Teaching Philosophy Statement

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Introduction

Engineering education has the unique responsibility of preparing graduates to solve some of society's most significant technological challenges. The global transition toward renewable energy, electrified transportation, intelligent manufacturing, and sustainable infrastructure demands engineers who possess not only strong technical knowledge but also creativity, critical thinking, ethical awareness, and the ability to work across disciplines. My philosophy of teaching is founded on the belief that students learn most effectively when rigorous theoretical instruction is integrated with authentic practical experience, active learning, and research-informed education. Throughout my academic career in the United Kingdom, Singapore, and India, I have sought to create learning environments that inspire curiosity, encourage independent thinking, and develop graduates who are prepared to contribute confidently to both industry and research.

My teaching approach is built around four interconnected principles: **deep conceptual understanding, experiential learning, research-informed education, and student-centered mentorship.** Together, these principles guide the way I design courses, supervise projects, develop laboratory experiences, and support students throughout their academic journey.

Deep conceptual understanding

Engineering students often encounter mathematically demanding subjects that can initially appear abstract and disconnected from practical applications. I believe that effective teaching begins by helping students understand the fundamental physical principles before introducing mathematical models and analytical techniques. Once students appreciate the engineering intuition behind a concept, they are better equipped to understand equations, derive solutions, and apply their knowledge to unfamiliar situations.

In courses such as **Power Electronics, Electrical Machines, Power Systems, Electrical Energy Conversion, Control Systems, and Electrical Circuits**, I emphasize conceptual reasoning alongside mathematical rigor. Rather than presenting formulas in isolation, I encourage students to explore why engineering systems behave as they do. For example, when teaching converter operation, inverter control, or electric machine characteristics, I first discuss the physical mechanisms governing energy conversion before introducing analytical models. This approach enables students to connect theory with engineering practice and strengthens their confidence in solving complex problems.

I also encourage students to compare alternative engineering solutions instead of simply identifying a correct answer. Open discussions regarding design trade-offs, efficiency, reliability, economic considerations, and sustainability help students develop professional engineering judgement that extends beyond examination preparation.

Experiential learning

Electrical engineering is fundamentally an experimental discipline. While lectures establish theoretical understanding, laboratory activities transform abstract concepts into tangible engineering experience. My own research background has reinforced the importance of experimental validation, and I strive to provide students with opportunities to experience engineering through observation, experimentation, simulation, and design.

One of the most rewarding aspects of my academic career has been leading the development of modern teaching laboratories. At Edge Hill University, I played a leading role in specifying, procuring, and commissioning advanced electrical engineering laboratory facilities, including Lucas–Nuelle systems covering electrical machines, power electronics, renewable energy, electrical drives, and smart grid technologies. These facilities significantly expanded opportunities for students to perform experiments using equipment that reflects current industrial practice.

Within laboratory sessions, I encourage students to move beyond simply following prescribed instructions. Instead, I ask them to interpret results, identify sources of experimental error, compare theoretical predictions with measured data, and propose engineering improvements. Such activities cultivate analytical thinking while reinforcing the iterative nature of engineering design.

Simulation also plays an important role within my teaching. I regularly incorporate MATLAB/Simulink models and power system simulations to help students visualize system behaviour before conducting laboratory experiments. By integrating simulation with practical validation, students gain a more comprehensive understanding of engineering systems and develop valuable computational skills expected by modern employers.

Research-informed education

One of the greatest strengths an academic can offer students is the ability to bring contemporary research directly into the classroom. My research focuses on intelligent power electronic systems, hybrid AC/DC microgrids, renewable energy integration, advanced converter control, and power quality enhancement. Rather than treating research and teaching as separate activities, I view them as mutually reinforcing.

In my classes, I frequently use examples drawn from current research literature and industrial developments to demonstrate how theoretical concepts are applied to emerging engineering challenges. Topics such as Model Predictive Control, intelligent converter systems, distributed energy resources, Software-in-the-Loop testing, real-time digital simulation, and renewable energy integration provide excellent opportunities for students to appreciate how engineering research addresses practical problems facing modern power systems.

Introducing students to contemporary research also encourages curiosity and demonstrates that engineering knowledge continues to evolve. Students begin to recognize that many engineering challenges remain unsolved, inspiring some to pursue postgraduate research while preparing others to become innovative practitioners within industry.

My own research programme on interconnected microgrids and intelligent converter control has further strengthened my ability to supervise research projects. I encourage undergraduate students undertaking final-year projects to investigate open-ended problems requiring independent thinking, literature review, experimental validation, and technical communication. These experiences provide an excellent bridge between taught coursework and professional engineering practice.

Student-centred mentorship

Every student enters university with different educational experiences, learning styles, and career aspirations. My role as an educator is not simply to deliver content but to create an inclusive learning environment in which every student can succeed.

I encourage active participation through questioning, collaborative problem-solving, small-group discussions, and project-based activities. Students are more engaged when they become active participants rather than passive recipients of information.

I place particular emphasis on developing communication skills alongside technical competence. Engineers must be able to explain complex ideas clearly to colleagues, industry partners, policymakers, and the wider public.

Teaching extends beyond the classroom. Effective mentorship plays an essential role in supporting students' academic, professional, and personal development. Throughout my academic career, I have supervised undergraduate capstone projects, postgraduate dissertations, and doctoral research while providing guidance on research methods, career planning, and professional development.

As a Fellow of the Higher Education Academy (FHEA), I also recognize my responsibility to model professional ethics, integrity, lifelong learning, and responsible engineering practice. These attributes are increasingly important as engineers address global challenges relating to sustainability, energy security, climate change, and technological innovation.

Conclusion

Looking ahead, I intend to further strengthen the integration of research, laboratory education, and industry collaboration within engineering programmes. I aim to develop project-based curricula that combine advanced simulation, Software-in-the-Loop experimentation, digital twins, and emerging artificial intelligence techniques to prepare students for the rapidly evolving energy sector.

I also plan to establish interdisciplinary student research opportunities that connect electrical engineering with computer science, artificial intelligence, data analytics, and sustainable energy systems. Such collaborations reflect the increasingly interdisciplinary nature of modern engineering and provide students with broader perspectives on solving complex technological problems.

Ultimately, my objective as an educator is to inspire students to become thoughtful, innovative, and ethical engineers who possess both the technical expertise and professional confidence to contribute meaningfully to society. By combining rigorous academic standards with supportive mentorship, practical learning, and research-led education, I seek to prepare graduates who are ready to address the engineering challenges of the future.