TEACHING STATEMENT

JASON POON

My goal in teaching is to build a supportive environment that enables students to reach their full potential as engineers. I believe that the process of education is a combination of classroom learning, hands-on learning, networking, and personal growth, and that the teaching process should be adaptive to the unique ways that each individual learns. I have developed my teaching philosophy through multiple semesters of teaching at UC Berkeley, my undergraduate career at Olin College of Engineering, my experience in mentoring and leading a research team, and my involvement with the power and energy technical community.

In the classroom, I have teaching experience as the sole teaching assistant for the combined undergraduate and graduate Power Electronics course at UC Berkeley for three semesters—Spring 2016, Spring 2017, and Spring 2018. During each of these semesters, I gained experience delivering lectures, developing course and lab content, holding office hours, and running lab sessions. When I was the teaching assistant for the class in 2016, the course had not been offered for seven years, and I was responsible for designing and implementing material for the laboratory portion of the course. Student evaluation of my performance as teaching assistant was largely positive, with an 'overall effectiveness' score of 5/5 in 2018 *[Dept. Average: 4.15/5]* and 4.71/5 in 2017 *[Dept. Average: 3.96/5]* (evaluation score for 2016 is not available).

My teaching philosophy emphasizes a deep understanding of the fundamentals and developing an overall confidence with the engineering approach. In my Power Electronics course, I worked to motivate the broader application and context of each concept, as well as facilitated a hand-on learning portion in lab where students would design and implement real power electronics circuits or components. A student commented to me that her experience in class gave her a sense for 'what's most important' and 'what questions to ask' in her new position at Tesla. Moreover, as an undergraduate student at Olin College of Engineering, I had the opportunity early in my career to think critically about engineering pedagogy, particularly with respect to making the engineering discipline accessible to people from all backgrounds. I believe that a key to do this is being able to spark excitement for whatever area of electrical engineering a student may find fascinating, and equip them with the tools and knowledge base to have confidence to leap into the unknown.

As a graduate student, I had the opportunity to mentor a number of undergraduate and younger graduate students, including Palak Jain, Chuqiao Li, Zeyu Song, Jiao Hongsheng, Deru Song, and Erik Iverson. In some cases, younger graduate students would assist me on my on-going projects (e.g. Jain on *FailSafe*), and in others, I would develop meaningful sub-projects that a junior graduate student or undergraduate could take ownership of (e.g. Li and Song on Minimum Distortion Point Tracking). Some of these projects have resulted in journal and conference publications [1, 2] as well as the basis for bachelor, masters, and doctoral dissertation projects. My philosophy as a mentor is to put students in the best environment for them to succeed; this means matching students with research problems that they find exciting, as well as finding the appropriate amount of student collaboration or mentorship that they are most comfortable with. I have realized that this approach helps motivate students to become independent thinkers and have the ability to reason about problems from rigorous perspectives. I look forward to adopting these principles in my future research group.

In addition to classroom and hands-on learning, I believe that an instrumental part of education comes from the technical community that one is part, not only to develop connections for job opportunities, but also for finding relevant research problems to work on. Towards this end, in 2015, I founded the Student Branch

Chapter for the IEEE Power Electronics Society at UC Berkeley, and have chaired the chapter for the duration of my graduate studies. Our student chapter has hosted guests and seminar speakers from industry, national laboratories, and external academic institutions across the power and energy community. This has enabled student interaction with a broader, global technical community that would not have been possible otherwise. Moreover, we strive to make our chapter accessible to an audience from the entire engineering community—I am particularly proud that women and underrepresented minorities comprise more than fifty percent of our regular membership. In another testament to the reach of our chapter, our Lecture Seminar Series on YouTube has attracted over 20,000 unique viewers to date.

As a new faculty member, I would be qualified to teach graduate-level courses in power electronics, advanced topics in power and energy, and linear and nonlinear system theory. I can also teach undergraduate-level courses in power electronics, power systems, circuits, and controls. In the first few years of my appointment, I will develop a series of four courses:

1. **Power Electronics** (undergraduate- and graduate-level) will introduce students to the fundamentals of power electronics, including dc-dc converters, inverters, power semiconductor devices, magnetics, and control. An extensive laboratory component will provide students with hands-on experience in the design, fabrication, and testing of power converters. A graduate-level version of the course will cover recent industry and research trends in power electronics, including resonant switched-capacitor converters, wide-bandgap semiconductor devices, and wireless power transfer.

2. **Modern Power Networks** (undergraduate- and graduate-level) will blend classical and emerging perspectives of power systems, with coverage on renewable energy integration, low-inertia microgrids and nanogrids, network congestion and mitigation, power electronics at the 'grid edge,' ac grid-forming inverter controls, and dc distribution architectures.

3. **Power Management Integrated Circuits** (graduate-level) will cover power management design in an integrated context, with topical coverage including analog and digital building blocks, integrated passive component design, integrated power converter circuit topologies, and relevant application areas (e.g. consumer electronics, IoT, bioelectronics).

4. **Power Electronics for Renewable Energy and Electrified Transportation** (graduate-level) will provide an application-oriented perspective of emerging power electronics-enabled technologies, such as electrified flying taxis, inverters for electric vehicles, and high power grid-interfaced power electronics. A major deliverable for this course will be a group hardware design project in which students will propose, build, and demonstrate working prototypes of such systems.

As a teacher, my mission is to guide students to become well-rounded and rigorous engineers who will serve humanity for the greater good. Through my teaching, mentorship, and leadership, I hope to make the electrical engineering discipline accessible and fascinating for people from all backgrounds.

References

[1] J. Poon, P. Jain, I. C. Konstantakopoulos, C. Spanos, S. K. Panda, and S. R. Sanders, "Model-based fault detection and identification for switching power converters," *IEEE Transactions on Power Electronics*, vol. 32, pp. 1419–1430, Feb 2017.

[2] P. Jain, J. Poon, J. X. Xu, S. K. Panda, C. Spanos, and S. R. Sanders, "Fault diagnosis via PV panel-integrated power electronics," in *2016 IEEE 17th Workshop on Control and Modeling for Power Electronics (COMPEL)*, pp. 1–6, June 2016.