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Application Summary

Competition Details

Competition Title: 2024 CTL Junior Faculty Teaching Excellence Award

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Application Information

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Personal Details

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ECE

Primary Appointment Title: Professor

Application Details

Proposal Title

Nomination Package for Prof. Daniel Molzahn



February 9, 2024

Dear Center for Teaching and Learning Awards Committee:

The School of Electrical and Computer Engineering (ECE) is proud to nominate Prof. Daniel Molzahn for the CTL Junior Faculty Teaching Excellence Award. Supporting the transition to clean, efficient, and resilient energy systems, Dr. Molzahn has made extraordinary efforts in educating the next generation of electric power engineers.

Dr. Molzahn is an exceptionally accomplished educator of power engineering students. Since Spring 2019 when he started as an Assistant Professor in ECE, Dr. Molzahn has taught power systems courses at the undergraduate and graduate levels (ECE 4320, ECE 4321, and ECE 6320) that typically enroll 20 to 40 students each semester. Since Spring 2022, he has also led a Vertically Integrated Projects (VIP) team which has had 121 total enrollments with 58 unique students. In all the courses he has taught, his teaching effectiveness scores on the Course Instructor Opinion Survey (CIOS) have been either perfect or nearly perfect (e.g., perfect 5.0/5.0 CIOS scores in his last five offerings of ECE 4320 and ECE 4321), which is an outstanding accomplishment. He also has perfect or nearly perfect CIOS scores for most other questions. Additionally, written student feedback on Dr. Molzahn's teaching has also been extraordinary.

To achieve these outstanding student evaluations, Dr. Molzahn has obtained resources to excel in teaching. These include a \$20k competitive grant from MathWorks, an NSF CAREER Award with a substantial outreach and educational component, \$15k in funding from ECE to support efforts to engage power engineering alumni with current students, \$20k annually from Sandia National Laboratory as well as staff engineering time to help mentor his VIP team, and \$250k from the Sloan Foundation which includes a substantial educational component related to the history of power engineering.

These awards support Dr. Molzahn's efforts in developing authentic course projects that are practically relevant and timely. With funding from MathWorks, Dr. Molzahn developed a course project for ECE 4320 tasking students with operating the Georgia power grid during a pandemic by managing tradeoffs between repairing critical infrastructure and disease exposure to repair crews. He also created a project where students optimally locate missile defenses to protect the Ukrainian power grid. His students presented the latter project to 25 staffers from Georgia's congressional delegation.

Along with traditional power engineering courses, Dr. Molzahn is also leading a VIP team that brings together students from across campus with diverse backgrounds to develop video game simulations of power grids operated during extreme events. Leveraging support from his NSF CAREER Award and Sandia National Laboratories' Resilient Energy Systems Mission Campaign, these video games will provide the basis for course projects, summer camps for high school students, and outreach to the public, starting with a public deployment at the Georgia Tech Dataseum in Spring 2024.

Dr. Molzahn also integrates his research and teaching activities via his leadership roles for top power systems conferences. For instance, as vice-chair of the *21st Power Systems Computation Conference*, he worked to record, publish, and curate videos of all research presentations from this conference on YouTube. These videos form the basis of course assignments that place students in the role of a National Science Foundation program manager tasked with critiquing the latest research.

Additionally, Dr. Molzahn is collaborating with two historians in a Sloan Foundation funded project that is interviewing senior power engineers to trace the history of algorithms underpinning power grid operations. Based on twenty 90-minute interviews conducted to date, Dr. Molzahn has developed curriculum units for his power engineering courses where students read seminal research papers and watch the interview recordings to understand the hidden assumptions and underlying motivations for the algorithms used to operate electric power grids. Since these interviews will be archived at the IEEE History Center, these curriculum units will be a resource for faculty in power engineering programs worldwide.

Furthermore, Dr. Molzahn's educational efforts closely involve Georgia Tech's power engineering alumni in his courses. The alumni give brief presentations on applications of the course content, evaluate student presentations, and assist with career planning. Recognizing the potential of these efforts, I funded Dr. Molzahn through his role on the Student/Faculty Committee to formalize these activities. I also note that Dr. Molzahn serves on the ECE Graduate Admissions Committee.

In summary, Dr. Molzahn is an excellent educator as shown by his near-perfect teaching evaluations, dedication to obtaining resources for educational endeavors, innovative course projects, integration of research and teaching, and alumni outreach. Thus, Dr. Molzahn is an exceptional candidate for CTL Junior Faculty Teaching Excellence Award.

Best Regards,

Dr. Arijit Raychowdhury, Steve W. Chaddick School Chair and Professor, School of Electrical and Computer Engineering

Reflections on Teaching

Daniel Molzahn

School of Electrical and Computer Engineering

As both a third-generation power engineer and a third-generation educator, my role as a power engineering professor unites traditions on both sides of my family. Accordingly, the proudest moments at the intersection of my personal and professional lives involve sharing my successes in power engineering education with my family. As retired K-12 teachers, my mother, mother-in-law, and grandmother particularly appreciate discussions regarding the impacts of emphatic, thoughtful, and authentic teaching and assessment practices on the next generation of students. My father, father-in-law, and grandfather, who worked at electric utilities and on power electronic converters, enjoy reminiscing with about their own engineering studies and their experiences over several decades in the power industry. In this context, I am fortunate to have the privilege of preparing the next generation of power engineers to address the energy transition to clean, affordable, and resilient electric power systems.

To train for my position as a professor, I strove to both understand educational theory and obtain practical teaching experiences. Through courses on teaching science and engineering during my PhD studies at the University of Wisconsin–Madison and my postdoctoral fellowship at the University of Michigan, I acquired such skills as active learning techniques and backward lesson design as well as knowledge of multiple intelligences and theories of student assessment. As a teaching assistant at the University of Wisconsin–Madison for the power systems engineering course that set me on my professional path, I first saw the challenges evident in teaching non-traditional learners who sometimes lacked the requisite background knowledge. During my postdoc at the University of Michigan, I had my first opportunity to mentor PhD students and guest lecture in graduate-level courses. Throughout my subsequent four years on the research staff at Argonne National Laboratory, I further honed my education and mentoring skills by giving guest lectures and co-advising PhD students with colleagues at various universities. These included the first PhD student for whom I was the primary technical advisor, Dr. Rasoul Narimani, who subsequently started a faculty position at California State University, Northridge. Having encountered several roadblocks in his research project, this experience helped teach me the importance of perseverance and empathy in mentoring students.

While my previous position on the research staff at Argonne provided ample opportunities to grow a strong research program, the limited ability to teach courses and inability to be sole mentor of graduate students led me to pursue faculty positions. Since starting as an assistant professor in the School of Electrical and Computer Engineering in the Spring 2019 semester, I have taught four iterations of ECE 4320: Power System Analysis and Control, four iterations of ECE 4321: Power Systems Engineering, and one iteration of ECE 6320: Power Systems Control and Operation, each of which usually has twenty to forty students. I have also led a Vertically Integrated Projects (VIP) team since Spring 2022, with 121 total enrollments (58 unique students). I also lead a research group that currently has ten PhD students, three MS students, three undergraduate students, and a postdoc.

Drawing on these experiences, my teaching philosophy is best summarized by four main objectives: (1) impart a sound foundation of basic knowledge for all students using an active lecture style, (2) provide broad context in order to make connections among course materials, (3) encourage student engagement through authentic and meaningful teaching, and (4) continuously enhance course materials.

