

Elevating the Basics: Meet Professor Roberts | College of Engineering

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Apr. 28, 2021 — Associate professor of mechanical engineering Nick Roberts came into engineering the way many do: growing up, he liked taking things apart and putting them back together. But thermodynamics and heat transfer, now his main research focus – wasn't an obvious match.



Nick Roberts is an associate professor in the Mechanical and Aerospace Engineering Department. His careful approach to learning has primed him for a balanced career in research and teaching.

“Thermodynamics was the first class in mechanical engineering that really was tough,” said Roberts. “I did really poorly on the first exam, but it motivated me to really understand the material.”

One of the things that drew Roberts to thermodynamics, is that it's relatively simple: you're using the same basic properties to get a myriad of outcomes, whether you're trying to produce steam from heat, heat from heat, or trying to refrigerate. Roberts' research focuses on developing two kinds of materials: those with good insulation and those with good conduction. And as this field has developed, it's become clear that both require a combination of materials to yield the right kind of thermal behavior. What's difficult is figuring out how to get there.

“There are no models that tell us if we take this material and we mix it with this other material, here's the property that we get. That's the overarching motivation for this work, and if we can understand that, then it makes it a lot easier to design materials to meet the constraints for these applications.”

One of Roberts' major projects is a collaboration with the materials science company Life-E, which hopes to use his research to create thermal interface materials for nuclear reactors. These materials need higher thermal conductivity than what is currently available, but they also need to withstand radiation.

“They can't degrade over time because the lifetime of a nuclear reactor is presumably 30 plus years. We need to understand and be able to predict what the thermal properties are going to be over the lifetime.”

Research is a big part of Roberts' role as a professor, but it also acts as a vehicle for what he wants to do most: to teach. From several teaching experiences during his college years, Roberts knew he wanted to continue working with students, which he now considers the most fulfilling part of his job today.

For Roberts, thermodynamics and heat transfer research is all about leveraging the basics to create something new. He takes the same approach to teaching. Teaching forces him to be creative, whether that's coming up with new ways to teach engineering concepts or making connections between the course material and his students' lives outside the classroom. He also likes that teaching requires him to keep learning. And he's not afraid of what he doesn't know.

“I love when a student asks a question that I don't know the answer to. It reminds me of being a student when I dig into books and the literature to find an answer. If an answer doesn't exist, then it can even become a research question to pursue in the future.”

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