Bluetooth LE
ITPG-GT.2789
Don Coleman
This one credit course meets on Friday, February 5, 12, and 19 from 3:20pm to 6:15pm

Bluetooth LE allows low-energy wireless connections between devices like lights, temperature and motion sensors, and wearable and portable devices. You can easily discover and connect to these devices without configuration from your phone, tablet, or laptop. The goal of the class is to introduce the concepts of Bluetooth Low Energy (BLE), explain the BLE protocol, teach students how to design BLE services, and how to build BLE devices.

This one credit class will be taught using Arduino, mobile phones and computers. Programming for the phones and computers will be done with JavaScript using Apache Cordova and Node.js.

Students will learn how to build Bluetooth Low Energy projects to exchange data between devices. They will learn the fundamentals of using Arduino, Apache Cordova and Node.js to create and use BLE services. Students will build a project that demonstrates their understanding of BLE. There will be a suggested project, but students will have the option to design and build their own project.

The class will meet 3 times over 4 to 5 weeks at the beginning of the semester. The first class will be the longest (5 hours) and go over most of the material, examples and give an assignment. The second class (2+ hours) will meet one week later to cover the additional material, answer questions, and help with things in progress. The last class (2 hours) will be a few weeks later to review and critique the student projects.

Platforms
• Arduino
• Node.js (Mac, Windows, Linux)
• Apache Cordova (Android, iOS)

Outline
• Required Hardware
• Basics of BLE
• GAP & GATT
• Advertising & Discovery
• Connecting
• Read, Write, Notify
• Using generic BLE apps
• Building BLE Peripherals
• Arduino & BLE Peripheral
• Dimmable LED
• BLE Button
• BLE Temperature Sensor
• Node.js & Bleno
• Demo examples using a Raspberry Pi and Bleno
• Controlling BLE Peripherals (BLE Central)
• Apache Cordova
• BLE plugin
• Scan for devices
• Connect to a device and explore Services
• Control a LED peripheral
• Read/Notify from a BLE button
• Read/Notify from a BLE sensor
• Node.js & Noble
• Repeat Cordova Examples use a Mac
• Connectionless Data Transfer
• iBeacons
• EddyStone Beacons
• Broadcasting characteristic data
• Examples using Node.js
• Possible Advanced Topics
• Peer-to-peer / Mesh (IPv6/6lowpan, GZLL)
• BLE peripherals on iOS and Android (requires native code)
• BlueZ

**Computer Vision with C++ and openFrameworks**

ITPG-GT.2561

Kyle McDonald

*This one-credit course will meet on Saturday, March 5 from 10 a.m. to 5 p.m. and Sunday, March 6 from 12:00 noon to 1:45 p.m.*

“Computer Vision” refers to a broad collection of techniques that allow computers to make intelligent assertions about what’s going on in digital images and video. Sometimes this means understanding the difference between an image of someone smiling and frowning, or something as low level as whether there is motion in front of a camera. Participants will be introduced to a brief history of computer vision and its relationship to media arts, but most of the time will be spent learning how to work with computer vision addons for
Computer Vision with JavaScript and p5.js
ITPG-GT.2807
Kyle McDonald
This one-credit course will meet on Saturday, Feb 27 from 10 am to 5 pm and Sunday, Feb 28 from 12:00 pm to 1:45 pm

“Computer Vision” refers to a broad collection of techniques that allow computers to make intelligent assertions about what’s going on in digital images and video. Sometimes this means understanding the difference between an image of someone smiling and frowning, or something as low level as whether there is motion in front of a camera. Participants will be introduced to a brief history of computer vision and its relationship to media arts, but most of the time will be spent learning how to work with computer vision frameworks for JavaScript: jsfeat for pixel manipulation, optical flow and object detection, and clmtrackr for understanding faces. Both computer vision classes will cover similar material with different toolkits, and students are welcome to take one or both. Before taking this class, students should have installed openFrameworks, compiled examples, and written some C++

In Short: Recurring Concepts in Art
ITPG-GT.2873
Georgia Krantz
This one-credit course will meet on Friday, January 29, February 5, and February 12 from 9:00 a.m. to 11:55 a.m.

What is the relationship between new media art and the art that preceded it? Has the revolutionary impact of digital media produced entirely independent spaces of art making and creativity? While observing how digital technologies produce new arenas for artistic expression and interpretation, we will examine how 20th-century artists working before the digital boom utilized other media, techniques and approaches to effect comparable formal, conceptual and experiential dynamics. This course will include reading, dialogue and short projects.

Integrated Data Thinking 101
ITPG-GT.2791
Tricia Wang
This one-credit course will meet on Saturday, February 20 from 12:10 pm to 6 pm and Sunday, February 21 from 12:10 pm to 3:05 pm
This course will teach students a research process that is designed for data-rich environments. Students will learn Dataframing©, a framework that unifies discovery and optimization research and integrates big data and thick data methodologies. We will introduce the fundamentals of running Data Sprints©, a rapid and iterative process for learning about users. Students will walk away with a common language for working with quantitative and qualitative, a set of techniques on how to ask the right questions, and a foundation for gathering insights for their projects.

**Practical Writing Workshop for Non-Native English Speakers**

*ITPG-GT.2615*

Adaora Udoji

*Section 1 of this one-credit course will meet for 1.25 hours a week in the first seven weeks of the semester; section 2 of this one-credit course will meet for 1.25 hours a week in the last seven weeks of the semester.*

This class is intended to help non-native English speaking students improve their ability to communicate their ideas in writing. We will go over basic elements of grammar, specific differences from other languages, common usage and expressions, etc. Students will bring in assignments from other classes for review and group editing. There will also be in-class writing exercises.

**Prototyping Interactive Spaces with Spacebrew**

*ITPG-GT.2595*

Brett Renfer

*This one-credit course will meet on Friday, February 19, 26, and March 4 from 3:20 p.m. to 6:15 p.m.*

Spacebrew is an open-source tool for building and experimenting with interactive spaces. It facilitates rapid prototyping of interactive and responsive environments by enabling designers and developers to easily and quickly connect real-time interactive applications across microcontrollers, computers and the cloud.

This workshop will introduce Spacebrew from a technical perspective and explore ways to prototype large scale interactive installations with Spacebrew. On the technical side, we will cover: a high-level introduction to Spacebrew; an overview of how to connect to Spacebrew with Processing, openFrameworks, Arduino, and Javascript; and demonstrations on how to use Spacebrew to connect all of the above together. Students will then be split into small groups and will be tasked with creating prototypes around a specific interactive scenario. Finally, we will explore narratives that can be created when these individual prototypes are networked together.

**The User of Assistive Tech: Engaging with People with Disabilities**

*ITPG-GT.2875*

Georgia Krantz
This one-credit course will meet on Friday, January 29, February 5, and February 12 from 3:20 p.m. to 6:15 p.m.

Creating useful assistive technology means truly understanding the user. Misconceptions about a user's abilities, needs or desires can quickly disrupt the best ideas and intentions. User research and testing is a must for all assistive tech projects, yet many people do not feel comfortable interacting with people with disabilities. This course aims to build an understanding of the importance of user input in assistive tech projects, and best practices for interacting with people with disabilities.

**Visual Listening**  
ITPG-GT.2677  
Jonathan Goldstein  
*This one-credit course will meet on April 4, 11 and 18 from 12:10pm to 3:05pm*

In this mini-course, we will explore the art and craft of drawing to support listening and understanding. The class will meet for three weekly sessions of three hours each. We will practice using an iconic drawing and diagramming style to capture the who, what, where, when, how much, and how of what someone is saying. We will also look at and practice using visual metaphors and visual templates to capture information from people who are speaking. As homework, we will conduct visual interviews of people, and share our experiences in class. In the final class session, we will have a question and answer session with 1 or more guest professional visual listeners, and discuss applications of, and further avenues for exploration of visual listening.

All drawing abilities are welcome. Expect to listen, draw, write, and diagram extensively and in quick succession. This class will be conducted in English and will involve listening carefully to spoken English and drawing representations of that speech in real time. Non native English speakers are welcome, but prepare to have the extra challenge of turning spoken words into pictures in real time in a language that is not your mother tongue. If you are ready for that challenge, you will get a lot out of the class." Students will learn and practice using different visual frameworks to elicit and capture information from other people.

Mini course: 3 sessions:

**Session 1:** Introduction to fundamental visual frameworks. Practice using them to capture information from other people with the help of markers and whiteboard.  
**Homework:** conduct visual interview with someone and visually document.

**Session 2:** Introduction to visual metaphors as a catalyst for conversation. Introduction to using visual templates to guide an interview for specific ends.  
**Homework:** use a visual template to conduct a visual interview and visually document.
Session 3: Practice visually capturing conversation in a group context. Presentations by and Q & A with one or more professionals who use visual listening in their work. Meanwhile students will practice visually capturing this Q & A.

