ITLS 5270/6270 Spring 2015

Craft Technologies

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Course Overview

> "Computers are central to the infrastructure that underlies almost every aspect of modern life—from transportation to medicine, entertainment to economics, and of course, communication. Yet there are curious gaps in the use of computers. Why don't we find them in our walls, clothing and furniture, despite repeated predictions that such a reality is just around the corner? Why don't more people learn how to build and program computers? Why are computing-related professions among the least diverse in society?"
>
> *-Textile Message, LeahBuechely, Kylie Peppler, Mike Eisenberg & Yasmin Kafai*

This course is part of a new movement to transform the landscape of technology education by changing the way we think of and use computers. It's about crafting with digital technologies – making hybrid creations that cross domains. We will use cutting edge technologies alongside more traditional crafts to explore the affordances of different conductive materials for interaction. We will design several projects, exploring the basics of interactive computing.

Graduate students in the course will engage in additional readings concerning learning theories and recent research. We are engaging with new technologies that can enable us to radically re-conceptualize how and when technologies can be used to support learning and instruction in many areas. Topics include: Constructionism, Arts, Technology, STEM Education, interest, and self-identification.

Course Objectives

The course is about designing. In it you will learn to design innovative crafts that bring together a variety of materials, crafting, and computing techniques in innovative ways. It's about creativity & personalized design with materials & techniques new and old. Along the way you will learn some things about *electricity*, *crafts*, and *computing*. And maybe even a bit about design, interactivity, and learning.

Properties of Materials

We will explore the properties of many different materials, new and old, common and hard to find. You should be able to figure out the properties of different materials and how to utilize them in novel designs. For instance, some key concepts of materials include:

- conductivity & resistivity (under different conditions)
- stretchiness, stability, bendability, squeeze-ability
- thickness & pliability
- capacitance

Crafting

We will engage in many different forms of crafting, building on and adding to our own prior expertise. The key is in the integration of traditional and electrical/computational crafts. Limits? Only time, resources, and the expertise amongst course members.

Computing

We will work with 3 programming environments, including ModKit, Arduino, and Scratch. Everyone will learn some of the basics of computing, including:

- Loops
- Conditionals
- Control Structures
- Variables
- RGB color schemes
- Sound (in Hertz)

Interactivity

We will apply the above domains to create interactive physical crafts, things that respond to some sort of user input such as: stretching, bending, squeezing, movement, and light.

Key Principles

Remix

Get help whenever, wherever, and from whomever you want – friends, family, classmates, YouTube, books, Wikipedia. Make sure you give credit where credit is due. Be sure to have ownership over your designs, even if you get tons of help from many people.

Learn as a Community

We're in this together, and the more we share, the better all of our designs and understanding will be. Draw on your prior expertise. Share honest constructive criticism with your classmates. Listen to criticism. Support each other.

Do-over… and over and over and over

This course involves new explorations. You will inevitably need to tear out stitches, re-do code, and re-design objects. It is an *expectation* that your designs will change.

Use Your Expertise

Draw on your own prior expertise in designing. Whether it's computing, knitting, or origami, you can find ways to integrate your own expertise with the materials and techniques covered in the course.

Be Creative

There are few limitations on what you can do in this course beyond time, cost, and initiative. Think creatively, take risks, and do something new.

Course Format

This is a design course and the bulk of our work will be in the form of projects, created together in class and finished on your own time.

Bring Projects to class *KEEP ALL PROJECTS* throughout the semester. You may take them home, but you must bring ALL designs to our final gallery.

Post Blog Reflections on the Canvas site.

Give and receive **Constructive Criticism** in class.

Do the **Readings** and consider them in your **blog posts.**

Asking Questions about the Material

Post questions on the **discussion board.** Many students will benefit from seeing your questions and others' responses. If you have a question, it is very likely that others do as well. The discussion board is a great place for us to learn from each other, sharing questions, answers, experiences, and perspectives. Questions regarding personal concerns may also be sent to the instructor via email, but most questions should be posted online. If you don't know/remember how to do something, not finding out before the next class is not an excuse for not finishing the assignment. We are here to help you succeed, but you have to **ask**!

Required Materials & Course Readings

The course fee provides you with the following materials:

- 2 coin cell batteries, copper tape, loose through-hole LEDs
- LilyPad Protosnap Board from Sparkfun
  https://www.sparkfun.com/products/11262
- Makey Makey Standard Kit from Sparkfun:
  https://www.sparkfun.com/products/11511
- 2 Adafruit Gemma boards
  http://www.adafruit.com/product/1222http://www.adafruit.com/product/1222
- 4 Adafruit Neopixels (1 pack)
  http://www.adafruit.com/products/1260

You will have enough supplies to complete every project this semester, but you may have to reuse parts from project to project. For the Final Project, there will be an opportunity to order additional parts at a discount.