Foundation of Basic Knowledge

In order to climb the ladder of Bloom’s learning objectives taxonomy, students must obtain a solid foundation of course knowledge. Imparting basic knowledge is especially challenging for a diverse class with significant disparities between experienced students and those seeing the material for the first time. This is particularly evident among non-traditional learners who sometimes lack the requisite background knowledge. Through multiple iterations of senior-level power engineering courses where I start with basic concepts that should, in

principle, be recalled from previous courses, I found that even advanced students benefit from a brief but intensive review of fundamentals.

To create a foundation of basic knowledge for all students, I am able to draw upon experience from my previous teaching courses to use an active lecture style. Active lectures encourage student engagement and understanding using brief exercises and assessments. For instance, after introducing a concept, I often provide a short related problem that students solve in a “think-pair-share” exercise. This gives the opportunity for all students to assess their mastery of the material, allows me to clarify any misunderstandings, and strengthens students' interpersonal networks. Active lectures have helped me reach multiple levels of student knowledge and anticipate the needs of non-traditional learners. Additionally, I aim to specifically and repeatedly call out common errors made on similar problems by students in previous courses to help students learn from their predecessors. After improvement through trial and error, this style has been well received among students and helps to bridge knowledge disparities.

Broad Context

Concurrent to imparting a solid foundation of basic knowledge, providing a broad context for course material allows students to construct an understanding of how knowledge fits together within and among disciplines. Putting knowledge in context enables students to build on their knowledge rather than simply memorizing material to pass the course assessments. To provide a contextual framework, I start classes by overviewing the purpose of the material and identifying connections to previous knowledge. Providing context is also accomplished by drawing on outside experts, such as guest lecturers from industry and government, who can demonstrate how the course material aligns with practical objectives. I also provide context through resources for deeper and broader student learning (e.g., related courses, seminars, and extracurricular groups).

To accomplish this, I leverage my role as the faculty advisor to the Energy Club, a student group on campus that broadly focuses on energy-related topics. This allows me to connect students with energy-related internship opportunities, visiting speakers, and educational programs from as diverse a range of organizations as utility companies, equipment vendors, national laboratories, and the US State Department, among others.

Authenticity in Teaching

With a contextually grounded foundation of basic knowledge, I use authentic teaching and assessment to motivate students to achieve a deep understanding of course material. Authentic teaching engages students with practical and meaningful learning opportunities. As a key mechanism for authentic teaching, projects which require creativity generate student interest and cement existing knowledge. Leveraging \$20k in funding from MathWorks, I put significant effort into developing realistic and timely course projects that connect students with modern challenges facing power engineers. These projects include a simulation that places students in charge of operating, maintaining, and repairing a simulated model of the Georgia power system during a pandemic. Students are tasked with balancing the need to maintain low-cost and reliable power system operation against the health risk imposed on the repair and maintenance crews due to the pandemic disease. A second course project tasks students with defending the Ukrainian power grid during the war with Russia by placing defenses to interdict missile attacks targeted at electric transmission infrastructure. Students must analyze the transmission network characteristics to identify key power lines whose failures would lead to significant power outages.

Graduate power systems engineering courses provide opportunities for research-focused course projects. These projects task student teams with miniature research projects the broader research community would find useful if well implemented well (e.g., extensions to open-source power simulation tools that program variants of traditional computational algorithms). To motivate the students, publicize the results to the research community, and connect students to industry, I leverage my professional network by having colleagues at Department of Energy National Laboratories connect virtually to the students' project presentations. My Laboratory colleagues listen to their presentations, read their project reports, and ask

questions to inform inputs to the students' project grades. By connecting students to the National Laboratories, my colleagues there get an early look at early stage graduate students to recruit for internships and postdocs.

As another example, my VIP team students are developing video game simulations of power grids operated during extreme events. With funding from my NSF CAREER Award and \$20k annually from Sandia National Laboratories, these video games will be used in future course projects, high school summer camps (including the Seth Bonder Summer Camps developed by the NSF AI Institute for Advances in Optimization, for which I am on the leadership team), and public outreach, beginning this semester with an exhibition at the Georgia Tech Dataseum. In a crowdsourcing effort, the VIP team and my PhD students will use data obtained from players of the game to inform other research, such as determining appropriate parameter values (e.g., laypersons' perspectives on tradeoffs between the cost, equity, and reliability of energy supplies) and as datasets for transfer learning techniques.

My interdisciplinary experiences also enable authenticity in teaching. A technical background alone is not sufficient for tomorrow's engineers to meet many societal challenges; authentic, interdisciplinary instruction is necessary to prepare students for workplaces that need increasingly diverse skills. For instance, sustainably meeting the world's energy challenges requires the interaction of experts from such fields as engineering, environmental science, social science, and policy analysis. My graduate studies in the Master of Public Affairs program, Energy Analysis and Policy Certificate, and Dow Sustainability Postdoctoral Fellowship programs have afforded me with a strong background for teaching to these interdisciplinary challenges.

I also strive for authenticity in my classroom by inviting recent power engineering alumni back to campus to give presentations on how their experiences in the power industry are related to the topics we are covering in class. I find that there is no better way to motivate students than to have junior alumni who were in their seats several years ago explain how they use course concepts daily in their professional lives. In some cases, I worked with power engineering alumni to develop homework and exam problems modeled after specific problems they encountered in their industry experience, including complementary recordings of actual data and photos of actual hardware. Furthermore, connecting students and alumni improves mentoring and has, in multiple instances, led students to their future employment. As someone who graduated into the start of the Great Recession in 2008 when even top engineering graduates were unable to find fulfilling jobs, I am passionate about connecting students to industry so that future students do not have the same hardships. To formalize all of these efforts, I received \$15k from the School of Electrical and Computer Engineering to connect current students and junior alumni.

Continuous Enhancement of Course Materials

In my experience, the first time teaching a course involves substantial challenges in keeping the basic tasks running: clear lecture notes created on time, homework problems assigned and graded, effective assessments developed, etc. During the second iteration of teaching a course, most of my available time is spent smoothing out all the minor issues and inconsistencies encountered during the first iteration of the course, e.g., rewriting notes for topics that were poorly explained, clarifying homework problems that students misinterpreted, reordering course materials to be more consistently presented, etc.

After the second iteration of a class, my goal is to achieve continuous enhancement of course materials. Every semester, I focus on developing one or two new experimental ideas. Complementing those discussed above (e.g., authentic course projects, alumni connections), I next provide summaries of other such extensions.

- **Virtual Reality Substation Walkthrough Tour:** In collaboration with my ECE colleague Dr. Lukas Graber who is an expert in high-voltage engineering, I used funding from one of my National Science Foundation projects to hire Ms. Kruti Maheshwari, a School of Industrial Design undergraduate student I met via my VIP team. After using a 360°-camera to take photographs throughout the substation, Ms. Maheshwari created a virtual reality (VR) walkthrough of the substation. Using two Meta Oculus VR headsets, I use this walkthrough to afford power engineering students in ECE 4320

and ECE 4321 with the ability to experience high-voltage hardware that would otherwise be inaccessible, thus providing a unique preparation for industry positions.

