NJIT

NEW JERSEY INSTITUTE OF TECHNOLOGY
COLLEGE OF ARCHITECTURE AND DESIGN

COMPUTATIONAL DESIGN/INTERACTIVITY

COURSE: DD 364 – Digital Design Studio II (5 credits) and DD 320 – Computational Design (3 credits)
PROGRAM: Digital Design/School of Art + Design
LOCATION: second semester junior year/spring term studio; junior or senior year/spring term design elective
INSTRUCTOR: Taro Narahara

DESCRIPTION: There are multiple ways to study and incorporate computational design and physical computing into a student's design education in the School of Art + Design at NJIT. 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. But students in other programs including Architecture, Interior Design, and Industrial Design – as well as students from the Colleges of Engineering and Computing Sciences seek out design courses in which they can creatively "make thinking things" and study physical computing, robotics, product design with sensors, adaptive structures, and so on. These students are afforded a lab-based seminar that deals with similar issues addressed in the studio, but at a more limited scale, for only three credits, and can be targeted towards the creation of products more closely aligned with the different areas and disciplines of study represented in the diverse student body. In both the design studio and course, 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) Provide an introduction to rapid prototyping, CAD/CAM, and algorithmic design for designers. (5) Explore potential relationships between various human senses (touch, hearing) and inanimate objects. (6) Provide opportunities for Industrial Design and Information Technology students to create algorithmically driven, sensor-based smart products outside of the studio sequence. (6) Reinforce the importance of craft when making digital or physical products. (7) 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) Borenstein, Greg. *Making Things See: 3D Vision with Kinect, Processing, Arduino, and MakerBot*. (O'Reilly Media/Make, 2011). (2) Fry, Ben. *Visualizing Data: Exploring and Explaining Data with the Processing Environment*. (O'Reilly Media/Make, 2011). (3) Igoe, Tom. *Making Things Talk: Using Sensors, Networks and Arduino to see, hear, and feel your world/2nd Edition*. (O'Reilly Media/Make, 2011). (4) Margolis, Michael. *Arduino Cookbook*. (O'Reilly Media/Make, 2011). (5) Noble, Joshua. *Programming Interactivity: A Designer's Guide to Processing, Arduino, and Openframeworks*. (O'Reilly Media/Make, 2011). (6) Reas, Casey. *Processing: A Programming Handbook for Visual Designers and Artists*. (MIT Press, 2007) (7) Terzidis, Kostas. *Algorithms for Visual Design Using the Processing Language*. (Wiley, 2009)