

Instrument Design and Quick Prototyping for the Marine and Environmental Scientist

(1 credit)

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Brief Description for UM Bulletin: Introduction to the principles and applications 3D printing, Laser cutting for non-engineers.

Course Description

In the past, Marine scientists needed to rely on expensive off-the-shelf instruments, or to settle for relatively low-quality sensors and platforms that they fabricated themselves. Recently, however, a "maker movement" has transformed access to sophisticated design and fabrication capabilities, leading to innovation in a wide variety of sectors, including the marine sciences.

This course for non-engineers will cover the basic principles and practice of: (1) computer aided design and drafting (CAD); (2) digital manufacturing techniques using 3D printing and laser cutting. This will be achieved via lectures and hands-on training in the RSMAS Makers Lab, whereby each student will be required to design, and 3D print an object pertinent to their research.

Online Material

<https://f360ap.autodesk.com/courses>

<https://ultimaker.com/learn/comparing-fff-sla-and-sls-technologies>

<https://www.youtube.com/watch?v=3LBTkLsjHGQ>

Learning Objectives:

- Students will learn the basic concepts of CAD 3D drafting (FUSION 360).
- Students will learn how to transition from 3D files to machined, or 3D-printed products.
- Students will learn how to use several types of 3D printers and CNC laser machine for their research work
- By the end of the course, students will have the required skills and experience in creating 3d printed objects from concept to fabrication.

Prerequisites:

For graduate students and for senior undergraduate students with instructor's consent.

Course Policies

Class Attendance:

Attendance is essential for learning the material taught in class.

Honor Code

You are expected to follow the University of Miami's honor code (http://www.miami.edu/sa/index.php/dean_of_students/undergraduate_honor_council/honor_code/). Students caught cheating on exams, improperly referencing published written or electronic material, or submitting work that is not your own will fail the course. No exceptions.

Course Structure

1. Reading material and online resources
2. Participation and questions are strongly encouraged.
3. Final project: Your final project will require you to design and construct an instrument prototype (relevant to you own research, if possible) and present the overall process to the class.

Grading

Final Project 100%

Schedule

TBD

Budget

This course will require \$50 per student in supplies for class demonstrations and to complete the final project

Week	Dates	Lectures and activities
1	TBD	Class Introduction and basic CAD
2	TBD	3D printing, CAD,
3	TBD	Laser Cutting and DXF files, more CAD
4	TBD	CNC router and introduction to CAM, and more CAD
5	TBD	Review of all manufacturing techniques, discuss final project

Final project due last week of class