**Visualizing the Universe**  
ITPG-GT.2869  
Carter Emmart  
TBA

Today, astronomers have charted the universe and astrophysicists make dynamic simulations of it to better understand how it all works. The Hayden Planetarium's millennium rebuild produced new ways to view all of this and share it with the world. This course offers a quick overview that covers the concept of visualizing the universe within theater based immersive data visualization. A look at how data across the largest measurable scales can be presented continuously within proper context and displayed through techniques of immersive graphics, interactive presentation and production to tell the most fundamental stories we can ever hope to resolve.

**Two-Credit Courses**

**100 Days of Making**  
ITPG-GT.2793  
Katherine Dillon  
*This 2pt class will meet on Thur from 12:10pm to 2:40pm (for one hour with the first and last class session meeting for 2.5 hours).*

Iteration and its impact on the creative process is the theme of this class. Students will identify a theme, idea or topic they would like to explore over the course of 100 days and commit to making or producing a variation on that idea every day for 100 days. Students who enroll must commit to producing and documenting physical evidence of their efforts. Projects can focus on building, writing, drawing, programming, photographing, designing, composing or any creative outlet.

In parallel to the making, in-class lectures will examine the work of artists who's work has been defined by iteration and discuss the role of discipline and routine in the creative process.

Toward the end of the class we will focus on documentation and reflection on the experience and each student will produce a compilation of their 100 day efforts.

**Biosemiotics**  
ITPG-GT.2867  
Oliver Medvedik  
Wed 09:00am to 11:30am
This two-credit course will meet in the first seven weeks of the semester.

In this course we will be exploring alterations in microbial motion in response to a variety of different stimuli and how this can be applied to make the invisible visible. Specifically we will be using protozoans, eukaryotic microorganisms that are fairly large, to induce and measure chemotaxis (attraction or repulsion to a chemical), phototaxis (attraction or repulsion to light) and galvanotaxis (attraction or repulsion to voltage).

Each of these various stimuli inputs can provoke responses that can then be incorporated into a variety of devices and applications. For example, biotic games can be constructed that allow you to control in real time the direction of movement of paramecia in response to a voltage field that is regulated by a joystick. This raises some interesting philosophical questions as well. The direction of movement of protozoans to a variety of water-borne chemicals can also be employed as a "biosensor", to test for pollutants.

Challenges: Using microbes as the central “component”, design a system that enables you to visualize the unseen.

**Body Electric**
ITPG-GT.2795  Mon 6:30pm to 9:25pm
Conor Russomanno
*This two-credit course will meet in the first six weeks of the semester.*

The human body is comprised of many complex systems, all of which are governed by the analog, electrical messages of the nervous systems. We sense. We perceive. We think. And we act. Or maybe we don’t. At every point in the chain electrons are flowing. Where this is true, electrical potentials can be measured with increasingly accessible tools. This class will be a hands investigation of the electricity produced by your heart (ECG) muscles (EEG) and brain (EEG). We will use novel devices to tap in, measure, analyze, and make inferences about how our bodies are affected by our environments, and in turn, we will learn to harness the electricity of our bodies to control our environments.

**Comics**
ITPG-GT.2925  Thur 3:20pm to 5:50pm
Tracy White
*This two-credit course will meet in the first seven weeks of the semester.*

Comics are more than a narrative form they are a communication medium. Combining words and images thoughtfully is a skill that is applicable to so many things we do. In this class you will look at, and practice, the myriad ways that these elements can be paired so you can hone your storytelling, clarity of thought and ability to innovate. We will breakdown the sequential narrative process into the
techniques necessary to develop a compelling tale and look at how the audience and the format you choose help to shape the final presentation of your ideas.

Students work on several small projects to build up their skills that will culminate in the creation of a feature comic written/drawn/programmed by each student that can be based on a previous assignments or done in conjunction with another class.

You do not need to be a trained artist to take this class, chicken scratch is welcome. You do need to be willing to take chances with your work.

**Computational Portraiture**  
ITPG-GT.2625 Sat 12:00pm to 5:00pm & Sun 12:00pm to 5:00pm  
James George  
*This two-credit course will meet on Saturday, February 6, Sunday, February 7, and Saturday, February 20 from 12 p.m. to 5 p.m., and Sunday, February 21 from 12 p.m. to 2:30 p.m.*

Ten percent of all photographs ever taken were created in just the last year. How has the ubiquity of cameras changed our culture’s relationship to images and altered photography as an artistic medium? By combining digital imaging, new sensing technology, algorithms, and metadata like geolocation, scientists and artists are discovering ways to synthesize new forms of vision out of vast data sets. Have these processes revealed new ways of seeing? What possibilities await in the near future?

During this 2-point course we will survey recent artworks made with techniques such as photogrammetry, 3D scanning, and computer vision, and research the tools used to create them. Students will have one week to conduct a portrait study using one of the techniques explored.

**Design Tool Studio**  
ITPG-GT.2735 Mon 12:10pm to 3:05pm  
Patrick Hebron  
*This two-credit course will meet in the first six weeks of the semester.*

Process is everything.

Any programming language can theoretically produce any program. In practice, though, every tool has its own proclivities and point-of-view, which subtly embed themselves in every aspect of the user’s output. In this class, we will explore software-based toolmaking as an artistic practice in its own right. We will study the process of decomposing complex, high-level features into their granular programmatic elements within a low-level, multiparadigm language, C++. Through the granular control of C++, we will think critically about the process of curating a
set of high-level features within a tool and form opinions about how these curations influence the user’s own creative process.

Each student will test his or her ideas through an iterative, semester-long software development project of the student’s own choosing. Though broadly interpretable, projects should relate to the theme of building software that aids its user in a creative or intellectual process. This could be a user-facing design application (a la Photoshop, Maya, Logic, etc, though obviously less full-featured than those commercial applications) or a developer-facing code library. Students can think expansively about these definitions and challenge these delineations.

Weekly assignments will be given to help guide the design, development and presentation elements of the final project. Students will also be expected to spend time engaging with and responding to the tools built by their peers. Our technical work will be supplemented with theoretical readings from Seymour Papert, Nicholas Negroponte, Buckminster Fuller and others.

**Designing Meaningful Interactions**  
ITPG-GT.2805  
Wed 12:10pm to 2:40pm  
Katherine Dillon  
*This two-credit course will meet in the first seven weeks of the semester.*

This class will focus on how to create interfaces that get people to take the action you intended them to take and how to make that interaction a compelling experience. We will look at a wide range of examples of interaction design and explore different approaches to solving user experience problems across a number of platforms and at a wide range of scales. The class format will include lecture, student presentations, class discussion in-class design exercises and some guest lectures. The class will be very hands-on with assignments each week that focus on a particular aspect of user experience design including research, wire-framing, rapid prototyping, critique and user testing. Tools will include pen and paper, models and digital tools. Students will be active participants in the class and all assignments will be discussed and reviewed in class. Students should come to every class with a computer and sketchbook.

**Development in the Public Interest**  
ITPG-GT.2809  
Fri 3:20pm to 5:50pm  
Harlo Niani Holmes  
*This two-credit course will meet in the last seven weeks of the semester.*

Over the course of the semester, students will team up with people who work in in high-octane environments (journalists, human rights defenders, cop watchers, whistleblowers, and documentary filmmakers) to build technical solutions for the public interest.
Students will be presented with a unique set of design challenges directly from domain experts, and respond with hardware and software solutions specially-honed to meet the client's need. This will require a lot of listening: together, we will work hard to understand the adversaries, threat models, and operational challenges frontline workers face daily.

Students will then be split into teams, and work together in a "sprint" tackling the needs of the client of their choice. First, we will get to know the field through the eyes of our client. Then, we’ll work with our client to design a solution. Finally, we’ll build. This course will be production-heavy, and incorporate two fundamental principles:

Human-centered, collaborative design focus: In our design phases, students will work with people in the field. We will incorporate input and feedback from those who will ultimately use our tools.

Development in the open: Students will not only be graded on the work they produce, but also their development process. Students will be expected to contribute to Stack Overflow, master Github’s pull request and issue tracker features, and learn to work with Transifex.

**Dynamic Web - Mobile**
ITPG-GT.2575     Mon 6:30pm to 9:25pm  
Colleen Higgins  
This two-credit course will meet in the last six weeks of the semester.

This 6-week, 2 point course will be focused on developing and deploying front-end mobile web applications using HTML5, CSS, JavaScript. Additional focus will be on capabilities suited to the mobile device such as the geolocation, touch interfaces, responsive design, sensor data (gyroscope, accelerometer, magnetometer), and media capture. Finally, the course will cover using the open-source Framework PhoneGap to export these web applications as cross-platform mobile apps that can be distributed via Google Play and/or the Apple App Store.

Some programming experience with JavaScript is required (ICM with p5.js or Comm Lab Web)

**Everything is Physical: The Art of Digital Mapping**
ITPG-GT.2801     Fri 3:20pm to 5:50pm  
Chisom Onuoha  
This two-credit course will meet the first seven weeks of the semester.