The course readings will be posted and up-to-date in Canvas, and are liable to change:

Buechley, L., Peppler, K., Eisenberg, M., & Kafai, Y. B. (2013). *Textile messages: Dispatches from the world of e-textiles and education*. Peter Lang. Selected chapters.

Course Requirements

You will need to use Canvas extensively in this course, and will be expected to stay connected and up-to-date with that system. All due dates will be kept current in Canvas. Communication outside of class will primarily happen through Canvas announcements, so make sure that your technology is setup in such a way that you receive these announcements. Please check out the Canvas tutorial videos at this link: https://resources.instructure.com/courses/32/pages/canvas-student-tour-videos

Grading

- Class Projects (30%)
    - Paper Circuit
    - Simple E-textile Circuit
    - Capacitive Touch Sensor
    - Handcrafted Sensors
    - Makey Makey Game Controller
    - Sense & React
- Design & Learning Blogs (20%)
- Participation (10%)
- Final Project (40%)
    - Project (25%)
    - Documentation (15%)

Graduate Students

Readings, Teaching, & Reflections on Learning with E-Textiles

Class Projects (30%)

Each project will receive 2 "grades", one for the *project* & one for its *documentation* (i.e., Design & Learning Blog). Blog entries will be due every week to document the development of your crafts. Each *project* will be scored based on following components:

- *Craftsmanship* (how carefully and thoughtfully was the project constructed?)
- *Concept* (how original and compelling is the conceptual design?)
- *Form/aesthetics* (how compelling is the aesthetic design?)
- *Functionality* (does it work?)
- *Timely completion of finished product* (are all your components attached)

In general, everyone brings different expertise to these projects, and everyone will be a novice at some aspects as well. **Improvement** and C**onscious**

Reflection on projects is the most important aspect overall.

Design & Learning Blog (20%)

You are expected to reflect on what you are learning throughout the course as you create your own projects. This will take the form of a weekly Design & Learning Blog, roughly 300-500 words in length, with pictures, videos, and links as needed. It is expected that you will **reflect on your own learning** and draw on some ideas from the course, including theories presented in the readings. You are also welcome to draw on ideas, theories, and experiences from other disciplines (humanities, sciences, engineering, art, etc.). Pictures, videos, and diagrams are strongly encouraged and often required to understand the end product. Imagine how depressing a course book without illustrations would be.

Each blog should answer:

- What challenges did you face? (I.e., what went wrong?)
- What successes did you have? (I.e., what went right?)
- What resources did you use to figure things out? (i.e., peers, guides, online help, instructor, TA, etc.)
- One paragraph connecting to readings and/or ideas from the course

Participation & Constructive Feedback on Class Projects (10%)

Course participation is very important for your success! This will support our collaborative knowledge building.

Participation includes:

- Attendance!
- Engaging in class
- Participating on the course site (comments, discussion boards)
- Asking and responding to questions (in class or online)
- Providing constructive criticism
- Sharing knowledge from your own experience or any ideas from the web (tutorials/ideas/information/links)

Final Project (40%)

- Project (25%)
- Online Tutorial (15%): Posted on Instructables.com

Your final project is the capstone of the course. You are expected to take what you have learned during the semester in addition to any prior experience/knowledge that you have from your major/hobbies, and create

either an **Original Project** or an **Educational Tutorial.** You must consult the instructor concerning your final project **before you begin**.

All Final Projects will be shared broadly on the Internet to the Hobbyist, Educational, or Research Communities

Original Project

An original project is something that has not been created elsewhere, though you are welcome to remix others' ideas. Remixing is encouraged, but it does need to be original in some way. It should go beyond what we have done in the course thus far and be an especially *original*, *creative*, *sophisticated*, or *cooler* project than the prior class projects. Accompanying an original project is a required Instructables.com post, where you provide specific step-by-step instructions so that another person could make your project themselves! See Instructables.com for examples. Specific instructions, pictures of your project in the making, and links to materials, tools, and code are essential to this documentation of your making process. If you are familiar with Pinstrosity (http://pinstrosity.blogspot.com/), we are trying to avoid that!