- **History of Power Engineering:** With \$250k in funding from the Sloan Foundation and in collaboration with two historians, I am the PI on a research project that is studying the history of the algorithms that underpin power grid operations. The heart of this project involves conducting oral history interviews with senior power engineers who created the foundations of these algorithms. As part of this project, I developed curriculum units for my ECE 4320 and ECE 4321 courses based on the twenty 90-minute interviews to help students understand the historical context and underlying assumptions used in today's grid operations to inform their work on future power grids after starting industry positions.
- **ChatGPT Problems:** With the rapidly growing capabilities of Large Language Models, I developed homework and exam problems that are based on responses from ChatGPT to technical questions. Specifically, I input homework and exam problems from previous iterations of my ECE 4320 courses into the latest version of ChatGPT. Students were tasked with identifying and correcting the errors in the ChatGPT outputs. This task helped students identify the limits of current Large Language Model technologies to impart appropriate degrees of technological skepticism and optimism. Furthermore, correcting errors also has students practice a different skillset compared to directly solving problems.
- **Improved Exam Development:** Effective teaching requires a substantial time commitment, so speeding up unproductive tasks that would otherwise sap valuable time can lead to better outcomes. Last summer, to this end, I invested several weeks programming a set of customized LaTeX macros to enable drawing three-phase circuits and single-line diagrams in the TikZ package. These customized macros dramatically reduced the time required to produce my exam documents for power systems courses. Demonstrating their value, my colleagues at other universities have recently adopted these macros to make exams and homework assignments in their courses.

At the end of every semester, I always read through student evaluations, reflect on what aspects of the course could be improved, and think about anything changing in the broader world that could impact my teaching for the next semester. In this way, I strive to adapt my teaching to topics such as Large Language Models, the Ukraine war, the coronavirus pandemic, etc. so that my courses improve in their authenticity and context.

Conclusion

In summary, I have found the most success in teaching by focusing on imparting a foundation of basic knowledge to reach students of all experience and ability levels, providing broad context to motivate and contextualize course content, striving for authenticity in course material and assessments, and continuously improving my courses during every iteration. I will conclude with two personal reflections, one that makes me profoundly sad and another profoundly happy.

Regarding the former, I always tried to operate my classes with compassion and empathy towards students. With flexible course policies regarding, e.g., assignment deadlines, the availability of course notes, office hour schedules, etc., I always tried to err on the side of generosity to students who may be struggling for any reason. This perspective took on a new importance for me several years ago after my father was diagnosed with a terminal disease that is slowly but steadily removing his physical faculties. I now, more than ever, try to meet students with empathy and compassion to whatever challenges they may be experiencing.

Regarding the latter, my role as an educator is now taking on a new dimension as my wife recently gave birth to an amazing baby girl. While giving her on-the-fly lectures regarding various topics during early morning feedings to keep myself awake, I have been reflecting on how I can both adopt my experiences as a professor to teach my daughter throughout her life and also learn from my experiences as a new father to improve my skills as a university educator.

Illustrations of Teaching Excellence and Impacts on Student Learning

Daniel Molzahn

School of Electrical and Computer Engineering

This document presents various quantitative and qualitative illustrations of teaching excellence and impacts on student learning based on Dr. Molzahn's teaching and mentoring.

Course Surveys (CIOS), Item 10: Considering everything, the instructor was an effective teacher

TERM	YEAR	COURSE			CLASS SIZE	5: strongly agree	4	3	2	1: strongly disagree	N/A	NO. OF RESP.	INTER-POLATED MEDIAN	GT median	CoA median
Fall	2023	ECE	4320	A	28	10	0	0	0	0	0	10	5.00	4.67	4.67
Fall	2023	VIP	2601	A	30	9	1	0	0	0	0	4	4.94	4.67	4.67
			3600	A											
			3601	A											
			3602	A											
			4600	A											
			4601	A											
			4602	A											
			6601	A											
6602	A														
			6603	A											
Spring	2023	ECE	4321	A	36	20	0	0	0	0	0	20	5.00	4.61	4.59
Spring	2023	VIP	2601	A	24	4	0	0	0	0	0	4	5.00	4.73	4.70
			3601	A											
			4601	A											
			4602	A											
			4603	A											
			6603	A											
Fall	2022	ECE	4320	A	33	18	0	0	0	0	0	18	5.00	4.70	4.67
Fall	2022	VIP	2601	A	18	7	0	0	0	0	0	7	5.00	4.70	4.67
			3601	A											
			3602	A											
			4601	A											
			4602	A											
			6603	A											
Spring	2022	VIP	2601	A	16	4	2	0	0	0	0	6	4.75	4.72	4.56
			3601	A											
			3602	A											
			4601	A											
Fall	2021	ECE	4320	A	27	14	0	0	0	0	0	14	5.00	4.75	4.67
Spring	2021	ECE	4321	A	29	19	0	0	0	0	0	19	5.00	4.73	4.60
Fall	2020	ECE	4320	A	21	16	1	0	0	0	0	17	4.97	4.53	4.42
Spring	2020	ECE	4321	A	15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fall	2019	ECE	6320	A	29	22	2	0	0	0	0	24	4.95	4.70	4.70
Fall	2019	ECE	6320	Q	8	5	2	0	0	0	0	7	4.80	4.80	4.80
Spring	2019	ECE	4321	A	16	9	0	0	0	0	0	9	5.00	4.60	4.50

Selected written student feedback from anonymous CIOS evaluations:

- “By far, Dr. Molzahn was the most enthusiastic, accessible, likable, prompt, and clear instructor I have had anywhere. He is a model for any academic professional, and his ability to do so well in his first teaching semester is nothing short of incredible. His respect for students and desire to give them prompt feedback on assignments is unparalleled.”
- “After speaking with many students in the class, I can say with confidence that you have done an amazing job teaching this course. Lectures are structured and well planned, which makes it easy to take useful notes and ask questions. From the first to the last minute of class your knowledge on the subject is more than self-evident. You also teach with a clear desire to leave no student behind and with a passion that is admirable and contagious.”
- “Professor Molzahn is the most passionate, caring, transparent, and invested professor I have ever had at Georgia Tech, and that truly shines through in his teaching. He is teaching an upper level, niche power systems course. It would be SO easy to make this course incredibly difficult and let students struggle by themselves, but the amount of care he pours into BOTH his teaching and how effectively his students' learning is tremendous. This course is hard because of the rigor of the material being taught, but it is SO manageable and enjoyable due to the instruction given by Professor Molzahn.”
- “Your power systems courses have been the absolute best courses I have taken as a student at Tech. I genuinely enjoyed all of the material and wanted to thank you for doing an exceptional job presenting it. I appreciate how passionate you are about the topics and how much you care about your students succeeding, both in class and in industry.”
- “I honestly want to go change some of my answers for other courses CIOS, because Dr. Molzahn's helpfulness and respect for students is leagues above any other professor I've encountered at GT. I really felt like I was seen as a full person in his class and am so grateful for that respect. Dr. Molzahn was also great at ensuring students understood what he was explaining, it seemed like he really didn't want any student to fall behind. Dr. Molzahn was seriously the best professor I've had at Tech.”
- “I have NEVER checked all 5's (strongly agree) with the above statements for a professor while filling out CIOS as quickly and confidently as I just did for Professor Molzahn. I could elaborate on every prompt asked, but for the sake of time/space, I'll expand on those that I think are most important/impactful. Molzahn's respect and concern for students is unmatched because he not only has respect and concern for us as students but as people, engaged citizens, and members of the power systems industry. His enthusiasm about this course and this industry is SO apparent by his eagerness to teach us the material as well as how much context he gives us in applying these concepts to the real world. His enthusiasm/passion then sets off a chain reaction to get students invested about the material. He is constantly sharing information about campus events relating to power systems, about career opportunities in the industry, and offering his network and support to approach any one of those events. He wants us not only to succeed and learn in his course, but he is truly invested and helping us find the best path/place for ourselves as we move into industry. His expectations for success in this course are very clear, and he tests/quizzes us according exactly to those expectations. I've never felt unprepared on the material that is being tested, and I feel like he is looking for our understanding of the material rather than getting a right number. His feedback on assignments, including tests/homework/written assignments, is SO thorough. Not only does he make answer keys easily accessible after assessments and go over common mistakes and walk us through problems as a class, but he provides detailed feedback on every students' individual assignments with where they may have messed up. He is so supportive in making sure we know where we got off track so we better understand for next time. I can't think of any ways instruction can be improved, but I hope every student in this course realizes and appreciates Professor Molzahn's efforts as much as I do.”