Course Description: Digital technology has created new opportunities and resources for mapping, cartography, and geolocation-based visual investigation. It has also brought the need to consider issues concerning power, representation, and space. In
this seven-week course, students will be introduced to GIS (geographic information system) basics and learn the practical realities of working with spatial data using digital mapping tools and technologies like mapshaper, Leaflet.js, TileMill, and d3.js. Time will also be devoted to investigating the conceptual questions that inform mapping and strategies for counter-mapping. Topics of discussion will include: what do maps represent as visual information artifacts? What happens when we consider maps as art objects? How is the expression of geodata a result of political processes? What does it mean for virtual creations to refer to physical realities, and in what ways do the two shape one another?

Students will work individually on weekly assignments, but will have the opportunity to collaborate on a final project that addresses the techniques and topics studied in the course.

**Hacking the Browser**

ITPG-GT.2811 Mon 6:30pm to 9:25pm
Cory Forsyth

*This two-credit course will meet the first six weeks of the semester.*

Web browsers were originally only for displaying web pages, but over the years they have become supercharged all-powerful web execution machines. In this class we’ll explore using experimental new browser capabilities and HTML5 APIs to build small web projects that augment and subvert the traditional browsing experience. In class we will look at the mechanics of Chrome extensions, bookmarklets, Chrome Apps, APIs such as: Service Workers, Battery Status, Geolocation, full-screen-mode, notifications, accelerometer usage, video camera access, speech recognition and text-to-speech. Class workshops will include topics such as building one's own ad blocker, programmatically replacing text and images on a website, making sites that respond to external events (such as location, battery life, weather), and creating a motion-based intrusion-detector. Some experience with HTML, CSS, and JavaScript (ICM with p5.js or Commlab Web/Networked Media) are requirements for this class.

**Labor in a Mobile-First World**

ITPG-GT.2797 Fri 09:00am to 11:30am
Ted Roden

*This two-credit course will meet the first seven weeks of the semester.*

This course will explore the very recent history and the future of work, labor, and employment. We’ll research and discuss how the nature of work will continue to evolve in a world with distributed workforces, working primarily mobile on their own time, and how that will affect both the workers and applications. How will applications be built using these models? How will our concept around "work" change?
The course is a balanced between a discussion of the implications of new labor models like Mechanical Turk and Uber and working directly with technologies that have made them possible. Students will create a series of small projects using javascript libraries, frameworks and APIs.

**Machine Learning for Artists**  
ITPG-GT.2863    Thu 3:20pm to 5:50pm  
Gene Kogan  
*This two-credit course will meet in the last seven weeks of the semester.*

This course will introduce machine learning for artistic practice. Machine learning is the technique of teaching computers to learn by example, enabling us to build interactive systems that intelligently respond to a variety of real-time inputs. Example applications include building new musical instruments, interactive installations, and video games whose behaviors are dynamically controlled by nontraditional inputs, such as a Kinect sensor, webcam, or internet data stream.

This course will not cover, nor assumes knowledge of, the technical or mathematical details of machine learning, instead focusing on how to integrate available tools into existing interactive applications, although resources for learning the technical aspects will be provided. The tools we use will be platform-agnostic, making it easier to add machine learning into existing applications. Programming ability will be helpful in customizing the provided tools, but is not required.

We will build interactive systems which use classification -- the ability of machines to assign categories, such as recognizing hand gestures -- as well as regression -- the ability of machines to predict values, such as how happy or sad a facial expression is. We will show how to transmit these values in real-time into environments such as Processing, openFrameworks, Max/MSP, Ableton Live, and others.

The course will also briefly touch upon the current frontiers of machine learning, including data organization, clustering, and visualization, as well as style emulation - - the ability of machines to generate images, audio, and text which imitate particular styles.

**Making Pop-Up Books and Paper Engineering**  
ITPG-GT.2884    Mon 6:30pm to 9:25pm  
Sam Ita  
*This two-credit course will meet the first six weeks of the semester.*

This two-point workshop covers the basics of paper engineering techniques (including folds, layers, dials and pull-tabs) to make movable designs that can be incorporated into your work. Weekly assignments and a final project.

**Mechanisms: If It Moves It Breaks**
ITPG-GT.2687  Thur 12:10pm to 2:40  
**Pete Beeman**

*This two-credit course will meet in the first seven weeks of the semester.*

We will introduce the delightful possibilities of simple machines and fundamental mechanical concepts—such as levers, gears, and linkages—through examples from the history of kinetic sculpture, interactive art, and manufacturing. Look to Alexander Calder’s *Circus* and Theo Jansen’s *Strandbeest* as examples. This class will teach the students the joy of making things that move, the pain of watching them fail, and the knowledge they will need to ensure that what they design won’t fail when it’s most important. Students will quickly engage these concepts with their own initial projects. We will share the challenges professional engineers and artists face when making something move and begin to identify and address those challenges. Discussions will focus on best practices in designing mechanical systems, determining requirements, simple prototyping, specifying, resourcing and manufacturing components, and testing. The students will find examples of things that work, and things that have failed. Site visits to shops where things are made will put these concepts into a real-world context. Students will also be required to design and build a final project that meets a basic set of requirements (e.g. includes at least 2 “simple machines,” is resettable, works, and looks good).

**Muscle: Move It, Bringing the Body Back**
ITPG-GT.2871  Wed 3:20pm to 5:50pm  
**Nancy Nowacek**

*This two-credit course will meet in the first seven weeks of the semester.*

MUSCLE is a class exploring the body as technology through readings, sketches, performance, dirty prototypes and conceptual proposals. For the past 79,850 years of evolution, the body has been the primary tool for transforming the world. Over the past 150 years, the body’s capacities and capabilities have been increasingly outsourced to machinery, appliances, and devices, and essentialized to eyes, ears, and fingertips. We will study the gap between what the body wants and what technology currently asks of it with the goal of bringing the body back into modern life. Students interested in digital performance, physical computing, computer vision and motion tracking will leave the class with a broad foundation in movement and conceptual methods and development for future projects and applications.

The course will survey a range of movement languages and practices — from sign language to crossfit, martial arts, and contemporary cultural forms like dance and slang — and examine the history of movement in industrial design and the physical choreography of tools, and the history of gesture in hardware and software. We will engage with ideas of interface, affordance, prosthetic, and avatar to marry movement, meaning, and device in new and experimental ways. The course is conceptually focused, but we will perform research-in-practice through small, weekly experiments that take the form of sketches, diagrams, videos, and prototypes. Classes may involve moving.
One Story, Seven Ways
ITPG-GT.2813 Thur 6:30pm to 9:00pm
Elena Parker
This two-credit course will meet in the first seven weeks of the semester.

“A work of art is realized when form and content are indistinguishable. When they are in synthesis. In other words, when they fuse.” - Paul Rand

Storytelling - the rehearsal of a narrative in a structured and meaningful way - can take many forms. This class asks how each form in which you tell a single story changes the way that the audience receives that narrative. You will choose a public domain short story and iterate upon it in seven different media. We will examine how to leverage the unique tools of each medium to best communicate a narrative. How do you articulate a character differently in audio versus performance? What part of your narrative is better suited to physical expression? Are there aspects of storytelling that a image or game just do better?
After choosing your short story, you will adapt it to performance, audio, image sequence, physical/installation and as a system or game. Along the way, we will look at outstanding examples of storytelling in each medium and examine how the authors fused form and content.

Prototyping Movies
ITPG-GT.2865 Wed 3:20pm to 5:50pm
Daniel O'Sullivan
This two-credit course will meet in the last seven weeks of the semester.

Have you ever seen a movie set take over several city blocks with trucks and trailers, tents and a crew of one hundred. Even in movies that rely more on special effects than location shooting you can see thousands of names roll by in the credits. Who can afford to tell stories that way? How can you interact with stories made that way? This course will look at how tools like the kinect camera, panoramic video, and XML transmission might allow people to sketch stories out of parts that are more easily composed, reconfigured and shared. The goal is not seamless special effects but rather the rough juxtapositions in the tradition of comics or storyboarding. Using these traditions as templates we will look at the dramatic parts of a story in addition to the audio visual parts. Stories in a living storyboard that can be created by anyone, evolve and intersect with others may never need to be made into a more finished movie. This class will draw on ideas coming out of ITP’s “Consumer Light and Magic” research project so students will be expected to have a pioneering attitude. Student will have assignment to gather compose and distributes parts of a story. Examples will mostly be in javascript with Unity being a viable alternative platform. ICM is a prerequisite and the Comics class might make an interesting compliment.
Puppets and Performing Objects
ITPG-GT.2915  Mon 6:30pm to 9:00pm
Ithai Benjamin
This two-credit course will meet the first seven weeks of the semester.

