COMPUTATIONAL DESIGN/INTERACTIVITY

COURSE: DD 364 – Digital Design Studio II (5 credits)
PROGRAM: Digital Design/School of Art + Design
LOCATION: Third-year studio course/spring term (undergraduate)
INSTRUCTOR: Taro Narahara

DESCRIPTION: All Digital Design students take one semester of physical computing within the undergraduate design studio sequence, devoting the term to the study and use of Arduino and Processing and the creation of projects emphasizing interactive techniques. They utilize sensors in student-built projects, along with 3D printing and laser-cutting. There is an explicit requirement to create interactive products and applications.

PROJECT: Individual interactive assignments. Some projects involve the use of Microsoft Kinect or Asus Xtion Pro Live to create interactive installations (e.g. interactive digital projection, augmented reality block construction game) and various ways particles and/or objects may be remotely manipulated through physical activity (e.g. proximity-controlled lighting, hand movement). Other projects require the design and construction of a kinetic interactive prototype using both sensor(s) and actuator(s) based on a conceptual idea in the context of the student(s) area of discipline (e.g. architecture, industrial design). Multi-disciplinary projects that link to other fields (e.g. biomedical engineering) are encouraged.

REQUIREMENTS: Deliverables vary by project. In all cases, built proof-of-concept elements are required that demonstrate degree of response to stimuli. Students build all components of physical projects and work with instructor to write code in Processing. Where interactive or kinetic products are designed and built, all components must be neatly integrated into the prototype using digitally fabricated parts (generally laser-cut or 3D-printed). Deliverables include live demonstration of project, a one-page description of the project that includes all hardware, software, methods and materials used, and references to online tutorials or resources. Also required is a video (up to two minutes in length) that captures the successful interactions inherent in the project, image files and photos of the product, and all files for Arduino, laser cuts, and 3D prints.

OBJECTIVES: (1) Provide design students with an opportunity to learn some computer programming and apply the knowledge to a project that deals either with human/computer interface. (2) Require digital design students to get out of the virtual environment into the physical one by building components and thinking of user interface(s). (3) Provide an opportunity for students to mix physical and digital with augmented and virtual reality applications of interactive computational design. (4) Introduce rapid prototyping, CAD/CAM, and algorithmic design for designers. (5) Explore potential relationships between various human senses (touch, hearing) and inanimate objects. (6) Reinforce the importance of craft when making digital or physical products. (7) Provide exposure to various sensors, actuators, and their applications in design. (8) Reinforce the importance and provide opportunity to practice a reflective and iterative design process with multi-phase/stepped projects that require prototypes and proof-of-concept products throughout the design process.

REFERENCES: (1) Bohnacker, Hartmut. *Generative Design: Visualize, Program and Create with Processing*. (Princeton Architectural Press, 2012). (2) Borenstein, Greg. *Making Things See: 3D Vision with Kinect, Processing, Arduino, and MakerBot*. (O'Reilly Media/Make, 2011). (3) Fry, Ben. *Visualizing Data: Exploring and Explaining Data with the Processing Environment*. (O'Reilly Media/Make, 2011). (4) Goldstone, Will. *Unity game development essentials: build fully functional, professional 3D games with realistic environments, sound, dynamic effects, and more!* (Packt Publishing, 2009) (5) Igoe, Tom. *Making Things Talk: Using Sensors, Networks and Arduino to see, hear, and feel your world/2nd Edition*. (O'Reilly Media/Make, 2011). (6) Margolis, Michael. *Arduino Cookbook*. (O'Reilly Media/Make, 2011). (7) Noble, Joshua. *Programming Interactivity: A Designer's Guide to Processing, Arduino, and Openframeworks*. (O'Reilly Media/Make, 2011). (8) Reas, Casey. *Processing: A Programming Handbook for Visual Designers and Artists*. (MIT Press, 2007) (9) Shiffman, Daniel. *Learning Processing: A Beginner's Guide to Programming Images, Animation, and Interaction*. (Morgan Kaufmann, 2015). (10) Terzidis, Kostas. *Algorithms for Visual Design Using the Processing Language*. (Wiley, 2009). *Pluralsight* tutorials available when logged onto CoAD network.