- “[His strengths are] being a professor that is caring and willing to work with the students to learn the most amount of information possible. I have never had a professor like Dr. Molzahn. It is safe to say he is the greatest professor I have ever had.”
- “Prof. Molzahn was all-around a fantastic instructor. He was enthusiastic and knowledgeable about the material, explained concepts very well, and it was clear that he genuinely cares about his students, wants us to succeed, and does everything in his power to make sure that we are able to do so. He is also a fantastic lecturer and very effective communicator. Usually, professors I consider to be good are nevertheless lacking in one of these areas, but Prof. Molzahn was not. He is without question one of the best professors I have had in my seven years at Georgia Tech, a distinction he shares with very few others.”
- “He has a passion and knowledge of the material. The best professor I've ever had in college. 10 out of 5 stars.”
- “Professor Molzahn is one of the Greatest. He has showed the most concern and appreciation for students, and he has given the best assignment feedback. As a student, I received tremendous support and guidance (for assignments and career-wise) from Professor Molzahn.”
- “Dr. Molzahn is very clear about what is needed to succeed in the course. I feel like the assignments and exams were very fair and required the amount of effort expected for a 4000 level ECE course.”
- “Professor Molzahn did an EXCEPTIONAL job introducing and presenting important topics on power systems and power engineering in addition to interesting and relevant current work being done in industry AND scientific research literature. The assignments were not too demanding, however, they thoroughly assessed your knowledge on the topics presented in the lectures.”
- “Dr. Molzahn may be the best professor I have had at Georgia Tech. After plenty of thought, I cannot think of any way in which he can improve.”
- “Prof. Molzahn is a great professor. He is kind, very helpful, and dedicated to his students' success.”
- “Very enthusiastic, always went above and beyond in helping and being available. Cared about students' interests and wanted them to be interested in the course material. One of the best Tech professors I have ever had.”
- “It's hard to determine which was the greatest strength of the professor's, as there were so many. ... Probably one of the best professors in the ECE department. 10/10!”
- “You make everyone in the class feel interested about the topic, even when the topic is more tough. As an exchange student, I have felt very welcome since the beginning and I really appreciate the effort of having Office Hours and Meet-ups, and I have been very impressed with how close you are to your students, always willing to help us.”
- “Professor Molzahn provided the most in-depth feedback on homeworks and exams I have ever received. I appreciate the amount of effort that was put into this, as this is extremely helpful. As well as that, professor Molzahn was also readably available to meet to answer questions or give career advice. He also cared about our input and wanted to make sure we were understanding the material.”
- “Molzahn's greatest strength is his passion for not just the material but the success of the students!”
- “I enjoy your enthusiastic demeanor, and you are one of my favorite professors at Tech.”
- “Professor Molzahn did a great job this semester making the classes engaging and educational. He was always mindful of the students, and tailoring the class to best help us learn.”

- “Professor Molzahn was a top notch professor this semester. He really went the extra mile to make distance learning feel not so different from being on campus. His office hours were consistent and very helpful. He showed great flexibility and understanding when adapting to the needs of the students.”
- “The teaching was always extremely clear, Professor Molzahn clearly cares about both the subject and the students. He was incredibly responsive both in taking time after class and responding to emails to help students learn. This course took me from knowing nothing about power systems to feeling confident about the course material.”
- “The instructor is the most caring teacher I have ever met, and I have been in school for a while! His dedication to the class was remarkable.”
- “I was always worried about doing anything meaningful related to power until taking this course. Now I truly feel like I have the foundational knowledge to follow any pursuits I may come across in this field. Thank you for significantly helping me get to this point!”
- “Professor Molzahn seems very interested in the subject, extremely knowledgeable in it, and excellent at communicating all of the concepts. He also seems very caring and responsive towards the students and invested in their growth.”
- “Dr. Molzahn really cares about the industry and his students. His desire to make us effective power engineers in industry really shows and he is by far one of the most approachable and helpful professors here.”
- “For the first time in any area, I have no criticisms about an instructor. Dr. Molzahn is as faultless as they come and is a credit to this institution.”
- “I loved the guest speakers. I loved that we always saw real examples in our homework and other assignments. It was great to be in a group as well, to learn the material further.”
- “Of every class I’ve had here at tech this course was designed so that all a student has to do is try and they will succeed.”
- [On ECE 4321] “Appropriate effort and load. Overall very well-managed class in terms of difficulty and work load.”
- “The greatest features were the in-class lectures, the in-class task, and class assignments. Professor Molzahn is extremely knowledgeable, and he passed much valuable information onto the class.”
- “Extreme clarity of lectures, career advice every class period, well-organized supplementary materials.”
- “The lectures were the best feature, but everything was great. Dr. Molzahn is a very engaging speaker, and his lectures are interesting and easy to follow.”
- “I strongly believe the course is perfect as it is.”
- “Professor Molzahn is an outstanding instructor. For every topic, background was provided which grabbed the attention of the class; tremendous support (in all aspects) was shown toward the students; great/detailed feedback for every assignment was provided. Overall, everything was ideal.”
- “His greatest strength is how much he cared for students and the class and how much he would empathize with the students. I felt no stress or negativity from the professor as I knew any problem I had I could ask the professor and we would come up with the best possible solution. He is probably the best professor I have had at Georgia Tech.”
- “Best professor I’ve had at Tech. Took this class because I was in 4320 with him. Great lectures and extremely helpful with timely replies outside of class.”

