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—John Irwin
Associate Professor/Mechanical
Engineering Technology Chair
Michigan Technological
University

Students gain an edge.

Students at Michigan Tech prepare for successful careers by using Autodesk® Inventor® software and Digital Prototyping to complete real-world projects.



Project Summary

The academic programs offered by the School of Technology at Michigan Technological University (Michigan Tech) give students the hands-on education they need to excel in industry—and the mechanical engineering technology program is no exception. It prepares students for practical design and production work by incorporating labs into nearly every class. One of the program's goals is to equip students with the technology skills required by future employers, including proficiency in 3D parametric design software. As freshmen, students learn Autodesk® Inventor® software and the basics of Digital Prototyping. Over their four years at Michigan Tech, they hone skills by completing a wide range of mechanical engineering projects. Using Autodesk Inventor software, students move beyond 3D to Digital Prototyping, designing, visualizing, and simulating products and their manufacturing processes before they build them. Autodesk Inventor Professional software has helped Michigan Tech students to:

- Evaluate alternatives to optimize designs
- Complete finite element analysis (FEA) on parts and components
- Resolve design challenges for their senior projects
- Master the software skills that employers want

The Challenge

Michigan Tech's mechanical engineering technology program attracts students eager to experience the fruits of their engineering labors. "Students who enter the program as freshmen are driven by an interest in manufacturing," says John Irwin, associate professor and mechanical engineering technology chair at Michigan Tech. "Others are drawn to it after they take one of our classes and experience our hands-on projects—they discover that making something is very satisfying."

Irwin teaches a product design and development class. During the class, students design and manufacture a product from start to finish—laying the groundwork for their senior projects. "They have to experiment with design alternatives, validating and optimizing their designs for Michigan Tech's manufacturing capabilities," he explains. "Then they actually fabricate their products in the shop. It gives them an excellent understanding of real-world product development processes."

Students get real-world experience using Autodesk Inventor software to design and fabricate projects.

Students must rely on 3D modeling software to complete their senior projects. “There’s no way any of them would complete their projects if they had to use 2D tools,” says Irwin. “Student projects are increasingly sophisticated and most include moving parts that have a high chance for interferences. Spotting and resolving all the potential problems in 2D would be nearly impossible in the time allotted.”

The Solution

While students have a choice of which software package they’d like to use, many choose Autodesk Inventor software. “There are many reasons the students like Inventor,” says Irwin. “It’s easy to use, it lets them constrain a sketch and make changes easily, and it includes the simulation and analysis capabilities they need to validate their designs.”

Irwin lectures his students on the importance of the Digital Prototyping facilitated by Inventor. “I used to work in the auto industry,” he says. “I tell them that I know from experience that they’re going to be doing Digital Prototyping on virtually any job they get. Companies don’t create physical prototypes, or as many physical prototypes, when they can validate designs digitally to save money. Employers today want to see Digital Prototyping skills.”

Redesigning 1908 In-Ground Turntable

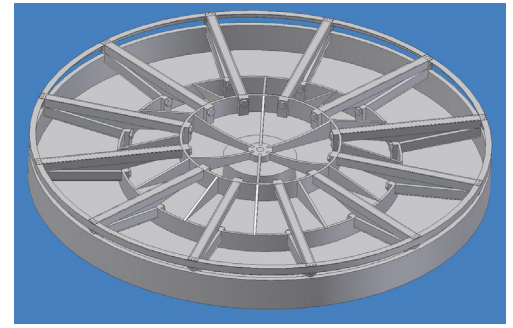
One recent, notable senior project involved replacing an in-ground garage turntable at the Laurium Manor, built in 1908. The circular turntable was comprised of pie-like sections and massive steel plates. “You drove the vehicle in and the turntable would rotate the vehicle 180 degrees so it was facing the right way when you wanted to leave,” says Irwin. “There are only two of these in the United States—the other one is in the Ford Museum.”

Bob Lohr, the senior leading the project, sketched and measured the original turntable during demolition and redrew the pieces in Inventor. He and his team members then tweaked the design to support the heavier cars now in use. “Inventor was an invaluable tool for redesigning the turntable,” Lohr says. “Since the top plates were the same throughout the design, we could import them as many times as needed into an assembly file. Then we applied constraints to make a moving model.”

Using the FEA capabilities in Autodesk Inventor Professional software, Lohr performed finite element analysis to determine the thickness of steel needed on the new turntable. “We needed to support a large modern truck with a plow, which we calculated could weigh up to 8,000 pounds,” Lohr notes. “We used I-beams to replace the old structural members and reinforced the top plates with angle iron.” When the design was complete, he presented it to the owners of Laurium Manor and they agreed to buy the \$4,000 of material needed. “We did all the welding ourselves on campus and then transported complete parts for assembly to the Manor,” Lohr adds. “Thanks to Inventor, it was much easier to visualize and fabricate the final product.”

Employment Edge

Irwin believes that students like Bob Lohr are well prepared to enter the workforce when they leave his program. “We’re seeing job listings all the time that require a background in Inventor,” he says. “Recently, one of my students was hired in part because he had Inventor skills. Having Inventor software experience on your résumé is really beneficial.”



The Result

With the help of Inventor software, the Laurium Manor turntable is operational—and students have the skills they need to secure a job upon graduation. “Our students tend to work at companies and in testing situations, rather than in research,” says Irwin. “When they leave the mechanical engineering technology program, they are prepared to go right into the workforce. With the hands-on Inventor training they receive here, they hit the ground running.”

For More Information

To learn more about Autodesk Inventor software, visit www.autodesk.com/inventor.



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