

Education and industrial consultancy

Ulster University

Ulster University uses Solid Edge as a platform to support the development of students and the growth of local businesses

Product

Solid Edge

Business challenges

Enhance student employability

Provide expertise to the local business community

Keys to success

Learning Solid Edge helps students understand engineering principles

Using Solid Edge with post-processing streamlines manufacturing

Results

Students frequently offered jobs by companies where they participated in an internship

Siemens PLM Software Student Design Contest won by final-year student

Solid Edge CAD model is the basis for new contract awarded to local company

Use of pre-finished material and streamlined techniques simplifies production

Innovative application of a CNC punch press helps create range of surface features

New jobs created locally



Through the use of Solid Edge, students gain valuable skills that enhance their employability and enable them to contribute to industrial innovation

Combining academic rigor with industrial experience

"Students who have been on placement are much more aware of the needs of industry, and have a rounded and informed perspective that really benefits their future careers." That's the verdict of Dr. Desmond Brown, senior lecturer in CAD (Computer-Aided Design) in the School of Engineering at Ulster University, where all engineering students undertake an industrial placement in their third year. The university has a strong vocational ethos and a

solid reputation for enabling students to put their design and technology skills into practice within a real-world environment.

According to Brown, the experience that students gain through placement adds to their employability. He cites one example where a student, during placement, was put in charge of all 3D CAD within a local company. This approach is not only of benefit to students, it is making a difference to local companies. "Every industry sector needs CAD technology and the skills are in demand," continues Brown. In addition to supplying such skills through its students, the university provides additional expertise and guidance through consultancy, and this supports industrial innovation across Northern Ireland and beyond.



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Acquiring the principles of engineering and 3D CAD

Students learn the principles of CAD by using Solid Edge® software from product lifecycle management (PLM) specialist Siemens PLM Software. Solid Edge was first implemented in 2005 by the university, which now has 250 licenses across seven computer laboratories. In addition, the students have a free copy on their personal computers. “It is important that we have a state-of-the-art, industry-standard software as our 3D CAD system,” states Brown. “Solid Edge has excellent capabilities and is easy to learn and use. We find that teaching with Solid Edge gives our students transferable skills, so if they are placed with a company that uses another software, they can still apply the principles of 3D CAD that they have learned.”

As students learn the operation of Solid Edge, they also become familiar with fundamental engineering concepts, such as the constraints of 2D geometry. Brown notes, “Because design often involves critical relationships between dimensions, we use Solid Edge to teach students why it is important, for example, to ensure that a hole remains the same distance from an edge during a downstream process or during amendment by another designer.”

Having learned the importance of parametric control, students in their final year discover another option in the form of synchronous technology. “The ability to import and edit non-native geometry is a major strength of Solid Edge,” Brown says. “Synchronous technology can save time and computing power because, with very

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Group Leader
Ulster University Advanced Metal Forming Research Group

complex parts, the whole model does not have to regenerate each time; there is no history to worry about and no waiting as with ordered or sequential mode. Siemens PLM Software provides the unique capability to combine parametric capability with the option of direct modeling and, from release to release, synchronous technology is getting better and better.”

Final-year students also cover downstream applications such as 3D printing, surface modeling and sheet metal design. Throughout the course, the university encourages students to make use of online resources such as the Solid Edge web-based library of standard parts. The mix of structured teaching, self-paced learning and work experience is certainly a winning combination. In 2014, one student’s Solid Edge model of a garden hose gun won the Siemens PLM Software Student Design Contest, a global competition with a monthly award. He now has a job at the innovation center where he did his placement.

Ulster University receives technical support from Majenta PLM. Brown expresses his satisfaction: “The specialists at Majenta PLM are excellent – first class in every respect. They are really responsive and are superb on technical support.”

A resource for industrial innovation

Ulster University has particularly strong links with local companies that know they can call in technological expertise whenever it is required. One of these is Garage Door Systems Limited, which has been producing made-to-measure garage doors for over 20 years. It sells sectional and roller doors made from sheet metal directly to the construction industry and to homeowners through a network of distributors.

