University of Notre Dame Students Learn World-Class 3D CAD Skills via PTC’s DesignQuest Program

Engineering Students Using Pro/ENGINEER® to Build A New Hip Implant for Real-World Applications

Notre Dame University, South Bend, Indiana

The University of Notre Dame, founded in 1842, is an independent Catholic university located in Notre Dame, Indiana, adjacent to the city of South Bend and approximately 90 miles east of Chicago. Admission to the university is highly competitive, with only one in every five applicants accepted to the freshman class.

The Challenge: Prepare Students for Real-World Engineering Challenges

Like many of the world’s top engineering schools, Notre Dame’s College of Engineering strives to teach its students engineering and design skills that are both in demand, and can be immediately applied in the real-world of manufacturing, design and engineering. In order to achieve that goal, the university must install, learn and then teach the most advanced technology tools now being applied in global industry. Unfortunately, many of these software technology applications—along with the necessary training and technical support—are prohibitively expensive to serve the needs of a large student population.

The Solution: The DesignQuest Program from PTC

As a member of PTC’s DesignQuest University Program, Notre Dame faculty and students receive low-cost Pro/ENGINEER software—the industry’s leading 3D CAD (computer-aided design) solution—as well as training and free technical support. Students learn how to apply the very same 3D design tools used by professionals at the world’s most successful manufacturing companies. The DesignQuest program provides teachers and professors with complete learning solutions, so they can prepare a new generation of innovators for success in a rapidly evolving technological world. PTC’s education program is a part of a technological literacy movement that seeks to improve critical thinking and multi-dimensional problem-solving skills, as well as to prepare a growing number of students to become engineers.

The Results: Students Create New Hip Implant

Today, students in the engineering program are developing valuable 3D CAD skills by using Pro/ENGINEER to design and build a new hip implant. Working with engineers from Zimmer, Inc., a world leader in the design manufacture and distribution of orthopedic implants, students are learning the essentials of 3D CAD, such as sketching and extruding product features, creating detailed drawings and assemblies, as well as behavioral modeling and computer-aided manufacturing. With these valuable, real-world Pro/ENGINEER design skills, these Notre Dame students will have a significant competitive edge when applying for professional positions upon graduation.

Pro/ENGINEER at ND

According to students in the Department of Aerospace and Mechanical Engineering at the University of Notre Dame, one of the best tools for a successful research project is Pro/ENGINEER. It’s even more exciting when the project has very specific and very practical applications that can change the quality of life for people who would use the “product” they are working to develop.

This past semester, Notre Dame engineering students Joshua Bartrom, Caitlin Kopf, Laura Peveler, Matthew Prygoski and Claire VerHulst teamed up to create the design and a mold for a new hip implant. Their work is part of proprietary research that is being conducted by the department, in collaboration with Zimmer, Inc.

For several years, faculty and students in the engineering department have been working with researchers at Zimmer on implants promoting minimally invasive orthopedic implant surgery. Students are learning that, as the US population ages, it is even more important to develop these implants. According to the Journal of the American Medical Association, nearly 10 million Americans have osteoporosis, which contributes to the more than 329,000 hip fractures recorded in the United States annually.
A broken hip can cause discomfort, disability, and loss of independence. Traditional surgery and recovery can also take a toll, with close to 40 percent of the total number of patients requiring long-term care. Minimally invasive surgery, with biocompatible implants, lessens complications from surgery and promotes quicker recovery times.

Throughout the semester, these students have come to appreciate the societal impact their work as engineers can have, although they cannot talk about the project specifics because the work is proprietary. They have also come to appreciate how useful Pro/ENGINEER is as a design tool.

“We wanted to work with polymers because they are more biocompatible than some of the more traditional implant materials,” says Bartrom. “Pro/ENGINEER made the design process—and changes along the way—very easy.”

“[Pro/ENGINEER] was a big part of the project, but we were also able to actually create the parts we needed through rapid tooling and stereolithography,” says Kopf. “We made the fixtures, too, which we used to test our implant, simulating the same angles and loads as the femoral shaft in the human body.”

While members of the implant team have been using Pro/ENGINEER since their sophomore year, most of the Pro/ENGINEER exposure in engineering at Notre Dame occurs in the junior year via a computer-aided design/computer-aided manufacturing course (CAD/CAM) taught by Professor Richard Strebinger.

“Our goal in the course,” says Strebinger, “is to introduce students to basic CAD/CAM tools using Pro/ENGINEER software, but we break up the work into three parts.”

Students first learn to sketch and extrude features, creating detailed drawings and assemblies. They are then introduced to mechanism design and the behavioral modeling tools for simulation and optimization. Lastly, they learn how to machine parts using computer-aided manufacturing.

“I was surprised at how many employers specifically asked if I knew Pro/ENGINEER,” says junior Carolyn Skinner. Carlos Montoya, also a junior, believes his experience with Pro/ENGINEER helped him secure a summer internship at Praxair, the largest industrial gases company in North and South America, where he will work in turbine and compressor production.

According to Strebinger, PTC provides the university with a broad range of integrated computer-aided design and engineering software, which exposes students to contemporary computer design tools for engineers.

As a member of PTC’s DesignQuest University program, Notre Dame faculty and students receive a site license of Pro/ENGINEER, along with student and faculty training, curriculum development and free technical support. The software provided to the University is the very same 3D design tools used by professionals throughout global manufacturing.

PTC’s education program is a part of a worldwide technological literacy movement whose goal is to improve critical thinking and multi-dimensional problem-solving skills, and develop the next generation of innovative, productive engineers.

For Notre Dame, the DesignQuest Program enables professors to teach the most advanced technology tools at a very affordable price, while preparing students for the toughest challenges of the real world. Even better, it gives students a leg up in the competitive world of professional employment, post-graduation.

“This [program] gives our students an edge in internship and job searches because they are already familiar with what ‘real-world’ companies are looking for,” said Strebinger.

To learn more about the University of Notre Dame and its aerospace and mechanical engineering department, visit www.nd.edu/~ame. To learn about PTC and how to join the DesignQuest program, please visit www.ptc.com/go/education.