While grocery shopping, have you ever wanted to be a cucumber? Make out with a red radish or pet a pizza? You can. Following the idea that puppets are “any performing object” and that objects can be useful as stand-ins for human beings, this class explores anthropomorphism, character development, narrative and performance. Through weekly assignments we will bring life to objects that we create, transform or find. Drawing inspiration from different styles of mainstream and experimental art, entertainment and puppetry we will develop original concepts of our own. Exercises explore a range of technologies and materials, from simple sock puppets to hand puppets, marionettes mechanisms and set building. We’ll spend time looking at how to successfully integrate interactive elements from other realms such as music, physical interfaces, etc. into our performances. This is a hands on 7-week class with a mix of individual and collaborative projects. Performance or puppetry skills are not required. You must bring your imagination and willingness to experiment and come up with creative solutions to class assignments. Students will showcase their best work in the annual puppet show aka WAKAPAKA PAPOWAPA.

Rest of You
ITPG-GT.2975  Wed 3:20pm to 5:50pm
Daniel O'Sullivan
This two-credit course meets the first seven weeks of the semester.

We build computers around an illusory image of ourselves. In particular the illusion that our consciousness is the full extent of our experience limits how we might use computers to augment the fuller expression of our lives. This class looks at how you can use computational media to connect with the rest of your existence. The class begins by examining some of the illusions that we operate under and how revisiting those can be helpful. Then you will use sensors to give voice the less represented parts of your body. This class will also serve as a gentle rejoinder to Physical Computing and ICM. Exercises will use bio sensors, cameras, logging, mobile tech, data analysis and visualization.

Sensory Driven Storytelling
ITPG-GT.2733  Wed 6:30pm to 9:00pm
Stacey Mulcahy
Narratives are often linear, with a start and an end, and sometimes even formulaic. How can we create new stories, reactive or even dynamic ones using sensory input to help direct or even define the direction of the narrative? We will explore
narrative driven games or environments in either 2d or 3d focusing on how sensory input can contribute to play and or performance.

Technologies and software to be covered will be Unity3d, communication protocols such as Web Sockets and OSC within the context of Unity3d to capture and share data, and the Kinect. Other hardware input will be addressed as needed through lab times.

**Storytelling with Non-Linear Video**

ITPG-GT.2815 Fri 09:00am to 11:55am
Alon Benari

*This two-credit course will meet in the last six weeks of the semester.*

Throughout history, as new storytelling mediums have emerged, content has adapted to fit the developing form. From oral narratives to theater, cinema, and television, storytelling will always evolve to fit the possibilities enabled by the platform. Yet, despite being interactive by nature, digital storytelling has not fully adapted to the medium. So - how is non-linear video shaping the future of digital storytelling?

This 7-week workshop will combine filmmaking and classic storytelling with gaming mechanics and interface design. The class will introduce the depths of non-linear video and allow students to create their own interactive experience. The focus is on what makes a good story in an interactive narrative environment. Students will have access to the Interlude platform - the industry leader in interactive video (behind videos such as Bob Dylan’s “Like a Rolling Stone”). In addition they will be given "backdoor" access to further customize the software for their own projects.

During the course of the semester, they will work in teams of 2-3 students to produce a short interactive video experience. Weekly lessons will mimic their project creation process - providing tools and knowledge for creative ideation, scriptwriting, film production, and product integration. Students will acquire basic Javascript and CSS skills in the class.

**Web Development with Open Data**

ITPG-GT.2817 Thur 12:10pm to 2:40pm
James Cropcho

*This two-credit course will meet in the last seven weeks of the semester.*

This 7-week, 2-point course will provide a framework for learning how to develop impactful and socially relevant web applications, with emphasis on presentation of freely-available datasets. It will focus on server-side programming using JavaScript, Node.js with Express, the PostgreSQL database, and cloud-based hosting, and will lightly touch on front-end web development. Students will learn to navigate New York City's and The United States' official datasets. The course will be a mixture of
lecture and in-class collaborative coding, with weekly programming and reading homework.

**Three-Credit Courses**

**Looking Forward**

ITPG-GT.2819  Tuesday 6:30pm to 9:00pm
Claire Kearney-Volpe

*This course meets at 2 MetroTech Center*

This course surveys assistive technologies and access for people with low vision and blindness. Historical, contemporary and forward thinking perspectives will be explored and guest lectures from leaders in the field and people with lived experience will be included. Students will learn about low-vision and blindness access and technologies across several domains (web, wayfinding, literacy, socialization, etc.) and will develop the skills to transform and advance them. In partnership with each other and community members that have experience with low-vision and blindness, students will develop their own projects in the second half of the class.

**Four-Credit Courses**

**Always On, Always Connected**

ITPG-GT.2958  Tuesday 12:10pm to 2:40pm
Shawn Van Every

With their always on and always connected nature, mobile devices (phones and tablets) have become the center of our connected self. They offer us the ability to access the network anywhere at anytime, enabling us to share our experiences and share in the experiences of others. They are also starting to emerge as the hub of an emerging set of smart personal accessories such as watches, glasses and jewelry.

In this class, we’ll examine the current state-of-the art in mobile technology and smart devices. We’ll focus on developing applications using Cordova, a set of cross-platform APIs for creating mobile applications with HTML, CSS, and JavaScript as well as connecting to and interacting other devices using BlueTooth.

ICM level programming experience is required.

**Basic Analog Circuits**

ITPG-GT.2728  Tuesday 12:10pm to 3:05pm
Eric Rosenthal
Todays mostly digital world also requires a basic knowledge of circuits that do not require computer processing. Analog circuits are simpler, lower cost, smaller and require less power and still perform many of the functions of digital circuits. In this course students will learn about the basic principles of electricity, components such as resistors, capacitors, diodes, transistors, audio amplifiers, power supplies and timers and circuits that interface to digital devices. The course includes circuits design and fabrication through lectures and hands on labs. Students will also learn the operation of electronic test equipment such as the digital multimeter, oscilloscope and function generator.

**Bodies of War: Engineering Ethics**
ITPG-GT.2823  Thur 3:20pm to 6:15pm
Jessica Behm

This course examines 21st-century technologies of war and asks: What is the edge of ethical engineering? Students will critically examine U.S. Military technologies including robotic exoskeletons, military robots, neural prosthetics and networking (brain warfare), biometric scanning, and UAVs (drone warfare). Soldiers from the U.S. Air Force, U.S. Army, and U.S. Marine Corps branches will join class sessions along with guest speakers to discuss the role of new technologies and robotic warfare during their service in Iraq and Afghanistan. Students will produce a final course project that may be submitted as an essay, multimedia project, or applied technology that engages with the ethical questions posed in the class. Each project will be designed over the course of the semester in direct collaboration with a U.S. Military former or active-duty soldier who will work with students on a theoretical, technical, or performative final project.

In 1992, French theorist Gilles Deleuze observed, “There is no need to fear or hope, but only to look for new weapons.” In the 21st century, the U.S. government, universities, and private institutions collaborate to “look for new weapons” by engineering technologies for American warfare. These technologies often focus on the human body as the site of military innovation. If the U.S. Military is primarily concerned with engineering “technologies of war,” is there an opportunity for engineers, such as ITP graduates, to engineer “technologies of peace?” What design and function would such embodied “technologies of peace” play and can they intervene in an increasingly militarized U.S. society where Google owns military robotic companies and Apple iPhones are used to detonate bombs throughout the Middle East?

**Building Applications for Local Economies**
ITPG-GT.2825  Wed 6:30pm to 9:00pm
Robyn Overstreet

As companies in the "sharing economy" grow more profitable, the more farcical the word "sharing" becomes to describe them. What would it mean to actually share resources within a local community? We’ll interrogate the sharing economy to find pieces useful for building cooperation within communities with and without the exchange of money. We’ll examine alternative currencies, barter, time banking, and cryptocurrencies as possible ways to strengthen local economies. We put potential
solutions in a sociopolitical context, with an eye towards issues of labor, class, and inequality. The class emphasizes reading and discussion, and also introduces technical concepts to facilitate prototyping. Students will build online systems of local exchange using web technologies such as JavaScript, Node.js, CouchDB, and geolocation tools. Those experienced with other web technologies are welcome to use those instead.

Prerequisite: familiarity with Javascript or other web-based programming language.

Syllabus

**Choreographic Interventions**

ITPG-GT.2861  
Mon 7:00pm to 9:30pm

Mimi Yin

*This course meets at 111 Second Avenue.*

Most of us are intimately familiar with interfaces where our movement serves as input to control interactive media. Less familiar are systems designed to compel us to dance, to groove, to move in new and unexpected ways.

This class explores the use of interactive media to “choreograph” in the broadest sense of the word from choreography as dance-making to choreography as crowd control. How do you get someone to soften their chest? Eat space? Change level? How do you shake the entire room? How do you orchestrate duets between strangers?

Conceived as a (re-)introduction to computational media through the lens of dance, students will practice how to apply computational thinking to the craft of choreography.