For Garage Door Systems, speed is natural. In some instances, doors can be delivered within 48 hours of an order being placed. So when an existing client approached the company in 2013 with a requirement for a side-hinged garage door intended for pedestrian access, the directors immediately began to prepare a response. The brief was for a new steel door that would look good, embody quality yet be at an affordable price point. There were two key requirements: it must not leak and it must have multipoint locking.

“Two million meters of steel have gone through our rolling machine and, because that is what we know, we began thinking in terms of a solution around roll forming,” explains Peter Doherty, general manager at Garage Door Systems. “Then we realized that we had an opportunity to widen our expertise.” At that point, Doherty sought guidance from Ulster University’s Advanced Metal Forming Research (AMFoR) group, which focuses on the implementation of high-added-value solutions for sheet metal processes and products.

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Group leader, Dr. Alan Leacock, took on the role of consultant, bringing his knowledge of CAD and a wide range of manufacturing processes. After a review of existing processes, Leacock proposed the use of sheet metal and digital design with Solid Edge linked through computer numerical control (CNC) to a punch press. He explained that if the design was right, the manufacturing process would take care of itself. In particular, there would be no need to spend any precious machine time on manual programming. Eager to embrace new methods, Doherty agreed and, with three days before a critical customer meeting, Leacock set out to create the initial concept using Solid Edge. The customer gave very positive feedback, and over the next five months Leacock and Garage Door Systems produced eight candidate designs and three physical prototypes. With each iteration, the design became both more robust yet more flexible.

A high-value solution

The final design included the following elements: use of pre-finished material to provide a range of finishes without the need for painting; innovative use of a CNC punch press to create eight different surface features; adhesive bonding instead of mechanical fixtures to cut out both the welding process and avoid the danger of rust; and a symmetry point in the center to allow for hanging either left or right on-site.

The key challenge was to fold metal in such a way that one complete door could be made from one sheet of metal. Once that was achieved, the CAD model was the master for variations such as double-skin doors. Leacock adds: “We could not have done it without Solid Edge, which allowed us to play with shapes, concepts and ideas and to see what would go where and how everything would fit together.” He illustrates with this example: “At one point during development, we were showing the design to the client, and were able to take feedback and make live adjustments there and then.”

Having been awarded a formal contract in late 2014, Garage Door Systems took delivery of new machines and tooling in December and, when finished material began to arrive in January 2015, it was time to perfect the forming and assembly process.

“We’ve never been afraid of trying something new, but this project has completely changed our outlook and attitude,” says Doherty. “Not only has it extended our own machining expertise, it has given us in-house CAD skills. We have a student on placement, and we have recruited the graduate who was our first student along with a maintenance fitter who enjoys playing around with machine settings.”

Solutions/Services

Solid Edge
www.siemens.com/solidedge

Customer's primary business

With a national and international reputation for excellence, innovation and regional engagement, Ulster University's core business activities are teaching and learning, research, innovation, and industrial consultancy.

www.ulster.ac.uk

Customer location

Ballymena
Northern Ireland

Partner

Majenta PLM Limited

Open minds open doors

"Our new punch press is a very sophisticated machine and we are using it in a unique way, with 21 stations and 30 different tool profiles," says Doherty. "The whole project has been exciting, particularly because our machinery and material suppliers told us that it could not be done: that using coated material with a punch press would not work because contact with the tool would cause damage."

Garage Door Systems expects to create several new jobs over the next three years as it increases export sales. "Our relationship with the university has enabled us to open new opportunities," concludes Doherty. "As a result of working with Ulster University, we now have in-house CAD capability and, through Alan's knowledge and enthusiasm, we have been able to strengthen our expertise in applied metal forming. We are confident that, by exploring ideas using Solid Edge, we will come up with new designs that ensure we continue to thrive in the future."

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Group Leader
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