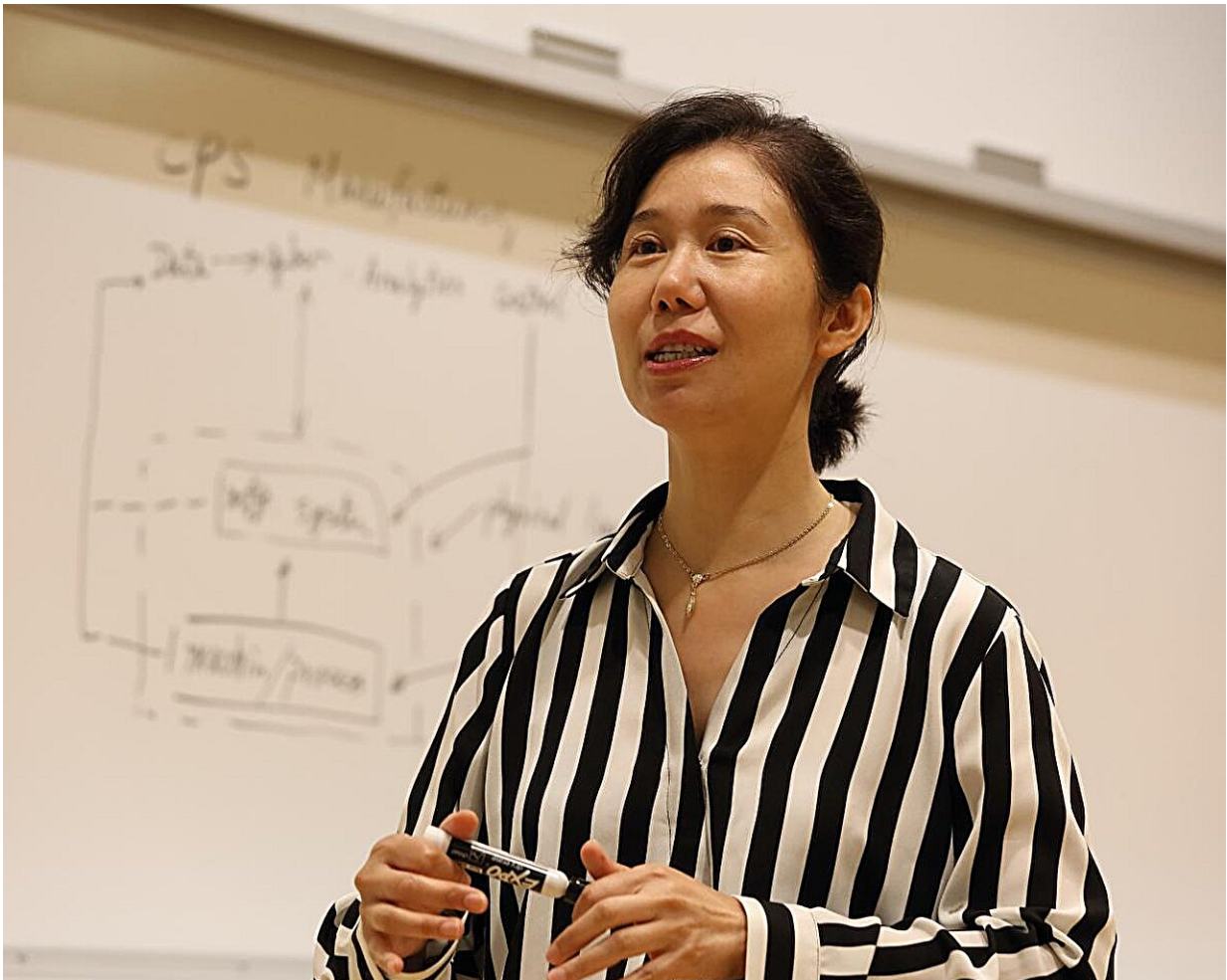


Q&A: Engineering skills to get a job in the 'new industrial revolution'

July 22 2024, by Eric Williamson



Whether you call it the "new industrial revolution," Industry 4.0 or 4IR, here's what professor Qing (Cindy) Chang says you need to know to compete for jobs running the modern factory floor. Credit: UVA Engineering

If you want to learn how to get a job as an engineer on the modern manufacturing floor overseeing improvements and collaborating with both people and robots, it helps to ask an expert for her advice.

The UVA School of Engineering and Applied Science consulted with Department of Mechanical and Aerospace Engineering professor Qing (Cindy) Chang, who was recently named a 2024 Society of Manufacturing Engineers Fellow for her career-long contributions to the industry.

Chang said the answer to the manufacturing "future of work" question can be found in parsing a multitude of data points. She and other experts refer to it as the "new industrial revolution," or Industry 4.0, which builds on the computing and robotics revolution of the last century.

"Recent developments in artificial intelligence and [machine learning](#) are improving the smart manufacturing domain through advanced analytics tools for processing the vast amounts of manufacturing data—transforming the '[big data](#)' into 'smart data' and knowledge," Chang said.

Smart manufacturing integrates data from various sources. That includes, as examples, sensors, machines and enterprise systems. Collectively, they can enable [real-time](#) monitoring, providing control and optimization of manufacturing operations.

"A responsive manufacturing environment can quickly adapt to changes in demand," Chang said. "It can reduce waste and improve overall product quality."

That's the job—and Chang should know. She was a three-time winner of General Motors' Boss Kettering Awards, which is GM's highest technical award. The company still uses her creative solutions in its processes. She

also continues to drive innovation through her research geared toward broader industry.

Here is what Chang says engineers contending for modern manufacturing jobs need to know:

Where is the automotive sector heading in general?

The [automotive sector](#) is undergoing a transformative phase driven by several key trends and technologies. Electric vehicles (EVs) and hybrid technologies are filling an obvious need due to environmental concerns. A trend of sustainable [manufacturing](#) goes along with that.

The development of fully autonomous vehicles is progressing, with significant efforts in sensor technology, machine learning, and regulatory frameworks. Vehicle-to-everything (V2X) communication and the "Internet of Vehicles" are connecting cars with the surrounding world, offering real-time data exchange and integration with smart city initiatives. And mobility as a service (MAAS)—the business of shared and integrated transportation—will continue to increase.

What skills should students have to compete for the new engineering jobs in manufacturing?

Generally speaking, students should develop electrical and electronics engineering skills, as well as [software engineering](#) and other skills within the computer sciences.

More specifically as it relates to the automotive industry, you'll need proficiency in embedded systems and real-time operating systems for developing in-vehicle software and control systems, mechanical engineering capability in vehicle dynamics and lightweight materials, and

AI/machine learning skills with the ability to perform data analysis.

Want to nominate some 'essential' courses you recommend that students take?

I would suggest the following courses for a well-rounded student: Manufacturing System Modeling and Control; Introduction to Control; Advanced Dynamics; Machine Learning for Engineering.

Beyond technical understanding, what leadership skills are important?

Graduates will need to display visionary thinking and have an innovation mindset. Communications skills are essential, as is the ability to exercise "change management," which is a form of adaptability. Leaders collaborate well, build teams and can make good decisions under pressure. Managers display both analytical thinking and decisiveness.

How does UVA Engineering stand out in preparing students for this competitive new manufacturing world?

UVA teaches all of these skills I mention and more, while being competitively positioned as a place where students are names, not numbers. Thanks to a small student-to-professor ratio, students get to know their professors, work on meaningful research projects and develop the leadership skills they will need to be valued on the job market.

Provided by University of Virginia

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