Open Source 3D Fabrication (IDA 351.01, Fall 2013)

Class Details
Location: Station 101
Time: Monday, 9:00 am - 3:00 pm
Instructor: Sam Sheffield Office: BR312 (Hours by appointment)
Email: ssheffield@mica.edu
Class Website: http://samsheffield.com/os3dff13

Course Description
This class will cover the basics of 3D design and printing in the MICA 3d studio. Students will work with ~~zbrush~~, ~~rhino~~, *OpenSCAD*, Processing, Arduino/sensors, and other open source applications to create printable, watertight 3D models for their robotic arts, sound, games and new materials projects. 3D laser scanning will also be covered, as will outsourcing fabrication strategies.

Course Goals
"The real voyage of discovery consists not in seeking new landscapes but in having new eyes" - Marcel Proust

This course is intended as a hands-on introduction to open source 3D printing tools. We will cover open source software and hardware which will enable you to design, fabricate, and share watertight 3 dimensional forms. In addition, you will learn how to maintain and operate open source 3D printers such as the RepRap Mendel. In addition, we'll be examining the nature of digital fabrication and open source culture within a creative arts context.

Learning Objectives
Upon completion of this course, you will...
- be able to configure and operate a RepRap 3D printer.
- be able to design watertight 3D models using an open source software toolchain.
- be able to troubleshoot common issues with fused deposition modeling printing.
- have experience working with an online version system for collaborating, backing up, and sharing.
- have a familiarity with open source license options for your own code-based work.

Important Dates
- Last day to drop class (no transcript record): Oct. 1st
- Last day to withdraw from class (W on transcript): Oct. 15th
- Last day of class: Dec. 16th

Required Materials
- Laptop (Mac or PC)
- 3 mm PLA filament (1lb spool or greater)
- Small cutting/shaping tools (Exacto knife, utility knife, small files)
- Sketching materials (notebook/sketchbook, drawing/writing tools

Grading
Grades are based on attendance, class participation, timely completion of assignments and their overall quality, and individual progress.

Grading System
- 3 Projects - 60% (Project 1 20%, Project 2 20%, Project 3 20%)
- Classwork and homework - 20%
- Documentation - 20%

Grading Guidelines
- A, A-: Excellent work, exceeds all basic requirements, demonstrates an understanding of the introduced concepts
- B+, B, B- : Good work, good execution but there are some minor issues, all requirements met, demonstrates that key concepts were understood.
- C+, C, C- : Technically "finished", met the requirements, a number of issues which resulted in unsuccessful execution, demonstrates some understanding of key concepts.
- D+, D, D- : Unfinished, didn't meet requirements, a lot of issues, very little understanding of key concepts demonstrated
- F : Work not turned in, failed to meet the basic requirements, no understanding of key concepts.

Student Responsibilities

Classwork
During class, you are expected to work on exercises or assignments. This is to provide you with in-class time for discussion, troubleshooting, getting/giving help, or whatever else you may need.

This class is intended to be a *peer learning* environment. I not only encourage you to, but expect you, to support and talk to one another during class.

Participation
As a citizen of the classroom, you are expected to actively participate in class exercises, discussions, and critiques.

Projects & Homework
All projects and homework are expected to be completed by the start of class on assigned due date.
All work turned in late will be deducted a full letter grade *per week*.

Collaboration
Collaboration on projects is welcomed! However, each team member must carry their own weight in the development and documentation of each project.

Each collaborator will fill out a Peer Review form, which will allow you to discretely provide feedback on your collaborators. Grades will be given individually, and this feedback will be taken into account.

Documentation
You will be responsible for providing edited documentation of all significant classwork, including projects & exercises.

For projects, this includes all of the following:
- 1 image of your work (minimum)
- 1 brief video
- A copy of source code (and assets, if applicable)
- A brief written document (200-ish words) on your project. (what it is about, how it works, etc.)

For exercises or other classwork, please submit the following:
- 1 image of your work (minimum)
- A copy of source code (and assets, if applicable)

Please put everything in neatly organized in a folder containing the title and your last name. All documentation should be thoughtfully prepared or edited prior to submission.

Project documentation will always be due the week *after* a critique, to allow you time to address any issues raised, if desired.

Exercise/classwork documentation is due by the end of the semester, but can be submitted at any time.

Backing Up Your Work
It is your responsible for backing up and archiving your work. Be sure to save often and make multiple copies of your in-progress projects during the semester.
You will be expected to use Github to manage your projects, so this should be no problem. That is, as long as you are diligently pushing commits…

Getting Help
"Anyone who has never made a mistake has never tried anything new." - Albert Einstein
We'll be covering a lot of material this semester which may be completely new to many of you. Please keep in mind that acquiring any new skill can be slow and difficult process. It is important that you let me know as soon as possible if you are ever unclear or confused about something.

Last Minute Requests
I'm deeply invested in everyone's success in this course, so I would like to help you as much as possible. However, it is important that you contact me as soon as possible. Otherwise, do not be surprised if your request for help received early on Wednesday morning goes unanswered.

A word of advice: 3D printing takes time and is fraught with all sorts of pitfalls which can/will cause you headaches. Don't wait until the last minute to start projects and homework and you should be fine.

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)
It is the responsibility of faculty and students to follow health and safety guidelines relevant to their individual activities, processes, and to review MICA's Emergency Action Plan and attend EHS training. It is each faculty member's responsibility to coordinate with the EHS Office to ensure that all risks associated with their class activities are identified and to assure that their respective classroom procedures mirror the EHS and Academic Department guidelines. Each of these policies and procedures must be followed by all students and faculty. Most importantly, faculty are to act in accordance with all safety compliance, state and federal, as employees of this college and are expected to act as examples of how to create art in a way to minimize risk, and reduce harm to themselves and the environment. Faculty must identify and require appropriate personal protective equipment for each art making process, for each student, in all of their classes, when applicable. Students are required to purchase personal protection equipment appropriate for their major. 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.

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 acknowledgment. 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 the 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. Depending on the circumstances of the case, the department chair may then report the student to the Office of Academic Affairs, which may choose to impose further penalties, including suspension or expulsion.

Class Schedule (subject to change)

Week 1-4 (9/9 -9/30):

- Introduction to open source 3D printing toolchain
- Operating and maintaining the lab's RepRaps
- OpenSCAD basics
- Github basics

Week 5 10/7: Project 1 work session
Week 6 10/14: Project 1 presentations
Week 7 10/21: Project 1 documentation due

Week 7-9 (10/28-11/4):

- OpenSCAD advanced
- Parametric and procedural forms
- Github advanced
- Materials

Week 10 11/11: Project 2 work session
Week 11 11/18: Project 2 presentations

11/25: No class: Thanksgiving

Week 12 12/2: Project 2 documentation due

- Open session. Some possibilities below...
- DIY PCB fabrication
- Introduction to the lasercutter
- Documentation session (classwork, Project 2)
- Project 3 work session
- DIY 3D scanning with the Kinect

Week 13 12/9: Project 3 work session
Week 14 12/16: Project 3 presentations. Documentation due by 12/20