Educational Tutorial (PDF and online)

An educational tutorial is making a new tutorial that could be used with a targeted group of people. Perhaps you'd like to make an e-textiles or Makey Makey template project that elementary, middle, high school, college, or seniors could create. Perhaps it's something that targets a particular disability. Be explicit about **who** this tutorial is for. Provide some **specific instructions** for making the project but be sure that the project itself is **open-ended** enough for personal expression. Provide **timelines** for how long **each step** of the project should take. Include a list of materials with links for where to obtain them. A teacher should be able to take this and engage a class in making it.

Graduate Readings & Assignments

For the graduate portion of the course, students will be doing some additional readings, reflections, and teaching. There are also 4 assignments (partially integrated into the other assignments) for graduate students. You will be given a check, check +, or check – for each.

1. Integrate readings into Project Reflections. There are two primary ways to do this. (1) You may simply integrate theories and ideas from the readings into your project reflections throughout. (2) You may have a special section at the end of a reflection where you jump up a level and consider ideas/questions/theories from the readings.

   Due: Each Blog.

2. Final 2-page Thought Piece. In addition to your final project and documentation, you will also write a 2-page thought piece (single spaced, Times, font 12, 1" margins) integrating the work you taught to the class with Craft Technologies (see below). This is "academic writing" and should be to the point, thoughtful, and with appropriate citations and references. (References should be included on an additional 3rd page).

   Due: April 29, 2015.

3. Course Teaching. With a partner or a group, you will pick one topic and lead an engaging interactive session with the class, max 15-20 min. Present big ideas, empirical research, etc. The instructor has 4 readings for each topic, and you may include 2-3 more if you find it helpful.

   The teaching must be interesting, engaging, interactive, and directed to a mixed undergraduate and graduate audience related to craft technologies. This is solely for our class, so DO assume that we know some things and that we've all been together.

   20 minutes total, including Q&A time. (You decide where Q&A time should fall in your teaching, but in some form you should solicit questions and allow for discussion. Structure it however you like).

   Possible Topics (apply them to craft technologies):

   - *Constructionism: Origins, Theory & Practice*
     - Papert (1980) Papert (1991); Bruckman (2003); Kafai (2006); Harel & Papert (1990); Denner, Werner & Ortiz (2011)

- *Gender, Diversity & Technology: Influences of Culture, Access, Interest, and Design*
    - Buechley (Ch 11); Searle, Fields & Kafai (2013); Barton, Tan & Rivet (2008); Kafai (1996); Brickhouse & Potter (2001); Bardzell (2013)
- *Arts, DIY & STEM Learning: Why, How, and What Next? (Or: Theories, Models, and Future Directions)*
    - Halverson (2012); Peppler (2010); Resnick, Berg & Eisenberg (2000); Fields, Kafai & Searle (2012); Sawyer (2012); Vygotsky (2004)
- *Computational Thinking & Craft Technologies*
    - Kafai, Fields & Searle (2012); Kafai & Peppler (2010); Grover & Pea (2013); Rose (2004); Turkle & Papert (1990); Wing (2006; 2010)

Grading scale

There is no curve for the class. Grades will be assigned based on the scale below, with your final grade rounded to the nearest tenth of a percentage point. *Note: The instructor is looking for improvement throughout the course.*

Grading scale	
A	90 – 100%
B	80 – 89.9%
C	70 –79.9%
D	60 – 69.9%
F	< 60%

Extra Credit

There will be two ways to earn extra points towards you final grade:

- by helping run a workshop to teach any of the topics that we work on in the class
- by entering and documenting an on time submission to a maker contest

You must get pre-approval via email with the instructor before participating in any of these extra credit activities. The instructor will confirm details on how

many points you will receive. Generally this will be in the 1-3 point range depending on the time you invest. You may enter a contest with one of your class projects or final projects.

Plagiarism

As stated in the USU Student Code, plagiarism is "the act of representing, by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and clear acknowledgment. It also includes using materials prepared by another person or by an agency engaged in the sale of term papers or other academic materials." Plagiarism is harmful both for the author of the original work and for the plagiarizer. Any individuals involved in plagiarizing work will receive an automatic fail for the assignment or project and will be immediately reported to the university administration. This includes plagiarism of projects.

Persons with Disabilities

Students with documented disabilities who are in need of academic accommodations should immediately notify the instructor and/or contact the Disability Resource Center at (435) 797-2444 and fill out an application for services. Accommodations are individualized and in accordance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1992.

Incompletes

In accordance with University policy, incompletes are not to be given for poor performance. There will be no incompletes given except for conditions beyond the student's control, including:

- Incapacitating illnesses that prevent a student from attending classes for a period of at least two weeks
- A death in the immediate family
- Financial responsibilities requiring a student to alter course schedule to secure employment
- Change in work schedule as required by an employer

Other, *unexpected* emergencies may be considered on a case-by-case basis. Regardless of the cause for the incomplete, appropriate documentation of the circumstances is required for an extension to be considered.

