rhino Model of milled models.

Project 2:

Proposal: Start moving towards a larger scale of milling. Develop an understanding of how materials react to milling. Produce a physical model that would define the strengths of CNC milling.

Deliverables: 1 large scale physical model that defines strengths in CNC milling.

Project 3:

Proposal: The final project will consist of making 3 large scale models, using different techniques of CNC milling to create the best strengths of each material. Each model must be made out of a different material in order to create an understanding of each material's weakness.

Deliverables: 3 large scale physical models with drawings

General Information & Policies

Research: For assistance with research, students are encouraged to contact Art and Architectural Research Librarian, Jenna Rinalducci. You can also contact her via email at jrinaldu@uncc.edu to ask questions or make an appointment to talk in person.

Academic Integrity: All written and graphic submittals, in-class presentations, and other academic tasks should be your individual and original work unless specifically noted as group projects. No cheating. No plagiarism. It is assumed that you are aware of and will comply with the spirit and specifics of the UNC Charlotte Code of Student Academic Integrity: http://integrity.uncc.edu/. Violations of the Code of Student Academic Integrity will result in disciplinary action. Faculty may ask students to produce identification at examinations and may require students to demonstrate that graded assignments completed outside of class are their own work.

Disability: If you have a diagnosed disability which influences your ability to learn or have your work assessed in the classroom, all efforts will be made to meet your needs. Please provide a copy of your Letter of Accommodation from the UNC Charlotte Office of Disability Services by the end of the second week of classes. Their office is located in 230 Fretwell and more information is available online at: http://www.ds.uncc.edu/. All information about your disability and accommodations will remain confidential. Please see the instructor if you are interested in being an official scribe (note taker) for this course. Your notes will be made available to others in the class with special needs.

Attendance: In order to fully benefit from and participate in this course, attendance is required. Two (2) unexcused absences automatically lower your final grade one letter grade. More than two (2) unexcused absences will constitute grounds for automatic failure of this course. Documentation of excused absences must be submitted in writing and show evidence of the medical or family emergency. When possible, notify your instructor as early as possible in advance of a potential absence.

Workload: This 3-credit course requires 3 hours of classroom or direct faculty instruction and 6 hours of out-of-class student work each week for approximately 15 weeks.

Religious Holy Days: Students whose religious beliefs prohibit class attendance or the completion of specific assignments on designated dates may request an excused absence. If the student notifies the instructor of the classes to be missed due to religious holy days by the end of the second week of classes, the student will be excused. (Eligible religions are those whose places of worship are exempt from property taxation.)

Diversity and Respectful Interaction: All perspectives and opinions are welcomed and will be respected in this classroom or studio, as long as they are presented in manner that is respectful. Intolerance will not be tolerated. Be mindful of your conduct when engaged in experiences and discourses with those who differ from you in appearance, race, ethnicity, beliefs, gender, sexuality, style, politics or intellectual position. If you feel personally uncomfortable or alienated, or that diversity in general is any way stifled in this class, please let the instructor know so that the situation can be remedied.

Culture: Students and instructors alike share responsibility for the collective culture of all SoA courses, all participants are expected to enhance its intellectual life by being present, pro-active, and respectful. All courses actively comply with and promote the SoA and CoAA culture policies, with which it is assumed you are aware. The SoA culture policy is available online at: https://coaa.uncc.edu/academics/school-of-architecture/about-theschool-of-architecture/studio-culture-policy Electronics: At all time during class cell phones, computers and other devices should be switched off and put away, unless permission to use those devices has been explicitly given by the instructor. All students are required to abide by the UNC Charlotte Standard for Responsible Use: http://itservices.uncc.edu/iso/standard-responsible-use. Remember that harassment, as defined in the UNC Charlotte Sexual Harassment Policy, is prohibited, even when carried out through computers or other electronic communications systems, including course-based chat rooms or message boards.

Grading: All courses in the SoA are governed by the rules and regulations of UNC Charlotte as stated in the University Undergraduate and Graduate Catalogs. For more information about these polices, please refer to the appropriate catalog, which can be found online at: http://www.provost.uncc.edu/catalogs/2007%2D2009/ (undergrad) and http://www.uncc.edu/gradmiss/gs_catalog.html (grad).

Grading of courses conform to the following grading scales and values:

Graduate Scale & Values

A 90-100 Commendable
B 80-89 Satisfactory
C 70-79 Marginal
U 69 & Below Unsatisfactory

Grading

Final course grades are based upon the following:
10% Introductory Project
10% Project #1
20% Project #2
60% Project #3

These grades are determined according to the following criteria:

A (Excellent / Commendable): Meets or exceeds stated requirements of the course; exhibits significant improvement, development, and/or intellectual growth over the course of the term; exhibits research efforts from which both the instructor and students may learn; all work turned in on time and presented in a professional manner.
B (Good / Satisfactory): Meets the stated requirements of the course; exhibits good improvement, development, and/or intellectual growth over the semester; provides a measure for student emulation; and all work is turned in on time and well presented.
C (Marginal): Fails to meet most requirements of the course (the work is incomplete to a significant degree); exhibits little or no improvement, development, and/or intellectual growth over the semester; and/or work is of a caliber only marginally acceptable at the graduate level. U (Unsatisfactory): Fails to meet the requirements of the course; and/or the work is incomplete or of a caliber unacceptable at the graduate level. A grade of U will affect eligibility for continued enrollment and will not apply towards degree requirements

Readings:

CNC Milling for Makers: Basics - Techniques - Applications by Christian Rattat
IBSN: 978-1681983028

Workholding for Machinists (Crowood Metalworking Guides) by Tim Stevens
ISBN: 978-1785002380

CNC Milling in the Workshop by Marcus Bowman
IBSN: 978-1847976307

Cost

The cost for the project will be broken down by the material costs and types of material that we will be exploring.

Acrylic: In Stock
Wood: In Stock
High Density Foam
Machine Wax