STATEMENT OF TEACHING PHILOSOPHY

My primary goal as an engineering professor is to engage students in the learning process. Our students will go on to pursue a gamut of professions and the most important gift we can bestow on them is to ignite their innate passion for learning and figuring things out. Likewise, excellent teaching requires lifelong learning and continuous improvement. In addition to teaching traditional math, science, and engineering technical depth, engineering educators are challenged with providing opportunities to build professional skills, such as teamwork and communication, as well as integrating learning of modern technology and tools. I intend to constantly evaluate the curricular content and my teaching methods with the understanding that the educational sphere of influence is constantly evolving; to be the most effective teacher I can be, I must also evolve and reinvent myself as necessary.My teaching philosophy is formed by a variety of influences, including: my professional and academic experiences; my interactions with inspirational educators; publications and conferences about educational best practices; and dialogue with my colleagues both at Cooper Union and beyond as to what is being taught and which teaching methods work best.

One approach I take in aiming to instill a passion for learning in my students is to provide opportunities for students to see the relevance of the engineering theory they are learning. During lectures I give automotive examples from my nearly five year professional career as a Powertrain Systems Engineer to illustrate engineering concepts. I also seek out other examples from different fields – medicine, aerospace, building systems, consumer products, finance, etc. – to ensure that I appeal to students with different interests and to show how engineering concepts can be far-reaching. I have been told by students directly as well as indirectly in anonymous student evaluations how they feel like they are learning “real engineering” in my classes.

My NSF Transforming Undergraduate Engineering Education (TUES) “Building Sustainability into Control Systems Courses” award (DUE #1044830, $107,884) and my NYSERDA “Workforce Training: Cooper Union Facilities Training and Curriculum Development” (PON#3442, $167,671) demonstrate my commitment to creating innovative curricular materials and inductive teaching methods that bridge theory and practice. As soon as we moved into 41 Cooper Square, I began using our new academic building as a learning tool by giving students tours of the mechanical rooms and Building Management System. As part of my NSF grant I developed background reading material, assignments, and laboratory experiments that connect control systems theory to our building’s systems. I also engaged undergraduate researchers in developing learning materials and building projects.

Research into how students learn and my own personal experience suggest students learn better when they can connect what they are learning to existing knowledge structures. I work to connect concepts I am teaching to typical systems students are familiar with, such as a refrigerator, the thermostat in a home heating system, and automobile cruise control. Students gain perspective about the importance of a topic if they see it as a part of a meaningful whole. I integrate the concepts I teach to fundamental math and science principles and other mechanical engineering concepts. To do this I maintain a dialogue with my faculty colleagues to learn about what is taught in other courses as well as to inform them when I am teaching a concept that may be directly or tangentially connected to concepts they teach. Doing so not only ensures

consistency in the curriculum but allows me to tie a concept I am teaching to concepts they will learn in another class, such as heat transfer and the control of the temperature across a heat exchanger. This dialogue also facilitates discussion as to opportunities to improve the curriculum as a whole.

Providing realistic, hands-on experiences is another central part of my teaching philosophy as these experiences help students connect the theory they are learning to the real world and provides opportunities to acquire essential skills necessary for their future careers. I created a new required Process Control Laboratory Course (ME352) as a co-requisite to the Feedback Control Systems (ME351) course. During these laboratories I give students my individual attention and probe them with questions to ensure they see the broader implications of the experimental procedures they are following.

It is crucial that we not only graduate students that are technically adept in math, science, and engineering fundamentals, but our graduates must also be able to formulate and solve open-ended problems, communicate well, and be able to work well in teams. In my Mechanical Vibration (ME301) course, I implemented a new team project component, in which students approach a real-world vibration problem without a textbook solution. As part of these projects students gain hands-on experience with testing and analysis methods (e.g., accelerometers, data acquisition and analysis, LabVIEW software and hardware), present results, and submit final reports. I equipped both the Mechatronics and the Vibration & Acoustics laboratories with industry-standard equipment to facilitate this type of hands-on, project-based learning. One particular vibration project team took data and analyzed the vibration of a subway car. As part of this project, the students interacted with an MTA engineer, who informed them that the tests they were performing were similar to the test the MTA performs and that the Cooper Union equipment is state-of-the-art. Providing students with these types of experiences builds confidence in their ability to tackle complex problems similar to those they will encounter in their future careers. To help students develop professional skills, I created a set of project guidelines and grading factors that guide students through the contents of a well-developed proposal and what is expected of them in their oral presentations and final technical report. I also give students detailed feedback as to where they can improve in these areas.

Teaching at Cooper Union has been tremendously rewarding as Cooper Union students continually inspire me to advance myself. Instead of simply answering students' questions, I enjoy helping them answer their own questions. It is in the pursuit of answering questions that boundaries of one's knowledge are extended and new discoveries are made.

As an engineering professor, I see my role as a guide on a student's path of self-discovery. I aim to not only provide my students with opportunities to learn important concepts and professional skills, but to expose them to how fun learning and engineering can be. I look forward to leading Cooper Union students on this path of discovery and learning alongside Cooper Union students for many years to come.