Teaching Statement
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An important pillar of scholarship is teaching. I believe that helping students reach their full potential, training the next generation of competent engineers and scholars, and educating the public on science and engineering are as important part of our legacy as our research contributions.

1 Summary of Experience

Throughout my career since I started teaching at the university level, I have gained significant experience and developed my skills in multiple facets of teaching (detailed in my CV). Below are some highlights of my experience.

- **Course teaching:** At Northern Arizona University (NAU), I have taught four courses, totaling 10 sections, as the sole instructor. All of my courses include hands-on software and/or hardware labs. My classes have received excellent student evaluation scores, between 3.4–3.75 average on a 4.00 Likert scale. During the COVID-19 pandemic, I adapted all my courses for the HyFlex teaching mode, that includes both in-person and online students, and have gained much experience in pedagogy and technologies for in-person and online teaching. At the University of Pennsylvania (Penn), I co-taught 2 of 3 modules of a new graduate course in EE, and guest-lectured and assisted in several undergraduate and graduate courses in EE and CS.
- **Course development:** At NAU, I have developed or re-designed four courses, each with significant hands-on and experiential learning components. I re-designed a control course with hardware labs based on a temperature control system and simulation labs. I re-designed a C programming for engineering course with an interactive textbook, engineering-related programming projects, and autograded exercises. I developed and taught an introduction to autonomous driving course based on the F1/10 autonomous race cars and a graduate course on modern control systems. At Penn, I helped develop three graduate courses in EE and CS; most significantly, I co-designed 2 modules of a course on model-based embedded systems, including both lectures and labs.
- **Program development:** Since taking the position of Assistant Chair of ECE, I have worked to revitalize the EE programs at NAU. I have chaired several committees to overhaul the bachelor's and master's programs in EE and computer engineering, including undergraduate and graduate curricula, ABET accreditation, teaching capacity, student recruitment, and faculty hiring. I led a successful proposal for adding a new emphasis area in electrical and computer engineering to my school's PhD Informatics & Computing program. I was heavily involved in creating new certificate programs in microelectronics design and embedded systems, in collaboration with industry. These efforts have provided me with invaluable insights on the many aspects of academic programs.
- **Student mentoring:** At NAU, I have mentored or been mentoring 11 graduate students, 10 undergraduate research students, and 10 Capstone teams (34 students). I have published 2 journal articles and 7 conference papers with my students. My students have won a best presentation award and several NAU Presidential Fellowships, co-founded startup companies, and joined prestigious graduate programs in the US.

2 Teaching Philosophy

My teaching philosophy mirrors my interdisciplinary approach towards research. I aim to ensure that students cultivate a strong and broad background, a holistic view and hands-on skills of system design and development, an appreciation of the application of STEM in many technical and societal areas, and equitable access to quality education and research opportunities. I believe that, to prepare students for their careers, a successful STEM education must: (1) equip students with a solid foundation of the field; (2) provide students with hands-on experience and practical skills; (3) stimulate and encourage students to make an impact; (4) move away from compartmentalization to appreciate diversity and interdisciplinary collaboration; and (5) provide equitable education and research opportunities to all students. I view myself primarily as a *facilitator of learning* rather than as an expert simply delivering information to students.

A solid foundation. Every engineer or scientist must possess a solid foundation of their field. An education program must equip its graduates with the fundamental knowledge and skills of the field. However, without proper motivations and guidance, they can be rather tedious and difficult to learn and comprehend for many students, which also hinder *inclusiveness*. My approach to motivating (inclusive) learning is to use concrete examples, especially every-day examples to which students can easily relate. I use plenty of examples, including simulations and real experiments, to motivate and illustrate basic concepts and make abstract theories more interesting and easier to understand. I have observed that interactive lectures and live demonstrations are powerful and intuitive tools to engage students and help them grasp theoretical concepts; for example, in my control courses, I use Matlab and Simulink simulations extensively to illustrate how theoretical concepts arise and are applied in practical problems. In my experience, by putting knowledge into context, I can enable students to experience its relevance and help them feel confident to learn by doing, thereby increasing their investment in the learning process. I have also found

it important to guide student learning with a big picture or roadmap of the course or the field, to help students visualize the "pieces" and understand how they fit together. I motivate the materials using a top-down approach: show students where we aim to be at the end of the course and how we intend to get there. Additionally, since many engineering and applied science concepts are repeated in several courses, I always aim to show in my teaching the cohesive nature of these concepts between different courses, so students can appreciate the unification of these concepts and focus their efforts on critical thinking and problem solving after they grasp the fundamentals.

