Intro to Digital Fabrication

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IS 320.01
3 credits, studio
Spring 2017
Tuesday 9:00-3:00
dFab Studio
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Course Description

Digital fabrication practices have revolutionized design and manufacturing, and are literally reshaping the world around us. Increasingly these tools are being employed by artist to create works heretofore impossible or impractical to make.

This class will be an exploration of computer-aided modes of fabrication and their integration into contemporary art and object making. A strong emphasis of this course will be technical training on the laser cutters, 3D printers, and CNC routers in MICA's Digital Fabrication Studio. We will also spend a considerable amount of time working in CAD and CAM software, with a particular emphasis on Rhinoceros. We will also examine the effect of this technology on our understanding of space and material, the structure of our economy and modes of production, and other social and philosophical considerations.

Student Learning Outcomes

- Students will gain a high degree of proficiency with the 3D modeling program Rhino.
- Students will learn to safely and effectively operate the laser cutters and how to determine proper settings for the given material and operation.
- Student will gain an understanding of multiple 3D printing technologies and operate filament-based 3D printers.
- Students will learn to safely and effectively operate the CNC router and how to generate toolpaths from their CAD file using RhinoCAM
- Students will think critically about emerging fabrication technologies and articulate current and future impacts on art, design, and society.
- Student will gain an understanding of algorithmic processes and the spreading effects of computation into physical objects and lived space.
- Students will discuss the social, economic, and technical impact of the "maker" movement and of "open source" projects/community.

Unique aspects of this class

- "flipped classroom" - lectures and tutorials as homework, hands on work in class
- balancing demand on resources

- constantly changing technology
- complexity in software, hardware, and materials

Required Materials (with estimated costs)

- Proper attire as described above($variable).
- A notebook to hold readings, safety handouts, and notes ($2).
- A flash drive ($12).
- Headphones for listening to tutorials in the computer lab($12).
- Materials for exercises will typically be provided
- Materials for projects will be variable. Costs could range from $20 - $500 for the class. This is largely up to the student. One must learn to effectively budget.

Grading Structure

Projects - 45%

There will be two projects over the course of this class. Depending on the development of the class, one or both of these may be done in teams. Projects will draw upon the skills built though exercises. They will not be specific to any one piece of equipment; rather they will be centered upon a general set of fabrication strategies to accomplish a defined goal.

Exercises - 25%

There will be a series of exercises that will allow you to focus strictly upon developing and demonstrating technical skills. Some will be software focused, others will be machine focused, but most will incorporate the two together.

Research: Web Publication and In-Class Presentation - 20%

Each student is responsible for research a topic related to digital fabrication and presenting it to the class. Topics may include a particular artist, an architecture firm, new technology, the social or economic impact of digital fabrication, possible futures, or other topics germane to the class. Topics should be approved by the instructor at least two weeks prior. Students will turn in their sources and research to the instructor. Following approval, student will then present their research to the class. Presentation dates will be established at the beginning of the course via a shared spreadsheet.

Engagement - 10%

As with all classes, participation is an important part of the learning process. Insightful contributions to critiques will help your fellow classmates, and also aid in your own development as an artist. Because of the complexity and rapid change of technology, the field of digital fabrication is one that relies upon the sharing of knowledge and multiple forms of partnership. Engaging in this community, in class and beyond, will be critical to your success in this course and is part of the life-long learning skills necessary to sustain a practice in this field.

Late Work

Due dates for class assignments are strict. All work must be completed and ready to present at the beginning of class on the day it is due. Exercises will not be accepted after their due date. Projects will be penalized one letter grade for every week that they are late. This work is difficult and there will constantly be unexpected problems. Know this and budget your time accordingly.

Revisions

Projects may always be revised. Though the pace of this course makes it difficult to rework pieces, you are certainly encouraged to apply information learned during your critique in order to make that work stronger. Resubmitted work will be re-graded and the new score will replace the old.

Attendance

Attendance is mandatory for this class. Because part of the class is devoted to gaining progressive technical knowledge, missing class quickly creates difficulties. It is also important that you are present for class discussions of readings, which cannot be made up.