Written Assignments

Unless otherwise advised in advance, all written assignments are to be completed in the following format:

1. MS Word file with **your name** and assignment type in the file name.
2. 8.5 x 11, single-spaced.
3. Times or Times New Roman, 12 pt. font, **your name** on first page.
4. Submitted by electronic copy through email.

ALL ASSIGNMENTS MUST BE ORIGINAL WORK

Plagiarism will result in a failing grade. The preferred style for bibliographic referencing is APA (*American Psychological Association*). You can find details about APA documentation on the following helpful website: http://www.wisc.edu/writing/Handbook/DocAPA.html. For educational research, the most popular database is ERIC (*Education Resources Information Center*). This can be found online at: http://www.eric.ed.gov/.

10 Pointers for Good Academic Essay Writing

1. A good general rule to follow in the structure of your papers is "tell them what you're going to say, tell them, then tell them what you said". In the introduction, provide a roadmap of what you are going to say in the paper. It will help your own organization and organizes the paper for the reader to follow your arguments along.
2. Be explicit about your questions, thesis, perspective and put it up front in your introduction. It's best not to leave your reader(s) guessing what the paper is about.
3. Provide signposts or points to your roadmap, e.g., "in this section, the following point…" or "to summarize" or "having covered the…we will now turn to…"
4. Section titles are also good as signposts but be sure that the content of the section reflects the title of the section.
5. Use transition sentences that build from pervious information and connects to the next.
6. Explain terms. Don't put them in quotes and assume the reader will know what you mean. Try very hard not to make assumptions about what the reader knows even though you know who the reader is and he/she might be an expert in your topic. The point is for you to demonstrate that you know the material.
7. Be consistent with your bibliographic referencing style.
8. Be careful not to over-generalize, e.g., "many theorists…" when you are only referencing one study.
9. Don't assume everyone sees or agrees with your perspective, you need to convince the reader of your perspective.
10. Summarize in the conclusion, what you wrote about in the body of the paper. Tie your conclusions back to your original question…how have you proven, answered, shown, presented information that addresses it. Don't introduce new information in the conclusion. It detracts from the cohesiveness.

Paper Circuits Week 1	1/7/15	
	Due:	Short Instructables Review (By Saturday, Jan. 10th) Short Blog Entry in the "Introduce Yourself" discussions on Canvas (By Saturday, Jan. 10th) 3 Question Quiz, "Experience Survey" (By 11:59pm Jan.7th)
	In class:	Introduction to Craft Technologies Paper Circuits, Simple Switches Blog Requirement Discussion (pictures/video/graduate students extra requirements) Teach Paper Circuits Project pack
	Homework:	Teach Paper Circuits Project pack Reading: *Textile Messages*, Introduction and Chapter 1 Blog Entry in the "Working with Paper Circuits" discussion on Canvas
Gemma Week 2	1/14/15	
	Due:	Yours and your students' Paper Circuits Reading: *Textile Messages*, Introduction and Chapter 1 Blog Entry in the "Working with Paper Circuits" discussion on Canvas
	In class:	Share Paper Circuits (Yours and your students) Simple E-textile Circuit Project Introduction Multimeters for debugging Work Time
	Homework:	Simple E-textile Circuit (Finish at Home) Reading: *Manga Electricity* Chapter 1 and *Textile Messages* Chapter 6 Blog Entry "Simple E-textile Circuit" discussion on Canvas
Capacitive Touch Week 3	1/21/15	
	Due:	Simple E-textile Circuit (Finish at Home) Reading: *Manga Electricity* Chapter 1 and *Textile Messages* Chapter 6 Blog Entry "Simple E-textile Circuit" discussion on Canvas
	In class:	Share Simple E-textile Circuit Capacitive Touch Sensor Project Introduction Pseudo Code Introduction (blink a light like a computer, dry erase board) Circuit Blueprint for Capacitive Touch Project (due in class)
	Homework:	Pseudo Code for desired light pattern changes Reading: *Textile Messages* Chapter 4 Blog Entry "Find Sensors In Your Home" discussion on Canvas
Capacitive Touch Week 4	1/28/15	
	Due:	Pseudo Code for desired light pattern changes Reading: *Textile Messages* Chapter 4 Blog Entry "Find Sensors In Your Home" discussion on Canvas
	In class:	Modkit Introduction (basic programming: Turn on an LED, delay, and loops) Work Time (project construction)
	Homework:	Capacitive Touch Project Part 1 (complete construction with working circuits, patches, and completed Modkit code for light patterns) Blog Entry "Capacitive Touch Part 1" discussion on Canvas
Capacitive Touch Week 5	2/4/15	
	Due:	Capacitive Touch Project Part 1(complete construction with working circuits, patches, and completed Modkit code for light patterns) Blog Entry "Capacitive Touch Part 1" discussion on Canvas
	In class:	Aruino Introduction (Turn on an LED, delay, loops, using incoming sensor information) Transfer code to Arduino Combine sensor information with code with if-then statements
	Homework:	Capacitive Touch Project Part 2 (Completed project ready to show using Arduino Code) Blog Entry "Capacitive Touch Part 2" (Include your Arduino code)

