NEW JERSEY INSTITUTE OF TECHNOLOGY
COLLEGE OF ARCHITECTURE AND DESIGN

PRODUCT DESIGN

COURSES: AD 463 – Collaborative Design Studio (5 credits), ID 364 – Industrial Design Studio (5 credits), ID 464 (5 credits)
PROGRAM: Industrial Design/School of Art + Design
LOCATION: Third- and fourth-year studio courses (undergraduate)
INSTRUCTOR: José Alcala and Martina Decker

DESCRIPTION: Design studios for product design program and a collaborative design studio that combines students from different programs (the penultimate design studio in the School of Art + Design) to work on common projects. Products designed vary in focus from term to term and include office supplies, building/architectural products, furniture, "smart" sensor-based and adaptive products, musical instruments, and more. Products use material properties and/or integrated electronics and sensors to solve problems that are identified by students and/or faculty as those for which there is (or may be) a commercial market and/or those that are specifically targeted to improve quality of life for individuals.

PROJECTS: Third-year students are asked to identify a need and develop a specific product used in the home or by individuals that requires material investigations to fit the appropriate production techniques, smart materials, and interactive requirements for solving problems. Fourth-year collaborative projects require the use of nanotechnology and material science combined with electronics to generate products used in a subfield of robotics called "soft robotics" to create active and reactive products that interact with the user. Fourth-year individual products utilize electronics and sensors to create interactive projects (like new types of musical instruments). An iterative and interactive design process is used that combines traditional media sketching, three-dimensional solid modeling (using SolidWorks as the primary tool), and then creating physical prototypes with a combination of digital fabrication (3D printing, CNC cutting, laser cutting) and traditional construction/production techniques.

REQUIREMENTS: Students must produce a physical prototype of whatever product is being designed and proposed. The process is defined and must be documented as part of the project. This process includes (1) study of precedents and investigation of current products; (2) ideation sketching for alternative proposals; (3) exploration of form and alternatives with digital modeling (SolidWorks); (4) digital visualization (renderings) of proposed products; (5) physical prototypes (generally a combination of 3D printed objects with hand-finishing); (6) package design and product booklet justifying production; (7) video and/or live demonstration of working proof-of-concept product.

OBJECTIVES:
(1) To develop an awareness of teamwork structures and dynamics. (2) To gain an appreciation of the nature and value of collaborative practices. (3) To learn from relevant precedence. (4) To develop an awareness and knowledge of emerging technologies that are influential to the development of products in general, and soft robotics in particular (for Collaborative Design Studio). (5) To develop aesthetically pleasing and successful design projects. (6) To develop an independent sense of experimentation and scrutiny, yet participate in critical discourse. (7) to develop design propositions that are reasonable and convincing based on research and evidence. (8) Be able to use a comprehensive design process that integrates multiple media from freehand sketching to virtual models to 3D printed prototypes. (9) Increase facility with use of digital media for visualization and study of alternatives (including color options) for product design.

RESOURCES:
Students have access to wood shop, metal shop, 3D printers, and other fabrication facilities. The "Idea Factory" under the direction of Prof. Martina Decker has additional tools and facilities available to the Collaborative Design Studio and to the third-year studio. A variety of references, especially for soft robotics are available and include: (1) Cecilia Laschi, et al. Soft Robotics: Trends, Applications and Challenges, Proceedings of The Soft Robotics Week, April 25-30, 2016, Livorno, Italy [e-book]. Cham: Springer International Publishing, ©2016. (2) Laschi, Cecilia, and Barbara Mazzolai. Lessons from animals and plants: the symbiosis of morphological computation and soft robotics. IEEE Robotics & Automation Magazine 23.3 (2016): 107-114. (3) Rolf Pfeifer, et al. The Challenges Ahead for Bio-Inspired 'Soft' Robotics. Communications of the ACM, vol. 55, no. 11, Nov. 2012, pp. 76-87. (4) Blaine Brownell. Transmaterial: a catalogue of materials that redefine our physical environment. New York: Princeton Architectural Press. ©2006. (5) Philip Ball. Made to Measure: new materials for the 21st century. Princeton, NJ: Princeton University Press. ©1997.