- “Besides being a great lecturer, Dr. Molzahn’s care for the students is his greatest strength. He always made sure we had the resources we need to succeed in the class, and he provided lots of helpful career-related resources for us.”
- “Openness and clear communication. I also love how he is willing to help us with a lot more than homework. He regularly informs us of events and internship opportunities and is a great resource that cares about the students.”
- “Every lecture was amazing, and I could remember all of the topics from a preceding course that he taught. This is how good he is. If every instructor could teach and be eager to help students like Dr. Molzahn, most classes would not be a drag.”
- “Dr. Molzahn is one of the best professors I’ve ever had, and I’m very thankful I was able to take both ECE 4320 and ECE 4321 with him.”
- [On possible improvements] “For the class, none. For Georgia Tech, hire 50 more Dr. Molzahns!”
- “In no way can instruction be improved. In fact, every instructor should meet Dr. Molzahn and learn how to teach well and be patient with students.”
- “Dr. Molzahn makes a conscious effort to walk through concepts from the student perspective, making complex content easier to understand.”
- “Once I attend the class, I can handle the assignment. Dr. Molzahn is pretty, pretty, pretty, excellent. Unbelievable professor!!!!!!”
- “Lectures were some of the best I’ve experienced in my time at Tech! The hws were also great opportunities to reinforce what we learned in the lecture.”
- “There were many great features of this course. These include take home midterms, unique ways of learning including applying MATLAB coding, ChatGPT, and guest lectures from industry professionals.”
- “I appreciated the structure of the lectures as Dr. Molzahn made an effort to cover relevant happenings (world/campus) and review previous content in addition to teaching new content. This ultimately helped to solidify understanding.”
- “Lectures were interactive, the professor created (live) lecture notes that were sufficiently close in detail to the textbook, but much easier to understand.”
- “Ability to explain complex concepts in a way that students can comprehend and stimulate learning by introducing related topics in class. Also fantastic job at connecting everything to the real world and always providing examples or fun stories from his career.”
- “Care for students. Probably does more for making students lives less stressful than any other professor I have had.”
- “Dr. Molzahn once again teaches us the industry secrets in one of the smallest niches in the US work force that finds international significance and ties back to the world's first electrification! He shares career guidance and networking opportunities with us regularly.”
- “Dr. Molzahn is easily one of the best professors I've had thus far at Georgia Tech. He effectively teaches complex concepts by approaching them from the viewpoint of a student and his enthusiasm for the content feeds into student engagement. Additionally, his genuine investment in student success means that he is accessible to students beyond the required "I have office hours." I think Dr. Molzahn has many more students visit his office hours than most because he has created a learning environment that encourages everything from questions about assignments to questions about work in the power systems field. Ultimately as a professor, Dr. Molzahn presents a compelling case to students on the fence about pursuing

graduate education or a career in power engineering. I greatly appreciate all his teaching/mentoring efforts and am glad to have had him as a professor this semester.”

- “Professor Molzahn is an extraordinary instructor. His celerity and knowledge made me extremely interested in the subject.”
- “He had unbelievable energy and enthusiasm, which made class more stimulating and fun.”
- “Enthusiastic, Energetic, Considerate, Patient, Overall perfect. I'm afraid I can not find a better professor other than Dr. Molzahn. He really ignites my interest in the power system.”
- “It felt like you truly wanted everyone to succeed and you were the kindest professor I've met at Tech. Keep doing your thing!”
- “Instruction could not be improved in any possible way. Instructor was the most effective professor I have encountered throughout my degree program.”

Selected feedback on ECE 4320 course projects (*Power Grid Pandemic, Defend Ukraine*):

- “This was one of my favorite projects to work on during my time at Georgia Tech.”
- “The end of year project was exciting.”
- “I enjoyed our final project as it related power systems to everything that is happening in the world with the pandemic right now.”
- “I appreciate how relevant this course was, especially including the project.”
- “The final project was very interesting, much better than a traditional final. The project gave real world experience.”
- “I very much enjoyed the final project, as it was both topical to current events and very applicable to what we had learned throughout the course.”
- “The final project was a ton of fun.”
- “The final course project was one of the best features of this class as it was a unique opportunity to interact with simulation tools and model how we may manage power systems in suboptimal conditions. The project option topics had obvious real-world relevancy and allowed for analysis from both the technical and contextual angles.”

Selected non-anonymous feedback from students:

- Abigail Ivemeyer (Georgia Tech BS/MS ECE Student): “I never would have explored the research realm without an invitation to work with one of my favorite professors, Dan Molzahn. There is just as much power in the actions of others inviting you into a space you never saw yourself in as there is in taking that first step yourself.” The following links offer further context: <https://news.gatech.edu/features/2022/08/celebrating-70-years-women-tech>, <https://news.gatech.edu/node/4931>
- Priya Mana (Georgia Tech PhD ECE Student): “Thank you for being one of my favorite teachers in the world! I don't think I ever had as much fun in a class project as in the 6320 course. Thank you for making the class so much interactive and such a learning experience.”
- Ethan Taylor (Georgia Tech BS ECE Student): “4320 and 4321 were absolutely my favorite courses at GT!”

- Alejandra Peña-Ordieres (Northwestern University IEMS PhD Student): “Your students must be extra happy to have you as a mentor. I learned a lot from the few months I was under your supervision and beyond, plus you supported me even after that. That's what I call an amazing advisor!”
- Laith Mubaslat (McGill University Masters Student): “Most of my work is based on things you've done. Everything from the review to your other work were beyond helpful and made me see things I wouldn't have been able to see otherwise.”
- Leah Salgado (Georgia Tech BS ECE Student): [After discussing fault analyses in class] “Just now, I was on a call for purchasing inverters and I was asked, “Hey, Leah, can you calculate the fault current for a triple line fault current if we give you the impedance for the transformer?” I believe I can.
- Leah Salgado (Georgia Tech BS ECE Student): “I wanted to say thank you for the clear lectures, the helpful office hours, the copious amounts of grace you afforded all of us, and for rooting for all of our careers. I could not have graduated without your flexibility and excitement to help us learn the material. I was not only exposed to the field of electrical power, but I was also given tools I will likely use in my every day life. Thank you, thank you, thank you.”
- *Thank a Teacher* note from Leah Salgado (Georgia Tech BS ECE Student), July 12, 2023: “Thank you for being such a great teacher, not just a professor - emphasis on "teacher". Not only do you take your time in lecture and office hours to explain topics, it is evident you genuinely care for your students and their success. Thank you for continuing to bring in top industry representatives to class help us explore and see innovation in action. You also communicate how much you love your own research, so it inspires us as your students to see beyond just "getting a job". Your love for the field is infectious and I'm glad I took your classes this semester and last.”
- *Thank a Teacher* note from Victor Alfaro (Georgia Tech BS ECE Student), July 21, 2023: “Professor Molzahn is the single greatest professor I have ever had. Dr. Molzahn is an extremely caring professor and his teaching is enthusiastic. I was losing interest in pursuing power engineering until I took power engineering with Dr. Molzahn. He will inspire many to look at problems in Power related problems and try their utmost best to solve them and not give up. I thank you Dr. Molzahn for making me believe in Power Engineering once more.”
- Erin Ohm (Georgia Tech BS ECE Student, ECE 4320 Fall 2023): “I also wanted to thank you for your generosity and understanding throughout the semester. I had a rough couple of months, and thanks to you, I was able to bear with my difficulties a little better. Thank you so much for a wonderful semester! It was a pleasure learning from you.”
- Mahitha Pothuri (Georgia Tech BS ECE Student, ECE 4320 Fall 2023): “I wanted to add that before taking your class, I had been debating with myself if Electrical Engineering was right for me or if I was good enough to do this major. Your class and teaching has really revitalized a passion I had for this major and for power engineering as a whole, and for that I'm really grateful. Thank you once again!”
- Luke Harrison (Georgia Tech BS ECE Student, ECE 4320 Fall 2023): “Just wanted to say thanks for the excellent job teaching the concepts for ECE 4320 and 4321. Both of these classes were the most interesting I've taken in my time at tech and will be the most useful as I begin my career. Out of my time at tech, these were some of the most well taught classes, and I'm glad to have had you as a professor.”
- Mark Moran (Georgia Tech BS ECE Student, ECE 4320 Fall 2022): “4320 has proven to be highly beneficial in my line of work. Understanding how system operators and planning engineers make decisions is highly insightful and gives me great explanations for how the grid is designed the way it is. So, for that, thanks so much! I honestly even use per-unit normalization all the time and hope to get more into fault analysis as time goes on!”

- Xuanzhang Liu (Georgia Tech BS ECE Student, ECE 4320 Fall 2023): “I also wanted to express my heartfelt gratitude for your remarkable contributions to the ECE 4320 course this semester. Your dedication to teaching and your passion for the subject matter have made a profound impact on my learning. The insights, knowledge, and skills I gained in your course have been invaluable, and I genuinely appreciate the effort you put into creating an enriching learning environment.”