Using computer vision and a broad range of media from graphics and video, to sound and text, we will look at directing both how people move (quality of movement) as well as where they move (pathways and spatial relationships).

We will evaluate the strengths and weaknesses of the various sensing technologies available to us today. What is the delta between what we can see and feel (strength, hardness, contortion) and what a computer can see and interpret (locations, contours, velocity, acceleration)?

**STRUCTURE**

Over the course of the semester, we will cover 4 topic areas: Pathways, Shape, Space and Sound+Text. Topics will be introduced through movement-based improvisation exercises. Computational strategies will be examined through code examples and custom software tools. For each topic, students will create a small movement study in 2 stages: the first analog, the second computational.
The class will culminate in a showing of student work. Final projects can either be in the form of a tool to aid in movement practice, an interactive installation or a live performance.

Because course topics are organized around movement concepts, technical topics will be introduced and built upon week to week. See syllabus for working list of technical topics.

PREREQUISITES
The course is intended both for anyone looking to deepen their practice in working with movement-based interaction regardless of previous experience with movement technique or programming. As a result, there is no pre-requisite for dance and no pre-requisite for code.

Creative Computing/Interactions Lab UNDERGRAD
ITPG-GT.1000  Mon 12:10pm to 3:05pm
Luisa Pereira Hors

Note: This is an undergraduate course for non-ITP students.

What can computation add to human communication? Creating computer applications, instead of just using them, will give you a deeper understanding of the essential possibilities of computation. Conversely excitement about your computational project ideas whether they be in the domain of art, design, humanities, sciences or engineering will best propel your acquisition of skills necessary to realize those ideas. This course will begin with the expressive capabilities of the human body and how we experience our physical environment. The Physical Computing skills will allow you to go past the limitations of the mouse, keyboard & monitor interface and at locations other than the home or the office. The platform for the class is a microcontroller (Arduino brand), a very small inexpensive single-chip computer that can be embedded anywhere and sense and actuate in the physical world. The core technical concepts include digital, analog and serial input and output. The second portion of the course focuses on fundamentals of computer programming (variables, conditionals, iteration, functions & objects) as well as more advanced techniques such as data parsing, image processing, networking, computer vision. The Java-based ‘Processing’ programming environment is the primary vehicle. Processing is more oriented towards visual displays on desktops, laptops, tablets or smartphones but can also connect back to the physical sensor & actuators from the first part of the class. The course is designed for computer programming novices but the project centered pedagogy will allow more experienced programmers the opportunity to play further with their project ideas and make lots of friends by helping the other students.

Data Art
ITPG-GT.2571  Mon 12:10pm to 3:05pm
Jer Thorp
Fascinating and terrifying things are happening at the intersection of data and culture. Our lives are being constantly measured, and information about us is being surveilled, stolen, and commodified. Dialogue around this data revolution has been dominated by corporations, governments, and industry – but what about the arts? In this class, we’ll investigate the means by which artists can engage (and are engaging) in the collection, processing, and representation of data. Using a research-focused, prototype-based approach, we’ll build a series of collective and individual projects to interrogate the ‘new data reality’. Students will use Processing, along with a variety of open-source data tools (such as D3.js, Miso, OpenRefine, MapBox & CartoDB).

Data in Conflict
ITPG-GT.2829 Wed 6:30pm to 9:00pm
Christina Goodness

Streams of data leak out of environments under duress: journalists and activists in repressive conditions; civilians and organised groups in wartime and conflict zones; prisoners and captives in detention. By nature, the sources of information may be at high risk, and the concept that "privacy is dead" puts human life in danger. Additionally information is a weapon used for advocacy in both sides of conflicts, to convince, to persuade, to create noise. What techniques and tools are used to collect, aggregate, visualise and report on conflict? Are our ethical systems outdated or are there still core principles worth preserving (e.g., "do no harm", "protect victim identity")? This course will look closely at real-life scenarios and the tools and techniques used within conflict environments. Key issues may include the use of open-source intelligence, human-sourced data, big data, evasive tactics, surveillance systems. working in groups, students will be asked to do a series of design exercises with specific constraints for the first half of the semester, like a series of design warm-ups. The second half of the semester students would work individually or in groups to create a prototype of a tool which could be implemented in conflict zones or environments. Students are encouraged to combine this class with lab classes, so that the prototype is sufficiently functioning for the ITP Show. The class will include guest speakers who will provide expert knowledge on specific information problems in conflict zones, to present their own tools, and to provide feedback at end of semester evaluations. The class will also aim to connect students with groups and organizations for further exploration beyond ITP.

Designing Games for Kids
ITPG-GT.2705 Thur 12:10pm to 2:40pm
Gregory Trefry

Making games for kids ain’t easy, but it sure can be rewarding. Kids can be the harshest of critics and also the most appreciative of players.

Designing a game entails crafting a complex and dynamic system to produce engagement. Designing games for kids demands that you do all of that and make it
look super simple. No 20 page booklets of rules. No relying on the good will of the player to hold their attention. Stir in the reality that a 4-year old is radically different from a 7-year old and you've got a formidable, but exciting design challenge in front of you.

Designing games for kids forces you to strip your games down to their essence honing your skills as an interaction designer. This class will lay out a basic framework for game design. Then we’ll use that framework to analyze and design games for different age ranges, skill levels and attention spans. We will also look at the interplay between games and education, focusing on ways to draw out learning through scaffolding. The class will focus heavily on production and playtesting. Students will make a series of games for different age ranges. They will also create curricular materials that scaffold one of their games to draw out elements of learning.

**Digital Fabrication for Arcade Cabinet Design**
ITPG-GT.2707  Thur 6:30pm to 9:00pm
*Mark Kleback*

In the past five years, we’ve seen a strong influx in the indie game community here in NYC. Babycastles gallery, the NYU Game Center, and the Death By Audio arcade are all showcasing games in public spaces. Many of these galleries are starting to display custom arcade cabinets that are impressive manifestations of these games.
In this class, students will use Unity to create a simple multiplayer game that can run on a Windows, Mac, or Linux computer. They will learn to use scripts that will launch this game on startup, and interface with hardware like buttons and joysticks using microcontrollers.
In the second half of the class, they will learn how to construct an arcade cabinet with digital fabrication tools like laser cutters, 3D printers, and CNC cutters. The class will culminate in a finished arcade cabinet that displays the game and can run uninterrupted for months in a public venue

**Directing Virtual Reality**
ITPG-GT.2831.  Wed 3:20pm to 6:15pm
*Sarah Rothberg / Carol Dysinger*

This is a collaboration between Grad Film and ITP.

How does an interesting piece of technology become a tool for making art?

When the Steadicam was invented, it was revolutionary technology, because it was a way to move a camera without laying track. But when Kubrick and the cinematographer who invented it, Garret Brown, got together on The Shining, it began to have a language and a meaning all its own.
In this class, Grad Film directing and cinematography students and ITP students will look at Virtual Reality and experiment with VR storytelling techniques.

We will:
investigate what has come before -- how it has been used narratively, for museum/art installations, and in documentary
compare and contrast the medium’s affordances with those of film, and test what film style elements can be brought into VR --- 360 mise-en-scene
look at the current delivery systems and publication platforms
explore newest techniques used at different studios and by independent makers through site visits and guest lectures
identify and create a vocabulary for the artistic effects created with our own experiments
learn and practice varied techniques for creating 360 content -- from the Ricoh Theta to Multi-camera rigs

Above all, this class will be experimental, focussing on the artistic possibilities of cinematic VR -- an antidote to the tech industry’s impulse to churn out demos for the next newest hardware.

The first half of the class will be more technique heavy, where the latter part will focus on production. The course is 12 weeks scheduled over the course of 14 weeks - with two weeks off (March 23 + April 6) for out-of-class production. The students will form cross-departmental teams, creating several short experiments and one more developed piece, and a deep familiarity with the new possibilities of cinematic VR.

**Energy**
ITPG-GT.2466 Thur 12:10pm to 2:40pm
Jeffrey Feddersen

"Energy has been called the "universal currency" (Vaclav Smil) but also "a very subtle concept... very, very difficult to get right" (Richard Feynman). Building on skills developed in physical computing, we will, through generating and measuring electricity, gain a more nuanced and quantitative understanding of energy in various forms. We will turn kinetic and solar energy into electrical energy, store that in batteries and capacitors, and use it to power small projects. Several sessions will include hands-on labs. We will develop skills useful in a variety of undertakings, from citizen science to art installations, and address a range of topics through the lens of energy. Students will build a final project using skills learned in the class."

**Food Systems: Interventions + Remediations**
ITPG-GT.2833 Wed 12:10pm to 2:40pm
Stefani Bardin
Super storms, drought, abundant chemical and fertilizer overuse and misuse, ozone depletion, fossil fuel exploitation and a crapload of bad decisions have contributed to the myriad causes of Climate Change and the shifting landscape of our Food System. For example, due to erratic weather patterns our coffee bean supply is predicted to diminish by 1/3 in the next 50 years or in the worse case scenario be completely wiped out. Strawberries need a temperate climate and a ton of water to thrive, both of which are becoming more unattainable everyday.

