**DXARTS 471A: Mechatronic Art, Design, and Fabrication I syllabus**

**Instructor**
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**DESCRIPTION**
Part one of a two-quarter studio sequence exploring the world of physical computing, creative coding and digital fabrication for art and design projects. Provides hands-on prototyping with digital/analog electronics, experimenting with interface design and programming with Arduino, Processing and PureData for the creation and control of interactive objects. The students will engage with the use of smart materials and learn to create their own sensors and actuators through digital crafting tools (such as laser cutters, cnc routers and 3d printers), as well as learn to conceptualize and fabricate responsive environments. Emphasis will be made in the use of mechanics and real-time interaction for multimedia installations and performances that explore surrounding space, movement and the role of the viewer/user in the creation of immersive experiences in the physical world.

**SOFTWARE TO INSTALL**

Arduino: <https://www.arduino.cc/en/software>

Fritzing: [Mac](https://canvas.uw.edu/courses/1434170/files/71874438/download) || [Windows](https://canvas.uw.edu/courses/1434170/files/71874752/download)

**SOFTWARE TO SIMULATE ARDUINO CIRCUITS ON-LINE**

TinkerCAD: [http://www.tinkercad.com](http://www.tinkercad.com/)

**STUDENT RESPONSIBILITIES AND REQUIREMENTS**
• Attend all classes
• Participate in class discussions and workshops
• Complete three mini-assignments
• Complete a ﬁnal project and do a live demo

**POLICIES**
• Late work is not accepted.
• If you have a disability that you think may impact your participation in this class, please contact Disabled Student Services. Every effort will be made to accommodate your needs.

**GRADING (100 points possible)**
• 45 - Assignments (3 assignments, 15 points each)
• 30 - Final Project
• 25 - Participation in class (engagement in class discussions, peer feedback, brainstorming, etc.)

**STUDENT CONDUCT CODE**

The University of Washington's [Student Conduct Code](https://www.washington.edu/cssc/for-students/student-code-of-conduct/) applies to all students. Students are expected to maintain the highest standards of [academic responsibility](https://depts.washington.edu/grading/pdf/AcademicResponsibility.pdf?utm_source=pce.uw.edu&utm_medium=referral&utm_campaign=(not%20set)). Plagiarism and other kinds of academic misconduct are considered serious offenses at the UW. Plagiarism is using someone else’s words or ideas without proper citation. It can range from failure to credit a single sentence or paragraph to passing off an entire article, speech or another student’s paper as one’s own.

**RELIGIOUS ACCOMMODATIONS**

Washington state law requires that UW develop a policy for the accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW’s policy, including more information about how to request an accommodation, is available at [Religious Accommodations Policy](https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the [Religious Accommodations Request form](https://registrar.washington.edu/students/religious-accommodations-request/).

**DISABILITY RESOURCES**

Your experience in this class is important to me. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs in this course.

If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact DRS at 206-543-8924 or uwdrs@uw.edu or [disability.uw.edu](http://depts.washington.edu/uwdrs/). DRS offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructor(s), and DRS.  It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law.

**ACADEMIC INTEGRITY**
Students at the University of Washington (UW) are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity. The UW School of Public Health (SPH) is committed to upholding standards of academic integrity consistent with the academic and professional communities of which it is a part. Plagiarism, cheating, and other misconduct are serious violations of the University of Washington Student Conduct Code (WAC 478-120). We expect you to know and follow the university's policies on cheating and plagiarism, and the SPH Academic Integrity Policy. Any suspected cases of academic misconduct will be handled according to University of Washington regulations. For more information, see the University of Washington Community Standards and Student Conduct website.

**SAFETY**

Call SafeCampus at 206-685-7233 anytime – no matter where you work or study – to anonymously discuss safety and well-being concerns for yourself or others. SafeCampus’s team of caring professionals will provide individualized support while discussing short- and long-term solutions and connecting you with additional resources when requested.

**ASSIGNMENTS**

# **Assignment #1: Things Come Apart**

This first assignment is inspired by [Todd McLellan's book "Things Come Apart: A Teardown Manual For Modern Living"](https://www.youtube.com/watch?v=3EFs7Lx8v7U), which makes visible the inner workings of some of the world’s most iconic design objects. In the book objects like an SLR camera, a mantel clock, an espresso machine, an iPad, a bicycle, etc are disassembled and broken down in order to be understood but to also illustrate the beauty of its components. The pictures are accompanied by essays of notable figures from the worlds of restoration, DIY, and design innovation who discuss historical examples of teardowns, disassembly, and reverse-engineering.