Practical skills. A student in STEM needs to possess practical technical skills, which complement a solid foundation in that they help reinforce the foundational knowledge. My teaching has always emphasized hands-on experience. For example, at NAU, my control courses include lab experiments with a temperature control system and a self-balancing robot, and students in my autonomous driving course built their own small-scale autonomous race cars and wrote code to drive them autonomously. Course projects are also excellent opportunities for students to learn and improve their critical thinking and practical skills, which I employ frequently in my courses, especially at the senior and graduate levels. The skills learned from these exercises will motivate students and strengthen their fundamental knowledge. Another way to help students gain practical experience is to involve them in research and real-world projects, for which I have actively encouraged and recruited undergraduate students into my lab. *This emphasis on developing critical thinking and hands-on skills forms the bedrock of my teaching approach.*

Make an impact. I believe that a major goal of every engineer and scientist is to make societal and economic impacts. Our mission as educators is to stimulate students' development to their full potential and provide them with prospects to go beyond the regular curriculum. Students should be given opportunities to work on practical, real-world problems in research projects, which they and faculty can greatly benefit from. I have mentored students at different institutions in research projects, independent studies, and Capstone projects. My students have won awards, written research papers, and presented at conferences. In addition to making tangible results while having fun and enjoying the process, challenging students to make an impact by developing real solutions and building real systems has proved to be a great transition to graduate school or careers in industry.

Diversity. Modern engineering and applied science are no longer constrained to a single discipline or domain. Engineers and researchers nowadays often need to collaborate with people with different backgrounds and use tools and methods that require knowledge of other domains. My control courses often have students from diverse backgrounds in EE, CS, Mechanical Engineering, and even Bioengineering, who contribute interesting and diverse perspectives. In my teaching, I strive to use examples from various fields, such as robotics, autonomous driving, and medical devices, to show the diverse nature of modern engineering and applied science. I believe that, to comply with educational needs for the next generation of workforce, we must move away from the compartmentalized educational approach and include diversity in the curriculum. *Our curriculum should be able to accommodate students with different backgrounds and train them to appreciate diversity and be able to collaborate across disciplines.*

Inclusiveness. Inclusiveness is a key principle of my teaching philosophy and is reflected in all the other principles. For instance, my teaching approach as described in *"A solid foundation"* improves learning accessibility and inclusiveness for all students with diverse learning styles, or my *"Diversity"* principle is aligned with and enhances inclusiveness. In my teaching and mentoring, I always strive to understand and accommodate students' needs, especially of students from underrepresented groups, make students feel respected and attended to regardless of their backgrounds, and provide ample and equal opportunities to all students. My success in this area is evidenced in the student feedback (scores and comments) for my classes and the success of my research students.

3 Teaching Interests and Plan

With my extensive teaching experience, I am confident that I can teach most of the topics relevant to my expertise in the undergraduate and graduate curricula. I am well-prepared for and will greatly enjoy teaching both undergraduate and graduate courses in any control topics, along with courses in cyber physical systems, optimization, and programming. I am interested in developing and teaching courses in applied machine learning and data-driven science and engineering, particularly at the intersection between machine learning and control, dynamics, and optimization, such as data-driven modeling and controls, or intelligent cyber physical systems. Additionally, I will appreciate the opportunity to involve in improving existing courses by developing experiments and practical projects. The interdisciplinary nature of my research cuts across several domains, allowing me to bring new perspectives and problems rooted in real applications to my teaching. My intentional approach to teaching, diverse research background, and rich teaching experience will give me an edge in approaching different teaching situations.

I also look forward to mentoring graduate students. Graduate students under my supervision will receive guidance to learn and discover knowledge, to develop research skills and career paths, and to eventually become productive and independent researchers. I will give them freedom to pursue their academic scholarship, while providing the necessary support and guidance on finding research problems and developing research solutions.