"Like engineers, designers and artists can play a role in advancing technology. It's a two-way street, where design practice can inform science and vice versa," said Genevieve Dion, Director, Shima Seiki Haute Technology Laboratory at ExCITe, and Assistant Professor, Fashion Design.

The Shima Seiki Haute Technology Laboratory has created an environment where students and faculty design and produce “smart” textiles. The lab is located in Drexel's ExCITe Center at 3401 Market Street, where it houses both the hardware and software for students and faculty researchers to design wearable technology that blends engineering with design. The multidisciplinary lab was established by colleagues in the College of Media Arts & Design, School of Biomedical Engineering, Science and Health Systems, College of Nursing and Health Professions, College of Engineering, College of Medicine and the iSchool.

Shima Seiki is a Japanese company that specializes in industrial knitting machinery, computers and computer programs used for knitting, 3D simulation and fabric simulation. In Drexel’s Haute Tech Lab, researchers are discovering how to mix fashion and technology—for humans and even for fashionable robots.

In 2012, the company signed a $1 million contract with Drexel to provide computers, software and knitting machinery now being used to bring research ideas to reality.

Four large knitting machines take up the majority of space in the Shima Seiki lab, each serving a different purpose. After researchers create a pattern, they can input the design directly into the knitting machine and watch it become a reality. These machines can knit with up to 28 colors or different types of yarn and even produce seamless garments.

Richard Vallett, a Drexel PhD student, has taken on a unique challenge, collaborating with the Drexel Autonomous Systems Lab (DASL) and the Haute Tech Lab. In December 2012, Vallett began working on a new fabric for Hubo for the Darpa Robotics Challenge (DRC). This year’s challenge is to have Hubo the robot, a multi-university collaborative project, drive a car. Hubo traditionally wears a grey plastic shell, which impedes his motion skills and does not protect his fragile frame. By replacing some of the grey shell with an experimental fabric, Hubo will have more motion in his arms and legs, making it possible for the him to use pedals and the steering wheel. Under Dion’s supervision, Vallett is experimenting with thick spacer fabric, which will offer flexible protection. The fabric will be cut and puncture resistant, and is made specifically to cover Hubo's knees and palms. Vallett’s PhD advising professor is Dr. Paul Oh from the department of Mechanical Engineering and Mechanics (MEM).

Kristy Jost spends two days a week in the lab, focusing on cohesive research, design and testing of her textile supercapacitors. She graduated from Drexel’s Fashion Design Program in 2011 and immediately began her PhD in Material Science and Engineering. Once Jost found an interest in smart textiles, she began thinking about garments and electronic textiles that will require power to operate. She wanted to create textiles that did not yet exist. Jost’s work centers around remaking energy storage materials into wearable and flexible knit structures that can be integrated into a smart garment. Her previous work demonstrated how screen printing was an effective technique for coating wearable cotton and polyester textiles with energy-storing materials to create textile supercapacitors. Today she uses intarsia knitted carbon fibers as a backbone for the screen printed materials, which serve as current collectors for charging the device. This is the first time knitting has been used to fabricate a textile supercapacitor. Jost’s project includes collaborations from the A.J. Drexel Nanotechnology Institute and the Haute Tech Lab, with advisors Dr. Yury Gogotsi and Genevieve Dion.

Says Jost: "One of the great things about the Haute Tech Lab is that everyone is working to solve different problems, yet we are all working towards the same goal of integrating electronics in garments.”