You are permitted one unexcused absence. Unless you have a doctor's note or special prior permission from the instructor, all absences are considered unexcused. If you fail to return from lunch break (or fail to make it to class before lunch) you will be considered absent for that class. For the reasons mentioned above, missing class will have an indirect effect on your grade. Any unexcused absence, beyond your one permitted, will lower your grade directly. If you have more than three absences, you will automatically fail the course. It is also important that you arrive to class and return from breaks on time. Tardiness slows down the entire class and is inconsiderate to the instructor and classmates.

If you miss a class, you are responsible for all the material covered that day. It is incumbent upon you that you get assignments, notes, handouts, readings and other information from your classmates. If you know you are going to miss a class, inform the instructor beforehand so that he can point you to some resources to help you cover what you will miss. If you miss class on a day that an assignment is due and have not made arrangements with the instructor, that assignment will be considered late.

Tentative Schedule

Aug 30	Introductions, Syllabus Review, Tour of Fab Lab, Intro to Rhino Hw: Read, watch Lynda, 2D assignment, sign up for research topic, find a tool to redesign or copy
Sep 6	Review Rhino files, laser cutter intro HW: Finish cutting stencil, upload photos of stencils, watch Lynda Ch 7-10, Ch 11-12(extras)
Sep 13	Student research presentations, Look at homework, Measuring with calipers, demo 2D to 3D, Designing for 3D printing HW: Read, tool assignment
Sep 20	Student research presentations, 3D Printing demo, work time for modeling and printing HW: finish modeling and print, upload photos, CNC Joinery reading
Sep 27	NO CLASS HW: Read Rhino CAM Mill Reference pas. 1 -22, design a cross lap joint
Oct 4	Student research presentations, Mini crit of tool assignment, Rhino layouts for milling, tool paths and demo CNC, Introduce Project 1, begin planning and researching HW: Review Rhino CAM manual
Oct 11	Student research presentations, CNC experience cutting joint, begin working on Project 1 HW: Work on Project 1
Oct 18	Student research presentations, Work on Project 1 work day HW: Finish Project 1
Oct 25	Project 1 Critique, Grasshopper intro HW: Parametric Design Readings
Nov 1	Student research presentations, Discussion, Grasshopper Basics HW: Grasshopper pattern assignment, Grasshopper Tutorials CH 5-6
Nov 8	Student research presentations, Data Structure management in Grasshopper HW: “Working with Data Trees” tutorials CH 1-7, data structure exercise
Nov 15	Student research presentations, Grasshopper continued, Introduce Project II HW: Begin working on project 2
Nov 22	NO CLASS // THANKSGIVING BREAK HW: continue research for final project
Nov 29	Research Presentation, work on Project II, individual help HW: Work on Project 2
Dec 6	Research Presentation, course, evaluations, work on Project II, individual help HW: Finish Project2
Dec 13	Crit Project II, document, upload documentation, class wrap up, show cleanup

Put These Art Stars in Your Calendar:

Interdisciplinary Sculpture FALL Visiting Artists:

- Sept. 13th, 5pm, TBD: Itziar Barrio
- Nov 8th, 5pm, Main 110: Andrea Crespo
- Thursday Dec. 13th, 5pm, Main 110: Cécile B. Evans

Mount Royal FALL Visiting Artist:

- Sept. 18 (Falvey OR Lazarus, TBD): Carolee Schneemann.
- Sept. 25: Javier Tellez
- Oct. 9: Carlos Motta
- Nov. 6: Michelle Handelman
- Nov. 13: Evelyn Hankins
- Nov. 27: Nancy Shaver

Students with Extended Illness or Cause for Legitimate Absence

In the case of extended illness or other absences that may keep the student from attending a class for more than three meetings, undergraduate students must contact the Student Development Specialist in the Division of Student Affairs. The Student Development Specialist will then work with the student to determine the cause and appropriateness of the absences and subsequently notify instructors as necessary. Graduate students must contact the instructor, program director, and the Office of Graduate Studies. Students in art education or professional studies programs must contact the Dean for the Center for Art Education or the Associate Dean for Open Studies, respectively. The appropriate administrator will facilitate a conversation with relevant faculty to determine whether the student can achieve satisfactory academic progress, which is ultimately at the sole discretion of the faculty member.

Americans with Disabilities Act

Any student who may need an accommodation based on the potential impact of a disability should contact the Learning Resource Center at 410-225-2416, in Bunting 458, to establish eligibility and coordinate reasonable accommodations.