This studio + seminar looks at the impact of human behavior on the environment through the lens of the very complex, dynamic and interconnected Food System and how the collateral of our behavior is swiftly changing what we grow, how we grow it and ultimately what we eat or will be eating in the future. Focusing on such developments as GMO’s and understanding the ways in which technology should not be shunned in favor of a more nostalgic embrace of food systems that is not the golden ticket everyone is expecting. Therefore we will work on projects that examine how technology can be leveraged to address these issues by designing small scale interventions in the areas of bio-remediation, food preservation, foraging and pollination.

**Future of New Media**

ITPG-GT.2297       Mon 6:30pm to 9:25pm  
Art Kleiner

This course explores the next few years in the development of media and related technologies, culture, and geopolitics. It uses scenario planning, a technique for making sense of complex future possibilities. The class works as a large project team, looking ahead 5-10 years. We distinguish predetermined elements from critical uncertainties, identify the underlying patterns that influence events, and come up with a few compelling, plausible stories about possible futures. We present the futures - and the strategies they suggest - to a public audience. The goal of the course is to enable you to make more robust decisions in the face of uncertainty. This is valuable for dealing with technological change, starting a business, plotting a career or making major life decisions. This class has developed a longstanding following at ITP because it helps make sense of the complex world that shapes (and is shaped by) new media.

**Going Public**

ITPG-GT.2835       Thur 6:30pm to 9:00pm  
**Liz Barry**

Chances are, your latest project or enterprise features ways for people to “get involved” and “take action.” But what does it mean to truly participate? This class introduces the idea that participation itself, from digital to non-digital, needs to be designed. We will explore collaboration ventures occurring in the knowledge production, transportation, housing, education, food, and finance sectors. We will analyze these models of
participation for their social and economic impact, then develop our own participation spectrum and apply it toward crafting new problem statements. Throughout this course, we will explore when technology can serve as a democratizing force, while assessing the limits of virtual participation.

Keywords: collaboration, power, facilitation, decision making, community management, network economy, digital labor, platform cooperativism” “In addition to the survey across sectors, and the development and application of our own spectrum of participation, after mid-term we will spend time getting into the details of online community management and group facilitation.

The final project would be to craft a problem statement for a particular issue/sector that clearly articulates a participation design. Problem statements will be delivered to a relevant audience (via PublicLab.org, Medium, others). ” Seminar with possible field trips and guest speakers.

Interactive Music
ITPG-GT.2713 Wed 6:30pm to 9:25pm
Yotam Mann

Interactive Music enables and empowers listeners/players to personalize, perform and explore composed music in greater depth. The democratization of music-making software, music video games, and the rise of DJ’ing has expanded the audience for interactive music to a growing group of people who don’t see music as something to enjoy passively, but as something to actively participate in. Interactive music is not specifically about generative music or audio synthesis, though it can include these topics. It is about realizing a musical idea as a collaboration between the composer and the listener. This course will guide students to make their own interactive music projects while considering how interaction enriches and augments the experience of music. The course will be structured around 1 final assignment in which students create an interactive music project. The technical part of the course will focus on Javascript, Web Audio (an HTML5 specification for audio synthesis, processing and playback) and Tone.js. Students will be encouraged to use Javascript, but ultimately, the language or platform is up to the students.

The class will focus on composing music for interaction by creating low-tech / no-tech interactive music projects exploring methods and dimensions of musical interaction. Topics will include exploring the spectrum of interactive music from playback to full-fledged instruments as well as relevant artistic questions such as “how much control should composers give to their players/listeners”. Students will be exposed to prior-art interactives in contemporary music, game pieces, and video game music. Intermediate projects will give students a chance to learn and apply the lessons on Javascript and the Web Audio API, specifically the interactive music framework Tone.js. Students will then combine the musical and technical lessons into their final projects. Possible projects might include: adaptive-length songs, music-based games, reactive/responsive compositions, interactive performances, collaborative jamming platforms, and interactive music boxes, interactive movie scores. The format of the course will balance instruction, discussion, and jamming.
Live Web
ITPG-GT.2734 Wed 12:10pm to 2:40pm
Shawn Van Every

The World Wide Web has grown up to be a great platform for asynchronous communication such as email and message boards which has extended into media posting and sharing. Recently, with the rise of broadband, more powerful computers and the prevalence of networked media devices, synchronous communications have become more viable. Streaming media, audio and video conference rooms and text based chat give us the ability to create new forms of interactive content for live participants.

In this course, we’ll focus on the types of content and interaction that can be supported through web based and live interactive technologies as well as explore new concepts around participation. Specifically, we’ll look at new and emerging platforms on the web such as HTML5, WebSockets and WebRTC using JavaScript and Node.js.

Experience with web technologies are (HTML and JavaScript) are helpful but not required. ICM level programming experience is required. (Social Software, Internet, Video) Syllabus

Memes: Spreadable Media and Thought Contagion on the Internet
ITPG-GT.2837 Wed 6:30pm to 9:00pm
Zoe Fraade-Blanar

Sleepy kitten videos, reaction gifs, and top-10 lists: digital junk food or vital component of modern sharing society? Memes target the parts of our brain that evolved for communal survival and hijack them for their own selfish ends, replicating and spreading without concern for the welfare of their hosts. This class explores the origins of viral phenomenon and contagious cultural units, from their religious beginnings at the dawn of humanity to their new-found proliferation on the internet. Through readings, discussions, and short and long-form assignments we will try our hands at using viral strategies for political purposes, advocacy, marketing, social interaction, and personal gain. Memes help us express ourselves and feel like part of a group, but they can just as easily lead to trolling, witch-hunting, and bandwagon journalism. Let’s investigate the good, the bad, and the adorable.

Nothing: Creating Illusions
ITPG-GT.2839 Tues 09:00am to 11:30am
Andrew Lazarow

How do we make something from nothing, and nothing from something? The idea of nothing, and optical illusions have been linked since the western discovery of zero lead to the beginning of linear perspective. In this course we will explore an array of optical illusions, ranging from traditional approaches to new technologies. Structured as primarily a studio course, we will work directly with Pepper’s Ghost, disappearing acts, making solid objects appear transparent, invisibility, false sense of depth, and approaches to designing negative space.

Assignments will include:

• Readings and blog post responses.
• Creating small-scale illusions with and without the aid of new technologies
• Exercises in camera analysis and projection mapping
• Calibrating camera values with projector values
• Making user interactions invisible, and then transmittable
• A Midterm: Creating a small scale prototype with controlled interactions
• A Final: Designing a full scale prototype accounting for user interactions

Performing User
IPTG-GT.2841 Wed 12:10pm to 2:40pm
Lauren McCarthy
This 4pt course meets for 14 weeks.

How do the technologies we use on a daily basis choreograph our actions, cause us to perform, and open spaces for improvisation? What are the ways we perform for each other, and how do the internet, mobile phones, and other networked technologies create new performance sites and possibilities?

The course will be structured around four performance assignments, requiring students to perform with physical hardware, on the internet, via telepresence, and in collaboration with a crowd. An important part of the course will be learning to critique each other’s work constructively—experiencing with an open mind, and thoughtfully and articulately responding.

The performance activities will be supplemented with study of prior performance art engaging technology, short readings, and technical workshops. The workshops will introduce technical tools the students may choose to incorporate into their work, such as IFTTT, Twitter bots, WebRTC, and Mechanical Turk. However, the focus will be on considering the context, function, and meaning of these technologies and translating this into novel ways of performing with them. No technical experience is required, though students may incorporate existing skills into their work. A desire to take risks and step outside of one’s comfort zone is necessary.
Piecing it Together
ITPG-GT.2533 Thur 6:30pm to 9:00pm
Eric Hagan

Designing and building physical objects can feel like putting together a puzzle without the box top. Even if you have all the pieces, an extra challenge lies in figuring out how they fit together. Digital fabrication tools make it possible to newly imagine and produce pieces that allow us to recreate or modify the "puzzle" as we see fit. Utilizing historic mechanical equipment (e.g. windmills, clocks, speed governors) as design inspiration, we will explore the possibilities of digital fabrication tools to solve issues of fastening, synchronicity, replaceable parts, repeatability, and modification of existing designs. A central goal of this class is to come to terms, and work productively, with the limitations of these otherwise revolutionary digital fabrication tools—particularly in regards to materials, scale, and aesthetics. By the end of the semester, students will be familiar with Adobe Illustrator, 2D and 3D CAD software, laser cutting, CNC routing, and 3D printing. No prior fabrication or design background is required for this course.