Virtual Reality Substation Walkthrough

As discussed in the reflection above, I worked in collaboration with Dr. Lukas Graber to create a virtual reality walkthrough tour of an electric substation and deploy this in my ECE 4320 and ECE 4321 courses. The photos below (reproduced with permission) show students taking the VR tour through the substation.



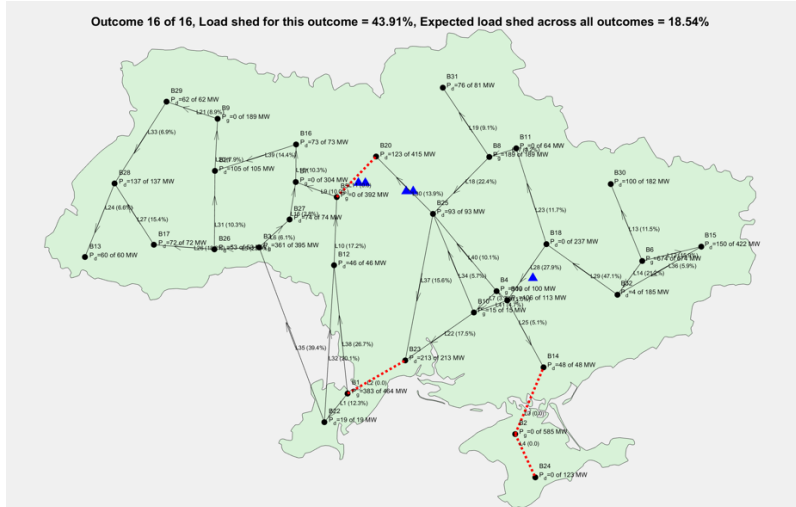
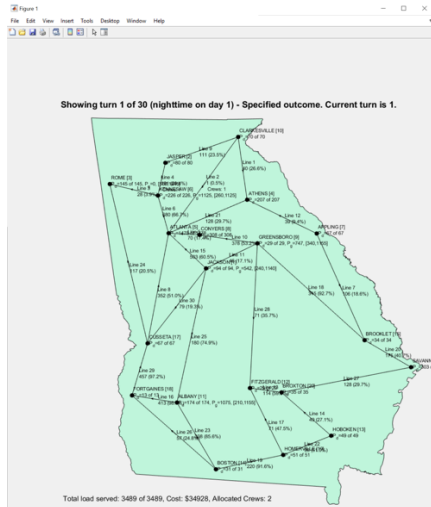
Sloan Foundation History Project Outcomes

As discussed in the reflection, I developed curriculum units based on my research project on the history of electric power grid algorithms via oral history interviews with senior power engineers. The response below from a student in my course was particularly fulfilling (emphasis added, shared with permission).

Excerpt from a written report from ECE 4320 undergraduate student Michael Ian McDonald: “Finally, the impact watching this interview had on me. After finishing the videos and giving me time to reflect, **I realized that this kind of project is what is talked about constantly at Georgia Tech.** Not the actual FDR [fault data recorder], although it is very interesting, **but the team being built to handle this project and the impact this project had on many different people.** In classes like ECE 1100, ECE 3005, and senior design, a “multidisciplinary team” is talked about heavily. We are constantly told how we need to be able to work in a team with people who don’t have our exact knowledge or degree and be able to effectively complete a projects goal. Dr. Liu discussed that this project brought together a team of people in power engineering, embedded systems, computer scientists, data scientists and more. **Although I’m told by my professors that I will work in teams where it won’t just be a team of engineers, it didn’t really get me thinking until watching these interviews.** Dr. Liu has made something with an impact that I dream of having, and she did it with a diverse team, leading to a complete and working product, and that’s amazing. **Ultimately though, it was the end of her interview that made me know I chose the correct thread. The power systems industry is in desperate need of new people who can apply a wide variety of skills and that “...there is a major revolution”, as she said. I want to have an impact and Dr. Liu’s interview showed that power engineering will let me have that impact.”**

Course Projects: *Power Grid Pandemic* and *Defend Ukraine*

The screenshots below show images of the power grid simulations developed for the course projects discussed above. Further details and example student project reports (shared with permission) are available at <https://molzahn.github.io/matlab.html>.



Ukrainian course project presentation to Congress

To create the *Defend Ukraine* course project in ECE 4320, my PhD student Rachel Harris created a synthetic (“realistic but not real”) test case of the Ukrainian power grid. Using only publicly available information, Ms. Harris created a plausible power grid model with both a detailed representation for demonstrating her cybersecurity research efforts and a high-level representation for the ECE 4320 project. Ms. Harris presented this Ukrainian test case and associated power grid vulnerability research to approximately 25 staffers from Georgia’s federal congressional delegation; see the picture below from this visit.



Vertically Integrated Project (VIP) Team: *Video Gaming for Electric Power Grids*

As discussed in the statement above, my VIP team is developing video games that place the player in the role of a power grid designer and operator tasked with maintaining reliability, transitioning to clean energy, and protecting against extreme events like wildfires and cyberattacks.



Relevant Service to ECE and the Institute

I was a member of ECE Student/Faculty Committee which focuses on student education and welfare via, for example, regular “coffee chat” meetings with students, participation in Eta Kappa Nu activities, and pre-finals care package events. I am currently a member of the ECE graduate admissions committee where I provide his Technical Interest Group with tailored recommendations of applicants for the power and energy faculty in ECE.

Contributing to diversity improvement efforts, I have participated in the Opportunity Research Scholars program, which involves ECE undergraduates from underrepresented groups in year-long research projects (<https://coe.gatech.edu/news/2021/02/engineering-culture-inclusion-and-diversity>). Moreover, I have participated in the FOCUS program which raises awareness of graduate education among students from underrepresented groups. I was also a judge of oral presentations at the 2023 Georgia Tech Graduate Technical (GT2) Symposium hosted by the Black Graduate Student Association (BGSA) and the Latino Organization of Graduate Students (LOGRAS). As co-chair of the Energy Systems Use-Case, I also contribute to educational initiatives for the NSF AI4OPT Institute (<https://www.ai4opt.org/education-diversity>), such as machine learning training sessions for HBCU faculty.

I also advise the Energy Club by helping student leaders organize both regular Energy Chats with prominent speakers and the annual Southeastern Energy Conference, which has approximately 150 registrants each year. This position includes co-advising the Solar District Cup Team, which took second place in the 2021 national competition.

February 9th, 2024

Nomination of Daniel Molzahn for the 2024 CTL Junior Faculty Teaching Excellence Award

Dear Center for Teaching and Learning Awards Committee:

In support of Prof. Daniel Molzahn's nomination for the *2024 CTL Junior Faculty Teaching Excellence Award*, this letter presents my observations of his teaching. As members the Power and Energy Technical Interest Group in the School of Electrical and Computer Engineering, we both teach undergraduate and graduate courses in power engineering, such as ECE 4320 and ECE 4321. Accordingly, I have been in contact with Prof. Molzahn since he started at Georgia Tech in Spring 2019, and we frequently share advice and ideas on how to improve our power engineering courses and curriculum. As this letter will support with observations about his education in two key contexts, Prof. Molzahn is an excellent power engineering educator and I strongly support his award application.