Environmental Health and Safety (EHS):

Students are responsible to follow health and safety guidelines relevant to their individual activities, processes, and to review MICA's Emergency Action Plan and attend EHS training. Students are required to purchase personal protection equipment appropriate for their major or class. Those students who do not have the proper personal protection equipment will not be permitted to attend class until safe measures and personal protection are in place.

Health and Safety in this Class

Safety will be an ever-present issue, which will develop as we learn new techniques and materials throughout the semester. Like other topics in this class, your grade will be affected by demonstrating your comprehension and application of safety rules. More importantly, your physical health and safety, and that of your class and studio mates, is at stake. It is absolutely imperative that you follow rules given by the instructor, posted in the studio, and stated by the shop manager, tech, or work study. Failure to follow safety rules could result in destruction of very expensive equipment, fires, blindness, loss of body parts, or other injuries. Following the basic safety rules described in class and reinforced in the studios ensures everyone's safety. Failure to do so will not be tolerated. Egregious or repeated failure to follow safety rules will result in your removal from and failure of this class.

While less dramatic, working on computers for extended periods of time poses its own health risks. Be sure to adjust your seat properly, maintain good posture, and take breaks to give your eyes and body a break.

Dress

Come to class every week dressed to work in a fabrication studio. If you are not properly dressed for class, you will be sent home to change and counted late.

Footwear - Open-toed shoes are never permitted. Do not wear shoes with slick soles or high heels. A solid pair of work boots/shoes are recommended.
Pants - No shorts, skirts, or dresses.
Shirt - Be sure that your shirt, and all of your clothes, fit well. Loose clothing can get caught in machinery and pull your hands and body into it.
Gloves - You should have a pair of work gloves to protect your hands while handling certain materials. Be sure to wear your gloves when you should, and don't wear them when you shouldn't. Gloves are unsafe when operating machinery that could grab the glove and pull your hand into the machine.
Hair - If you have long hair, you must tie it back while working in the shop.
Jewelry - No large or dangling jewelry should be worn in the studio.

Plagiarism

Each discipline within the arts has specific and appropriate means for students to cite or acknowledge sources and the ideas and material of others used in their own work. Students have the responsibility to become familiar with such processes and to carefully follow their use in developing original work.

Policy

MICA will not tolerate plagiarism, which is defined as claiming authorship of, or using someone else's ideas or work without proper acknowledgement. Without proper attribution, a student may NOT replicate another's work, paraphrase another's ideas, or appropriate images in a

manner that violates the specific rules against plagiarism in the student's department. In addition, students may not submit the same work for credit in more than one course without the explicit approval of all of the instructors of the courses involved.

Consequences

When an instructor has evidence that a student has plagiarized work submitted for course credit, the instructor will confront the student and impose penalties that may include failing the course. In the case of a serious violation or repeated infractions from the same student, the instructor will report the infractions to the department chair or program director. Depending on the circumstances of the case, the department chair or program director may then report the student to the appropriate dean or provost, who may choose to impose further penalties, including expulsion.

Appeal Process

Students who are penalized by an instructor or department for committing plagiarism have the right to appeal the charge and penalties that ensue. Within three weeks of institutional action, the student must submit a letter of appeal to the department chairperson or program director, or relevant dean or provost related to the course for which actions were taken. The academic officer will assign three members of the relevant department/division to serve on a review panel. The panel will meet with the student and the instructor of record and will review all relevant and available materials. The panel will determine whether or not to confirm the charge and penalties. The findings of the panel are final. The panel will notify the instructor, the chairperson, division, the student, and the Office of Academic Affairs of their findings and any recommendations for change in penalties.

Title IX Notification

Maryland Institute College of Art seeks to provide an educational environment based on mutual respect that is free from discrimination and harassment. If you have encountered sexual harassment/misconduct/assault, please know that there are multiple ways to report it and you are encouraged to do so (www.mica.edu/equal_opportunity). Additionally, in order to meet our commitments to equity and to comply with Title IX of the Education Amendments of 1972 and guidance from the Office for Civil Rights, faculty and staff members are required to report disclosures of sexual violence made to them by students, except when prior notice regarding a specific classroom assignment or discussion is provided. If you require academic accommodations due to an incident involving sexual harassment or discrimination, please contact Student Affairs at 410.225.2422 or Human Resources at 410.225.2363.