Playful Communication of Serious Research
ITPG-GT.2974 Mon 3:20pm to 6:15pm
Lillian Preston

Exhibition design is the art of marrying experience and information. The best do so seamlessly; the very best surprise and delight you along the way. In this class you will explore the craft of interactive exhibition design through practice. Working in small groups, you will select an NYU researcher whose work is of interest to you and create an interactive experience that presents this research to a broader, public audience. In the process, you will learn to interrogate content and form, audience and environment, medium and message to create a meaningful and playful exhibit experience.

This class is taught by Lillian Preston, Senior Producer at RAAMedia, the world renown exhibit design firm.

Programming Design Systems
ITPG-GT.2843 Tues 09:00am to 11:30am
Rune Madsen

Until recently, the term Graphic Designer was used to describe artists firmly rooted in the fine arts. However, as design products are becoming increasingly dynamic, the field of design is changing too. In this course students explore the field of graphic design through code. Class time will be divided between exploring design topics like colors, grids and typefaces, and applying these towards computational topics like randomization, repetition and generative form. A
significant part of the class will be devoted to understanding systems as an important part of our design history. Weekly readings include relevant writings from the history of graphic design (Josef Muller-Brockmann, Paul Rand), articles from the history of computation (Vannevar Bush, Douglas Englebart, Martin Krampen) and everything in between (Sol Lewitt, Edward Tufte, etc).

The class aims not only to teach the students how to create design systems in code, but also to have something interesting to say about it. The class requires ICM or similar programming background. This class is built on the class “Printing Code”, and students who took that class should not take “Programming Design Systems”

**Project Development Studio**

ITPG-GT.2564 Wed 09:00am to 11:30am
Daniel Rozin

This is an environment for students to work on their existing project ideas that may fall outside the topic areas of existing classes. It is basically like an independent study with more structure and the opportunity for peer learning. This particular studio is appropriate for projects in the area of interactive art, programming, physical computing and digital fabrication. There are required weekly meetings to share project development and obtain critique. Students must devise and then complete their own weekly assignments updating the class wiki regularly. They also must present to the class every few weeks. When topics of general interest emerge, a member of the class or the instructor takes class time to cover them in depth. The rest of the meeting time is spent in breakout sessions with students working individually or in groups of students working on related projects.

**Project Development Studio: Hardware**

ITPG-GT.2821 Wed 09:00am to 11:30am
Jeffrey Gray

The speed of progress in the field of hardware development — championed by the maker movement — has reached dizzying highs over the past few years. However, with this boom of new tools and conveniences comes an increased set of philosophical and conceptual concerns — how do we best recall the lessons of past practitioners and artisans, and apply their same principles to our design/development practices?

Project Development Studio: Hardware is a weekly class, aiming at providing a tangible space where students can research, conceive, and execute on a single idea over the course of the semester. Students with a strong desire to take that idea or prototype to the next stage will be provided a base of operations in this classroom, where they can further chisel out the idea, and put it through the rigors of real-world installation. Project types might include, but are not limited to, reactive sculpture/lighting/furniture, interactive art, networked objects, physical games, or manifestations of data in the real world, just to name a few. Students will be encouraged to explore this struggle over the best means of integrating data from sensors and/or external inputs into tangible objects in the physical world. While students are investigating and sharing their project’s journey
throughout the 14 weeks, we will discuss design patterns, technologies and tools used in today’s physical interaction endeavors. An overall theme for these work sessions emphasizes the adages “nothing is new under the sun” and “what’s old is new again”, as a means of solving problems, reinvestigating solutions used by many different types of craftspeople.

The class will be divided into two sections — in the first, students will be given insights into modern technologies by the professor(s) and special guests, tying them back to the rich history that each was derived from, while at the same time working on researching and defining a project they wish to apply their learnings to. In the second, students will devote their time to advancing these projects, presenting their progress in class each week, and gathering feedback from the professor(s), classmates, and special guests.

**Prototyping Electronic Devices**

ITPG-GT.2845        Thur 6:30pm to 9:00pm
Deqing Sun and Peiqi Su

The most difficult part of prototyping is not the building process, but the process of deciding how to build. If we choose proper technology for prototypes, we can improve their robustness and simplicity. This course will cover available and affordable technologies for ITP students to build prototypes. The course will start from soldering, wiring and LED basics. Then it extends to multitasking, signal processing, communication and advanced skills beyond PCom class. Each session will have lectures followed by in class practice with guidance. Workshop sessions during midterm and final period allow students to work on their own project with help from instructors. No required assignment. Students will listen to lectures and do hand-on practice in class. There will be workshops for students to work on their midterm and final project for other classes.

**Radio Ga Ga**

ITPG-GT.2847        Fri 09:00am to 11:30am
Surya Mattu

Radio waves have been harnessed for communication for over a century. From simple morse code signals to high definition video, this medium has played a critical role in enabling how we, and our devices interact with each other. Thanks to increasingly accessible hardware platforms, the barrier of entry has been lowered for harnessing this medium. Making a project that uses wireless has become cheaper and easier than ever before, however, the protocols used (Wi-Fi, BLE, Zigbee) are still a small part of the entire Radio Frequency (RF) spectrum. This class will start by diving into Wi-Fi as a way of better understanding some RF fundamentals that a lot of wireless infrastructure relies on. We will then dive deeper and look at Software defined Radios and listen to other parts of the spectrum that were previously off limits for creative exploration. These include air traffic control, weather satellites, GSM, and many more!
This class hopes to make radios exciting for the uninitiated with an explanation of the technical fundamentals they are based on along with the social and political impact they have in our current digital landscape.
We will use the FCC allocated radio spectrum as our playground and explore the waves!

**Reading and Writing Electronic Text**
ITPG-GT.2778     Fri 3:20pm to 5:50pm
Allison Parrish

This course introduces the Python programming language as a tool for reading and writing digital text. This course is specifically geared to serve as a general-purpose introduction to programming in Python, but will be of special interest to students interested in poetics, language, creative writing and text analysis. Weekly programming exercises work toward a midterm project and culminate in a final project. Poetics/text analysis topics covered include: character encodings (and other technical issues); cut-up and appropriated text; the algorithmic nature of poetic form (proposing poetic forms, generating text that conforms to poetic forms); transcoding/transcription (from/to text); n-gram analysis and Markov chain generation; performing digital writing. Programming topics covered include: data structures (lists, sets, dictionaries); strategies for making code reusable (functions and modules); functional programming (list comprehensions, recursion); getting data from the web; simple web applications; and parsing data formats (e.g., markup languages). Prerequisites: Introduction to Computational Media or equivalent programming experience

**Readymades**
ITPG-GT.2597     Wed 3:20pm to 5:50pm
Gabe Barcia-Colombo

This course is about taking old things and making them new. Loosely based on the tradition of Marcel Duchamp’s “Readymades,” students will re-imagine old technological devices and antiques as new media installations or art objects in the form of scientific, ethnographic, artistic and historic relics. By embedding new technology (sensors, micro-controllers and small projectors) into found objects, students will explore a combination of anthropology and new-media storytelling. Can we create interactive art devices that tell a human story? How do we maintain artistic control while building artwork that requires human interaction? How can we re-appropriate found objects in a meaningful way to create new-media installations?

This is a production heavy four credit course taught in Max/Msp/Jitter and focused on making museum ready interactive durable installations. Possible projects include: time traveling typewriters, boomboxes from mars, ghost phones and musical bicycles. Pre-requisites include a flair for the absurd...and soldering.
**Reinventing the Wheel**  
ITPG-GT.2849  
Tues 12:10pm to 2:40pm  
Benjamin Light

The class will dive deep into one of the simplest machines. The humble wheel has been with us for millennium, but is ripe for reinvention. We will investigate and create wheeled mechanisms, toys, kinetic sculptures, and robots. Our objects will roll, spin, and slide. We will cover fabrication, mechatronics, design, and engineering techniques. This class will be prototype and fabrication heavy with multiple projects and a final.

**Social Hacking: Appropriating Interaction Technologies**  
ITPG-GT.2851  
Wed 3:20pm to 6:15pm  
Lauren McCarthy / Kyle McDonald

This course explores the structures and systems of social interactions, identity, and representation as mediated by technology. We will investigate ways that technology can be used to augment, subvert, alter, mediate, and ultimately deepen interaction in a lasting way.

How do the things we build and use limit and expand the way we understand and relate to each other? We'll explore this question by building new tools and creating new situations for breaking us out of existing patterns, and discussing contextual examples from media art, performance art, psychology and pop culture. Technologies explored will include computer vision (face/body/eye tracking with openFrameworks), data representation and glitch, browser extensions and plugins (in Chrome), computer security, mobile platforms, and social automation and APIs (Facebook, Twitter, Mechanical Turk).

Students will develop projects that alter or disrupt social space in an attempt to reveal existing patterns or truths about our experiences and technologies, and possibilities for richer interactions. Different tactics for intervention and performance will be explored, first through a set of short prompts or experiments, and then through a larger, more thorough intervention.