Ensuring a reliable and efficient supply of electricity requires highly trained and experienced engineers to design, operate, and maintain electric power systems. Traditional power systems engineering education covers material on modeling individual system components and analyzing their connections in large-scale power grids. There exists a wealth of educational materials (e.g., textbooks, course notes, homework problems, etc.) related to mathematical modeling and analysis techniques, both of which are essential to being a successful power engineer.

However, unlike many other engineering disciplines where students get significant amounts of hands-on experience with the systems they are studying, it is difficult for instructors to have power engineering students work directly on real utility-scale hardware due to the safety and security concerns associated with critical infrastructure such as electric power grids. While very valuable to students' educations, taking field trips to substations, generating plants, industrial facilities, etc. is costly and difficult, so many power engineering students graduate without ever seeing utility-scale hardware outside of pictures in a textbook. This challenges instructors' ability to communicate practical aspects of power systems engineering. Thus, utility companies must spend significant effort training junior engineers in the practical aspects of power systems before they can make major contributions to the industry.

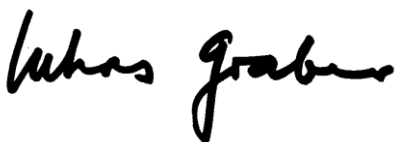
Emerging virtual reality (VR) technology provides new avenues to address this challenge. Based on an idea conceptualized by Prof. Molzahn, we collaborated in creating a VR walkthrough tour of an electric substation. Using funding from one of his National Science Foundation projects, Prof. Molzahn hired Kruti Maheshwari, an undergraduate student majoring in Industrial Design from his Vertically Integrated Projects (VIP) team. As part of a summer project, the three of us obtained access to an electric substation that Ms. Maheshwari photographed using a 360-degree camera. Ms. Maheshwari then used Kuula software to compile these photos into a VR walkthrough of the substation that is compatible with low-cost Meta Quest VR headsets. I note that Ms. Maheshwari was subsequently hired as an intern at the Electric Power Research Institute to create similar VR walkthroughs for utility-scale generation plants to train recent power engineering graduates as they start their careers in this industry.

I also observed Prof. Molzahn's classroom where he deployed this VR walkthrough in several iterations of his ECE 4320 and 4321 courses on power systems engineering. Using two Meta Quest VR headsets simultaneously broadcasting to the overhead projector, Prof. Molzahn guided the class through substation components that they had recently learned to model mathematically. This gave students a novel perspective on power engineering hardware with an unprecedented level of detail. The students were clearly strongly engaged with the lesson and responded with insightful questions and comments. Based on these successful deployments in his classes, we aim to build on this work with VR tours of other power facilities (wind farms, hydroelectric dams, high-voltage DC power converters, etc.).

Along with this VR project, I also collaborated with Prof. Molzahn for the last five semesters in presenting the Power and Energy Thread to freshman ECE students in the ECE 1100 course. This is a key course for building a pipeline of future power engineering students as they start their undergraduate studies. Prof. Molzahn and I present the curriculum, research projects, and job opportunities associated with the power engineering program at Georgia Tech. We also use devices from my laboratory to have students build simple electric motors and explore high voltages with a Van de Graaff generator. Dr. Molzahn's clear and engaging presentation always boosts student interest in power engineering.

To summarize, Prof. Molzahn is an outstanding educator, as evidenced by his innovative work with VR technologies for power engineering education and dedication to engaging the next generation of students in power engineering. He is thus an excellent candidate for the CTL Junior Faculty Teaching Excellent Award and I strongly encourage your consideration of his candidacy.

Sincerely,

A handwritten signature in black ink that reads "Lukas Graber". The signature is written in a cursive, flowing style.

Lukas Graber, Ph.D.
Associate Professor
Georgia Institute of Technology
Phone: 404-894-2726
Email: lukas.graber@ece.gatech.edu

Dear Faculty Awards Committee,

My top piece of advice to younger electrical engineering students at the Georgia Institute of Technology is to take any course that you can with Dr. Daniel Molzahn. For a young alumnus who spent five years completing both her undergraduate and graduate degrees in the School of Electrical Engineering, one may think that there are several pieces of worthwhile advice that I can bestow, and that would be a true statement. Yet, that number one spot remains occupied because I wholeheartedly believe that taking a course with Dr. Molzahn is one of the most valuable opportunities available to current students.

Over the course of the past four years, I have grown to know Dan Molzahn in numerous roles and contexts. I am lucky to have been a student in his classroom for two semesters, grateful to have served as his teaching assistant for one semester, and thankful to have had the opportunity to conduct research alongside him for two years. Now, I am honored to be able to recommend him for an award that remarkably reflects the impact that he has had on so many electrical engineering students, postdocs, and colleagues since the start of his academic professorial career at Georgia Tech.

Dr. Molzahn embodies an unquestionable commitment to the education and future success of his students. He works to lower barriers for his students by increasing accessibility to work and research opportunities, industry engagement, and professional societies. He willingly trades potential lecture time to dissect recent research papers that touch on course concepts, brings in IEEE-affiliated student organizations to support their membership efforts, and invites industry engineers back to network with his current students. Through these efforts, it is obvious that he cares not only about the success of his students within the four walls of his classroom, but he uses the time in that space to set students up for success in their future careers as well.

He is adaptable in his coursework both with himself, his students, and situational circumstances. I was enrolled in courses taught by Dr. Molzahn for both the spring and fall semesters of 2020 during the peak of COVID-19 restrictions – Power System Engineering and Power System Analysis & Control, respectively. Like the majority of college campuses in spring of 2020, Georgia Tech students found ourselves uprooted from campus in the middle of the semester and quickly transitioning to 100% virtual learning. Dr. Molzahn immediately polled our class with various options to adapt his course to best serve each of these students from our new distanced-learning locations. He invested in new writing tablet technology for himself so that he could continue instruction as similarly to what we had experienced in the classroom. He made himself and his course materials widely accessible so that technology imposed the smallest inconveniences as possible. His flexibility while maintaining his commitment to have us leaving that course enriched in power systems technical knowledge was admirable. Amidst the world falling around us, he provided a stable and comforting learning environment to escape to.

Come that fall semester, I returned to his classroom in a hybrid scenario to find our end-of-course project for Power System Analysis & Control would be a pandemic simulation of utility crews in Georgia. He had developed a MATLAB simulation of a fictitious Georgia transmission model that allowed the students to apply course concepts such as power flow, operational practices, economic dispatch, and optimization methods. Framing this transmission simulation project in a pandemic setting also allowed students to consider perspectives about keeping the crews safe and how to maintain efficient operation and maintenance with limited overlapping between personnel to lower potential COVID-exposure. Dr. Molzahn took, and continues to take, real world scenarios and

provide the most relevant and practical projects for his students. This enables students to get out of theoretical and idealized application of equations and consider the course material in the world that we are experiencing first-hand. His creativity with teaching is unparalleled, and 2020 was only his second year as an assistant professor at Georgia Tech. He took obstacles and unprecedented times and transformed them into opportunities for his students – showcasing his immediate impact in the School of Electrical Engineering.

After meeting Dr. Molzahn in a classroom setting, he reached out to me to see if I would be interested in joining his research team for one of his ongoing projects in collaboration with the National Renewable Energy Lab and some of his colleagues at Colorado University - Boulder. I had never foreseen myself engaging in the research realm, but I could not pass up the opportunity to continue to work alongside Dr. Molzahn. There is something so powerful about a role model inviting you into a space you never saw yourself in, and he provided me with a platform that I never would have sought out myself. Not only did he give me a seat at the table, but he pushed and supported my personal contributions to the extent that I served as primary author of my first research paper despite being the most junior member of the team. That paper was accepted to the 2021 Power and Energy Conference at Illinois, and I had published and presented my first research paper within one year of joining the team thanks to the driving force and support that Dan provided. Dr. Molzahn doesn't only open doors for his students, but he sees their success all the way through to the finish line.