Sensors Week 6	2/11/15	
	Due:	Capacitive Touch Project Part 2 (Completed project ready to show using Arduino Code) Blog Entry "Capacitive Touch Part 2" (Include your Arduino code)
	In class:	Share Capacitive Touch Projects Handcrafted Sensor Project Introduction Sensor Use Group Brainstorm More on Multimeters Guest Speaker: Dr. Deborah Fields
	Homework:	Handcrafted Sensor loose group project (Completely Due Next class!) www.Scratch.MIT.edu website signup Blog Entry "Handcrafted Sensors"
Makey Makey Week 7	2/18/15	
	Due:	Handcrafted Sensor loose group project (Completely Due Next class!) www.Scratch.MIT.edu website signup Blog Entry Handcrafted Sensors
	In class:	Handcrafted Sensor Presentation Introduction to Makey Makey Introduction to Scratch, Scratch website (how to adapt code to use with Makey Makey)
	Homework:	Makey Makey Game Controller Project (can work with a partner) Blog Entry "Makey Makey Game Controller Project Part 1 " (construction and pseudo game code)
Makey Makey Week 8	2/25/15	
	Due:	Makey Makey Game Controller Project (can work with a partner) Blog Entry "Makey Makey Game Controller Project Part 1 " (construction and pseudo game code)
	In class:	Work on Scratch game code for Makey Makey Work Time
	Homework:	Makey Makey Game Controller (controller construction and code completed) Blog Entry "Makey Makey Game Controller Project Part 2" (controller construction and code tweaks)
Makey Makey Week 9	3/4/15	
	Due:	Makey Makey Game Controller (controller construction and code completed) Blog Entry "Makey Makey Game Controller Project Part 2" (controller construction and code tweaks)
	In class:	Makey Makey Game Day
	Homework:	None!
3/11/2015	SPRING BREAK SPRING BREAK SPRING BREAK SPRING BREAK SPRING BREAK SPRING BREAK SPRING BREAK	

Sense and React Week 11	3/18/15	
	Due:	Be well rested
	In class:	Introduction to Sense and React Project Lesson in Red/Green/Blue LED Programming Lesson on programming tones Introduction to Final Project
	Homework:	Blog Entry: "Sense and React Part 1" Sense and React Simple Song due Circuit design, pseudo code and sketch for Sense and React Project
Final Project Week 12	3/25/15	
	Due:	Blog Entry: "Sense and React Part 1" Sense and React Simple Song due Circuit design, pseudo code and sketch for Sense and React Project
	In class:	Sense and React work time Introduction to Final Project
	Homework:	Blog Entry "Sense and React Part 2" Sense and React Project Final Project Supply List Final Project 2 minute presentation notes
Final Project Week 13	4/1/15	
	Due:	Blog Entry "Sense and React Part 2" Sense and React Project Final Project Supply List Final Project 2 minute presentation notes
	In class:	Sense and React Presentations 15 min. Break stretch, etc. Final Project 2 minute timed presentations
	Homework:	Final Project Break Down Due Dates Final Project Abstract (250 word essay submit online)
Final Project Week 14	4/8/15	
	Due:	Final Project Break Down Due Dates Final Project Abstract (250 word essay submit online)
	In class:	Instructables requirements (Peer review) Final Project In class work day
	Homework:	Blog Entry "My Final Project Part 1"
Final Project Week 15	4/15/15	
	Due:	Blog Entry "My Final Project Part 1"
	In class:	Final Project In class work day
	Homework:	Completed Final Project Blog Entry "My Final Project Part 2"
Final Project Week 16	4/22/15	
	Due:	Final project presentations Completed Final Project to be graded in class Blog Entry "My Final Project Part 2"
Finals Week Reception	4/29/15	
		Instructables write-up finished, link submitted online 4/29/15 1:30 PM Craft Technologies Exhibition Reception (date, time, location TBD)