ARCH151 Introduction to Digital Fabrication

Terps Young Scholars 2026

July 13-31, 2026; MTuThF 10AM - 4PM; W 10AM - 2:30PM (Break 12 - 1PM)

ARCH 0111

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Meetings by Appointment Only

Course Description

Digital fabrication has transformed design and manufacturing, enabling the creation of works once too impractical to produce. This course explores computer-aided fabrication and its role in contemporary design and object making. Students will receive technical training on laser cutters, 3D printers, and CNC routers in the MAPP Fabrication Labs, using CAD software--especially Rhinoceros 3D--to translate digital models into physical forms. The course also considers how these technologies influence our understanding of space, material, production, and broader social and philosophical issues.

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.

Students 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.

Students will gain an understanding of digital processes and the spreading effects of computation into physical objects, lived space, and bodies.

Course Progression

We will begin with Rhino and build CAD skills throughout the program. We will progress through laser cutters in the first week, 3D printing in the next, and focus on the CNC router in the last week.

Dress

Come to class every week dressed to work in a fabrication studio. These rules are critical in the machine shop area, but should be a general practice for when in the Architecture Building.

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/Scarves - No large or dangling jewelry/scarves should be worn in the studio.

Grading Structures and Related Policies

Projects 70%
There will be three projects over the course of this class. Projects will draw upon the skills built through exercises and other class activities, with each project focused on a core technology: laser cutters, 3D printers, CNC router.

Engagement 20%
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 a maker. 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.

Attendance 10%

Note: All work must be documented and posted to ELMS. Uploaded materials are the primary sources for grading.

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.

If you miss a class, you are responsible for all the material covered that day. Be proactive. 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 they 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.

Please visit www.ugst.umd.edu/courserelatedpolicies.html for the Office of Undergraduate Studies' description of the Excused Absence Policy.

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.

Campus Policies

It is our shared responsibility to know and abide by the University of Maryland's policies that relate to all courses, which include topics like: academic integrity, student and instructor conduct, accessibility and accommodations, attendance and missed assignments, grades and appeals, copyright and intellectual property.

Please visit www.ugst.umd.edu/courserelatedpolicies.html for the Office of Undergraduate Studies' full list of campus-wide policies and follow up with me if you have questions.

Policy For The Office Of Civil Rights And Sexual Misconduct

Notice of mandatory reporting of sexual assault, sexual harassment, interpersonal violence, and stalking: As a faculty member, I am designated as a "Responsible University Employee," and I must report all disclosures of sexual assault, sexual harassment, interpersonal violence, and stalking to UMD's Title IX Coordinator per University Policy on Sexual Harassment and Other Sexual Misconduct. If you wish to speak with someone confidentially, please contact one of UMD's confidential resources, such as CARE to Stop Violence (located on the Ground Floor of the Health Center) at 301.741.3442 or the Counseling Center (located at the Shoemaker Building) at 301.314.7651. You may also seek assistance or supportive measures from UMD's Title IX Coordinator by calling 301.405.1142 or emailing titleIXcoordinator@umd.edu. To view further information on the above, please visit the Office of Civil Rights and Sexual Misconduct's website at ocrsm.umd.edu.

Academic Integrity

The University's Code of Academic Integrity is designed to ensure that the principles of academic honesty and integrity are upheld. In accordance with this code, the School of Architecture, Planning, and Preservation does not tolerate academic dishonesty. Please ensure that you fully understand this code and its implications because all acts of academic dishonesty will be dealt with in accordance with the provisions of this code. All students are expected to adhere to this Code. It is your responsibility to read it and know what it says, so you can start your professional life on the right path. As future professionals, your commitment to high ethical standards and honesty begins with your time at the School of Architecture, Planning, and Preservation.

It is important to note that course assistance websites, such as CourseHero, are not permitted sources, unless the instructor explicitly gives permission for you to use one of these sites. Material taken or copied from these sites can be deemed unauthorized material and a violation of academic integrity. These sites offer information that might not be accurate and that shortcut the learning process, particularly the critical thinking steps necessary for college-level assignments.

Additionally, it is understandable that students may use a variety of online or virtual forums for course-wide discussion (e.g., GroupME or WeChat). Collaboration in this way regarding concepts discussed in this course is permissible. However, collaboration on graded assignments is strictly prohibited unless otherwise stated. Examples of prohibited collaboration include: asking classmates for answers on quizzes or exams, asking for access codes to clicker polls, using models from other student or creators (except for Revit families), etc.

Student work that is found to be authored by another individual will be reported to the Office of Student Conduct. If it is found that a student shared their file with another individual "for reference", etc, both students will be reported to the Office of Student Conduct.

Artificial Intelligence

In this course, my expectation is that you will not use any artificial intelligence (AI)-powered programs such as ChatGPT or DALL-E to help you with your assignments. Any use of AI-generated work to outline, write, create, or edit your assignments will be considered an academic integrity violation. These programs may provide inaccurate or biased information, but more importantly, they do not serve your development as a student when learning new software. In this course you will learn valuable skills from outlining, generating, and editing your own work. If you have any questions about this policy or are not sure if a resource you have found will violate this policy, please ask.