As a young professional, one of the most influential entities between college and your early career are the people that you have in your corner. Dr. Molzahn so willingly sponsored my success in the classroom, in research, and in the start of my professional career. He is willing to offer up his network and resources to see his students succeed. As an undergrad, he met with me many times and took a more advisory role in helping me map out the rest of my curriculum for both my undergraduate and graduate degrees – discussing everything from potential power industry applications of various course topics to what specific ECE and other engineering curriculum could strengthen my technical knowledge for different pathways I was pursuing. I am immensely grateful for his instruction, for his mentorship and sponsorship, and for his impact that I still feel shockwaves of – beyond graduation, above geographic separation, and deeper than academics.

Dr. Molzahn has played an important role in preparing me to enter the industry of power engineering. He has solidified and strengthened the foundation for my chosen career, and I have been able to witness him fulfill that role for countless other electrical engineers – no matter where their end goal is industry, academia, or research. My friends, peers, and colleagues even beyond the School of Electrical Engineering or Georgia Tech itself have heard my praise for Dr. Molzahn because he is such a rare find. It is my honor to recommend Daniel K. Molzahn for the 2024 CTL Junior Faculty Teaching Excellence Award, and I hope this letter of recommendation has justly shown the drive, dedication, and endless passion that Dr. Molzahn gives to each of his students.

Sincerely,

Abigail Ivemeyer

ajivemey@southernco.com

Southern Company – Transmission Planning Engineer

Georgia Tech BSEE '21 & MSECE '22

February 8, 2023

Dear Faculty Awards Committee,

I am very pleased to recommend Professor Daniel Molzahn for the 2024 CTL Junior Faculty Teaching Excellence Award. I am a Senior Systems Engineer at Enphase Energy. I got my undergraduate and master's degrees in electrical engineering from the Georgia Institute of Technology where Professor Molzahn taught me three Power Systems courses. He also supervised a classmate and me on a research paper where we assessed the impacts of nonideal communications on distributed optimal power flow algorithms which we recently published.

Professor Molzahn has shown exemplary creativity when teaching. Whenever he introduced new concepts, he walked us through the derivation of their relevant equations and solved exercises that exemplify their use cases utilizing diagrams and imagery. I appreciate this teaching structure as I believe that we need both an understanding of the theory from first principles as well as its concrete relevance within the real world to fully grasp, and retain, what is being taught. In contrast, other professors would quickly introduce concepts without using deep explanations, supporting material, or concrete examples which made Professor Molzahn stand out among his peers. Furthermore, he showed creativity by inviting experienced people in Power Systems to his lectures. This is important as it shows students how they would implement what they have learned outside of academia and because it gives students an idea of what their professional experience would be like after graduation.

He has shown outstanding dedication to his students by always being available and very responsive both inside and outside of the classroom. During his lectures, I would frequently ask questions which he would take seriously and answer to the best of his ability. Whenever he felt that he had not given a satisfactory response, he would research the topic and give a more thorough explanation in the following lecture. He was also very responsive to our emails and made himself available to support us with assignments and exams. In line with his extraordinary dedication, his assistance continued even after I graduated from Georgia Tech. Professor Molzahn kept working with my classmate and me on our paper for over a year after our graduation until we were able to publish it. Moreover, when I was looking for a job, he connected me to recruiters and gave me counsel, support, and letters of recommendation.

Professor Molzahn complemented his creativity when giving lectures and his dedication to his students with an uplifting attitude that fostered passion among his students. In conclusion, he is a clear example of excellence in teaching, which is why I strongly recommend him for the 2024 CTL Junior Faculty Teaching Excellence Award. Please feel free to contact me if I can be of any further assistance.

Sincerely,



Carlos Menendez

Senior Systems Engineer

Enphase Energy

cmenendez@enphaseenergy.com

+1 (408) 823-4197

February 9, 2024

Dear Institutional Awards Selection Committee:

I am writing on behalf of Dr. Daniel Molzahn as a nominee for the 2024 CTL Junior Faculty Teaching Excellence Award. During the Fall 2023 semester, I was a student in Professor Molzahn's Power Systems Analysis and Optimization course (ECE 4320). By participating in the course, I can attest to Professor Molzahn's engaging teaching style and thoughtful interactions with students.

Professor Molzahn demonstrates excellence in teaching by making each class meeting period more than just a lecture. He effectively used class time to share about events/opportunities or news related to power engineering, get a pulse of where students are at with understanding the content, and show simulations/real world applications - in addition to covering standard lecture content, which included plenty of examples and relevant context. Professor Molzahn's passion for teaching and making this the best possible learning experience was abundantly clear as he continually asked for feedback on new elements of the course and took the time to ensure students understood not just the "what," but also the "how" and "why."

Professor Molzahn's research and prior experience working for Argonne National Labs helped emphasize the "why" element of the content covered. Oftentimes, we would start a topic and he would be able to point to an instance where he's used the concept in practice. For example, when discussing the part of the power optimization problem has to do with optimizing costs, Professor Molzahn shared with us one of his research projects that he works on in collaboration with other professors in the Industrial Engineering Department. Professor Molzahn also frequently features his PhD students' work which helps show how course content and research efforts are connected. For example, when discussing energy security, he brought up a recent conference paper his PhD student had presented which focused on cybersecurity related to the grid.

Similarly, one option for our end of course project was modelled on a simulation of the Ukrainian energy grid that another PhD student had built. This particular project option was looking at the optimal strategy for placing defenses on Ukraine's grid to prevent against major attacks/blackouts. This end of course project was particularly interesting and allowed students to have a first-hand experience with the power and limits of simulation. Additionally, I enjoyed that the project was connected to a critical optimization problem that not only had implications for grid efficiency, but also acknowledged the international factors at play.

Another assignment related to Professor Molzahn's research efforts in collaboration with historians at a partner institution, was reviewing IEEE History interviews with key players in the power systems optimization field. This assignment not only provided context for the now widely used algorithms, devices, and methods, but also served an important purpose

for me, as a young person who is just getting ready to enter the power engineering field. Through this assignment, I realized that some of the most accomplished people in the field today were also just beginners with lots to learn at some point. As I listened to their journeys and challenges, it seemed that a common theme arose – what may seem trivial in the moment has the potential to become important if that idea is nurtured and grown. Professor Molzahn’s thoughtfulness when planning assignments like this one, ultimately showcase his commitment to helping students explore and find their place among the many opportunities encompassed by power engineering.

In general, Professor Molzahn wants to see students succeed and helps whether that’s making a connection, holding additional office hours before a midterm, or talking through careers in power engineering. Throughout the semester, Professor Molzahn particularly focused on helping connect students with opportunities on campus and at National Labs. For instance, I sat in on an International Affairs class which discussed energy security with representatives from the State Department – an opportunity I would not have had otherwise.

I am delighted to recommend Professor Molzahn as a nominee for this award as he excels in the criteria outlined and exemplifies the spirit of the award. I would be happy to provide any additional insight if needed.

Sincerely,

Hanna Khor

Electrical Engineering Bachelor’s Candidate

Georgia Institute of Technology

hkhor@gatech.edu | 470-667-5036