Technical requirements:

A conviction that creative people can derail society for the best, a deep love for code, and a willingness to explore uncomfortable situations. You should at least have taken Introduction to Computational Media or have similar experience with programming.
Benjamin Light

Subtractive fabrication is a common manufacturing process that produces durable and functional objects. This class will cover multiple techniques on machining and milling raw material into custom parts. We will focus on both traditional and digital fabrication tools: lathe, CNC router, 4 axis mill, etc. We will cover CAD, CAM, and machine setups as well as research affordable desktop milling solutions for personal shops.

The class will be hands on and fabrication heavy, paying close attention to precision, accuracy, and craftsmanship.

There will be weekly fabrication exercises, a midterm, and a final project. It’s mill-er time.

**Temporary Expert: Design + Science in the Anthropocene**
ITPG-GT.2853      Tues 12:10pm to 2:40pm
Stefani Bardin

This class provides foundational understanding of the scientific and social issues related to the design of resilient urban futures. It provides ways of understanding our shifting ecological landscapes and the need to engage in design that addresses the conditions of the time we are living in now = the Anthropocene = the epoch when human beings began to problematically impact global climate and ecosystems.

Following the methodology of “The Temporary Expert,” students will combine traditional research and analysis with hands-on experimental project development. We will use the scientific method as an investigative and evaluative tool for these design interventions by learning to test and measure a variety of different kinds of data and then creating projects to evaluate, share and even perform this information.

Students will learn to pinpoint and begin to understand the increasingly mercurial geological conditions of our planet supplemented by field trips to bio-labs, workshops with scientists and visits from artists working within the scientific world. Weekly work consists of readings, interviews, writing, daily artistic practice and systems thinking exercises.

**The Nature of Code**
ITPG-GT.2480       Wed 12:10pm to 3:05pm
Mimi Yin

Can we capture the unpredictable evolutionary and emergent properties of nature in software? Can understanding the mathematical principles behind our physical world help us to create digital worlds? This class focuses on the programming strategies and techniques behind computer simulations of natural systems. We explore topics ranging from basic mathematics and physics concepts to more advanced simulations of complex systems. Subjects covered include physics
simulation, trigonometry, fractals, cellular automata, self-organization, and genetic algorithms. Examples are demonstrated in native JavaScript using p5.js. Much of the class time will be dedicated to in-class exercises and self-study as the course is available online through a video series and textbook.

Prerequisite: H79.2233 Introduction to Computational Media or equivalent programming experience.

**The World-Pixel by Pixel**  
ITPG-GT.2273 Thur 3:20pm to 5:50pm  
Daniel Rozin

Images and visual information are perhaps the most potent tool at our disposal with which to engage viewers of our computer based creations. Computers have the ability to share our visual world by means of evaluating visual information, transforming visual content and even generating visuals from scratch. This class focuses on the art of computer graphics and image processing. We explore the concepts of pixilation, image representation and granularity and the tension between reality and image. Students are introduced to the tools and techniques of creating computer images from scratch, manipulating and processing existing images, compositing and transitioning multiple images, tracking live video and masking, compositing and manipulating live video and manipulating depth information from Kinect. The class uses the C++ language in OpenFrameworks and Processing.

**Thesis**  
ITPG-GT.2102.21 Tues 3:20pm to 9:00pm Nancy Hechinger / Eric Rosenthal  
(4 Points)  
ITPG-GT.2102.2 Tues 3:20pm to 9:00pm Robin Reid  
(4 Points)  
ITPG-GT.2102.1 Tues 3:20pm to 9:00pm Nancy Hechinger  
(4 Points)  
ITPG-GT.2102.5 Tues 3:20pm to 9:00pm Gabe Barcia-Colombo  
(4 Points)  
ITPG-GT.2102.4 Tues 3:20pm to 9:00pm Katherine Dillon  
(4 Points)  
ITPG-GT.2102.3 Tues 3:20pm to 9:00pm Kathleen Wilson  
(4 Points)  
ITPG-GT.2102.6 Tues 3:20pm to 9:00pm Andrew Lazarow

This course is designed to help students define and execute their final thesis project in a setting that is both collegial and critical. It is structured as a series of critique and presentation sessions in which various aspects of individual projects are discussed: the project concept, the elaboration, the presentation, the process and time-table, the resources needed to accomplish it, and the documentation. Critique sessions are a combination of internal sessions (i.e., the class only) and reviews by external guest critics. Students are expected to complete a fully articulated thesis project description and related documentation. Final project prototypes are displayed both on the web and in a public showcase either in May or the following semester.
This full-scale design-build course will engage a new conception of public space from a point of departure that is both technological and ecological. The aim is to examine the wide-ranging possibilities of sensors, digital fabrication, living vegetation, and public architecture located in the heart of Times Square. The students will be freely supplied with most working materials by the renowned Material Connexion library and sponsored at the citywide NYCXDesign celebration. A final student driven life-sized group project will be installed outdoors for public display throughout the entirety of the NYCXDesign festival in May 2016.

Today’s scarcity of public spaces due to rampant privatization leaves little room for truly enjoyable outdoor respites. In order to produce a unique interpretation of future public space, students will be challenged to explore the dynamic networked relationships between living and non-living elements. While there have been many points of confluence traditionally between the media-based digital realm and the architecture of open space, the specificity of these relationships and how they are embedded in the urban tapestry often remains unrecognized within the discourses of both disciplines. This course will attempt to fuse that relationship and produce an integrated life-sized artifact.

Students will be introduced to a series of place making exercises proposed in Times Square to tease out the most exciting and buildable scheme. A sequence of group discussions around heterogeneous approaches will be reviewed and tested in digital mock-up form. Students are encouraged to present their own ideas as big-picture concepts or discreet fragments to be combined into a larger narrative. An introduction to the skills and resources for designing, growing, and fabricating with ecological materials, including CAD/CAM/CAE; NC machining, 3-D printing, sketching, laser cutting, thermoforming, mold making/casting with composite materials and carbon fibre, nonferrous/ sheet metal work and DIY garden sensors. This course also puts an emphasis on learning about open spaces, urban farms, and public installations.

Transformational Design: Mindfulness and Physical Computing for Experience-driven Design
ITPG-GT.2857 Tues 09:00am to 11:30am
Daniel Rosenberg

This class brings together Mindfulness and Physical Computing through hands-on, playful, and collaborative exercises. You will learn how to become mindful in design, that is, how to direct your awareness towards the experience of the products you are putting together. And you will learn how to use what you experience directly as a means to talk and think about the experience of the people you are designing for. Our tools will be Arduinos, sensors and effectors that we will learn and explore from the point of view of our bodies and minds—mediating by paying attention to what we do and feel with these materials in the moment, as we are putting them together and trying things out. As a result, we will learn how to create interactive objects/spaces never
experienced before, and how to design for others without trying to prescribe their experiences.

**Wearable Tech Design**

ITPG-GT.2859  
Mon 12:10pm to 3:05pm  
Despina Papadopoulos

Twenty odd years trending and still we have few (if any) examples of truly integrated wearable technology examples that have reached market scalability. Most examples of wearable technology are akin to a “cottage-industry”– handmade, bespoke and expressive, more couture than ready-to-wear, reminiscent of the pre-industrial revolution methods of production for textiles and clothing.

The challenges we had 20 years ago remain largely the same despite growing market interest in the area. But with new developments in rapid prototyping and e-textiles we are in a much better place today to address some of the major roadblocks in taking wearable technologies to scale and disrupting the current manufacturing infrastructure.

In this class we will emulate a concept and design to go-to-market process and break the semester in 4 stages:

1. Develop compelling use-cases and gathering requirements – identify applications, services and wearable environments that address human needs and an engagement model that goes beyond the much quoted 6-month drop-off rate for most existing wearable devices. How do we activate behavioural change, a need for delight and magic, or look at the needs of emergency responders, nurses, and chronically ill patients? Whether we design a wearable environment for dance performers, first responders or expectant mothers, our focus will be in designing a compelling system that addresses the needs of said user’s and environment and goes beyond single use scenarios.

2. Turn requirements to design and technology specifications – having identified a target audience and their needs, we will work to select existing technologies and solutions and specify how our wearable solutions addresses each requirement, making sure that intention, design and creative vision are retained in specifications.

3. Experiment with solutions with an eye to manufacturability and scale – we will look at existing manufacturing processes and come up with solutions that can be adapted to manufacturing or create solutions that do not yet exist. Experimentation and rapid prototyping will be the focus of this phase while we develop design guidelines and development specs.

4. Develop a final prototype and production plan – at this stage we will build a robust prototype that addresses production needs and outlines how we will source and take prototypes to scalable products.

We will do these with an eye to integration and scalability and with placing special emphasis on design and rapid, iterative prototyping. Visiting guests will provide context on processes in the apparel and footwear industry as well as updates on emerging solutions in e-textiles and conductive yarn developments.