Accessibility and Disability Services

The University of Maryland is committed to creating and maintaining a welcoming and inclusive educational, working, and living environment for people of all abilities. The University of Maryland is also committed to the principle that no qualified individual with a disability shall, based on disability, be excluded from participation in or be denied the benefits of the services, programs, or activities of the University, or be subjected to discrimination. The Accessibility & Disability Service (ADS) provides reasonable accommodations to qualified individuals to provide equal access to services, programs and activities. ADS cannot assist retroactively, so it is generally best to request accommodation several weeks before the semester begins or as soon as a disability becomes known. Any student who needs accommodation should contact me as soon as possible so that I have sufficient time to make arrangements. https://ads.umd.edu/.

For assistance in obtaining an accommodation, contact Accessibility and Disability Service at 301-314-7682, or email them at adsfrontdesk@umd.edu. Information about sharing your accommodations with instructors, note taking assistance and more is available from the Counseling Center: https://counseling.umd.edu.

Student Resources And Services

Taking personal responsibility for your own learning means acknowledging when your performance does not match your goals and doing something about it. I hope you will come talk to me so that I can help you find the right approach to success in this course, and I encourage you to visit UMD's Student Academic Support Services website (https://tutoring.umd.edu/) to learn more about the wide range of campus resources available to you. In particular, everyone can use some help sharpen their communication skills (and improving their grade) by visiting UMD's Writing Center (https://english.umd.edu/writingprograms/writing-center) and schedule an appointment with the campus Writing Center.

You should also know there are a wide range of resources to support you with whatever you might need, including UMD's Student Resources and Services website (https://sph.umd.edu/academics/advisingresources/undergraduate-center-academic-success-and-achievement/casa-student-resources-andinformation). If you feel it would be helpful to have someone to talk to, visit UMD's Counseling Center (https://counseling.umd.edu/).

Basic Needs Security

If you have difficulty affording groceries or accessing sufficient food to eat every day, or lack a safe and stable place to live, please visit UMD's Division of Student Affairs website (https://studentaffairs.umd.edu/) for information about resources the campus offers you and let me know if I can help in any way.

Technology Policy

Please refrain from using cellphones, laptops, and other electronic devices during class sessions unless we have designated such use as part of a class exercise.

Netiquette Policy

Netiquette is the social code of online classes. Students share a responsibility for the course's learning environment. Creating a cohesive online learning community requires learners to support and assist each other. To craft an open and interactive online learning environment, communication must be always conducted in a professional and courteous manner, guided by common sense, collegiality and basic rules of etiquette.

Course Evaluation

Please submit a course evaluation through CourseEvalUM to help faculty and administrators improve teaching and learning at Maryland. All information submitted to CourseEvalUM is confidential. Campus will notify you when CourseEvalUM is open for you to complete your evaluations for fall semester courses. Please go directly to the Student Feedback on Course Experiences website (https://www.courseevalum.umd.edu/) to complete your evaluations. By completing all your evaluations each semester, you will have the privilege of accessing them through Testudo, the evaluation reports for the thousands of courses for which 70% or more students submitted their evaluations.

Copyright Notice

Academic / Studio Culture Policy

Studio culture is an ever-changing presence in architectural education and the profession, and it is important to talk about how greatly it impacts our lives, not only in the classroom or the office, but on a day-to-day basis. (from: Studio Culture: Stories and Interpretations A Product of the 2015-2016 AIAS Advocacy Advisory Group) The Architecture Program's Academic/Studio Culture Policy was developed jointly by students and faculty and provides a framework for respectful engagement.

Information on policy can be found online at:
https://arch.umd.edu/sites/default/files/2024-05/Academic%20Culture%20Agreement_Spring%202024.pdf

Retention Of Student Work

University regulations require the professor to retain all examinations for a period not less than one academic year. The School of Architecture does reserve the right to retain certain projects for use in publicity, display, or other official uses such as accreditation. In addition, projects may be retained for archival reasons or in cases of grade disputes. If any student work is retained, faculty members will make every accommodation to permit the student to document that work (photograph or otherwise make reproductions) for use in personal portfolios.

IT Resources And Computer Lab Etiquette

The IT Group Technology Solutions Center (TSC) is a valuable resource for computing related information and inquiry for all students and faculty of the school. Please direct questions and concerns for IT services and equipment and report any and all service problems/outages to the TSC either in person at their office space or via email at TSC@umd.edu. The Digital Media Lab (DML) upstairs and the Digital Research Lab (DRL) downstairs and the Document Output Center (DOC) are public IT facility areas available to all students that must be shared by all students across the school and maintained in a professional manner through appropriate student conduct for the beneficial use of all. The DOC is a facility provided for the support of academic mission of the school relating to student media input/output. The equipment provided is available for student use of the "pay-for-print" system. Students must prepay for all output in the facility. While quiet and constructive communication between students in the lab is encouraged, visits by other students outside the class during class time are not permitted. Students must respect the work and workspace of others at all times. NO FOOD OR DRINK is permitted in the computer labs or IT facilities at any time.

Sustainability

The University of Maryland and the faculty of Architecture believe that sustainability is a big part of the built environment. We encourage you to adopt sustainable practices during this course. Consider the use of materials, printing/plotting efficiency and the energy consumption of your travel and actions on the broader environment and your personal impact on the built environment. For further information visit the Campus Sustainability at the University of Maryland: http://www.sustainability.umd.edu/

Architecture Student Handbook

Please also find other important and complementary information you need to familiarize with in the Student Handbook at: https://arch.umd.edu/sites/default/files/2024-11/0824_ARCH_Student_Handbook_Updated.pdf