Smithsonian [exhibition of the work](https://www.themsv.org/exhibitions/things-come-apart), [more pics from inside the book](https://www.toddmclellan.com/thingscomeapart) and [essays](https://canvas.uw.edu/courses/1434170/files/71976145/download) accompanying the images.

For this assignment, you need to reinterpret this process by selecting an everyday object, or a piece of clothing that you will break down and photograph in a top-down view like the image above, as well as a small text with background research about your object. Submit on Canvas:

* A picture of your object taken apart.
* A small essay (500 words) about the history of the object, or some of its components that made an impression on you as if you were archaeologists trying to understand its use.

For this first assignment, you will work individually.

# **Assignment #2: Media Archaeology**

# "Media archaeology can be understood as a heterogeneous set of theories and methods that investigate media history through its alternative roots, forgotten paths, neglected ideas and machines. [...]

Indeed, what media archaeology investigates are also the practical rewirings of time, as is done in media artistic and creative practice work, through archives digital and traditional, as well as DIY and circuit bending which recycle, and remix obsolete technology as much as they investigate aesthetic and political economic conditions of technical media.

Media archaeology takes place in artistic labs, laboratories where hardware and software are hacked and opened, but also in conceptual labs for experimenting with concepts and ideas."

[- Jussi Parrika, What is Media Archaeology, beta deﬁnition ver. 0.9, 2012.](https://jussiparikka.net/2012/12/16/what-is-media-archaeology-beta-definition-ver-0-9/)

Taking as a starting point the concept of Media Archaeology ﬁnd a traditional, or even obsolete "technology" and hack it using Arduino and a digital fabrication technique that we have learned in class. Submit on Canvas:

          • An image of your prototype before and after hacking it, together with small paragraph explaining why you' ve selected the speciﬁc technological object and how you' re re-purposing it.
          • A schematic of your circuit (could be drawn by hand or digitally, or a breadboard version using Fritzing).
          • Your Arduino code.

Think creatively! Almost anything around you can be seen as a "technology" (from a book, to a garment, to an old tv or radio, to a wooden toy even).

**Essential bibliography**

**Electronics/Arduino**

* Collins, Nicolas, Handmade Electronic Music: The Art of Hardware Hacking (Second Edition). Routledge, 2009.
* Igoe, Tom, Making Things Talk. O'Reilly, 2011.
* Monk, Simon
* Hacking Electronics: An Illustrated DIY guide for makers and hobbyists. McGraw-Hill, 2013.
* Electronics Cookbook. O'Reilly, 2017.
* Platt, Charles
* Encyclopedia of Electronic Components Vol. 1 (Power Sources & Conversion), Maker Media Inc., 2013.
* Encyclopedia of Electronic Components Vol. 2 (Signal Processing), Maker Media Inc., 2013.
* Encyclopedia of Electronic Components Vol. 3 (Sensors). Maker Media Inc., 2013.
* Quan, Ronard, Electronics from the Ground Up: Learn by Hacking, Designing & Inventing. McGraw-Hill Education, 2015.
* Scarpino, Matthew, Motors for Makers. Pearson Education, 2016.

**Processing**

* Reas, Casey & Fry, Ben,
* Processing: A Programming Handbook for Visual Designers,
Second Edition. MIT Press, 2014.
* Make: Getting Started with Processing, Second Edition. O'Reilly, 2015.
* Shiffman, Daniel,
* Learning Processing, Second Edition: A Beginner's Guide to Programming Images, Animation, and Interaction. Morgan Kaufmann, 2015.
* The Nature of Code: Simulating Natural Systems with Processing. Web PDF, 2015.
* More books at: <https://processing.org/books/>

**Tutorials**

* Arduino: <https://www.arduino.cc/en/Tutorial/HomePage>
* Processing: <https://processing.org/tutorials/>
* SparkFun: [https://www.sparkfun.com/tutorials/](https://www.sparkfun.com/tutorials)
* Adafruit : <https://learn.adafruit.com/>
* How to Get What You Want: <http://www.kobakant.at/DIY/>
* Instructables: <http://www.instructables.com/>
* Hackaday: <https://hackaday.com/>