Voronezh State Engineering University
Educating tomorrow’s Russian aerospace engineers

Students develop skills across PLM

Preparing engineering students for industry positions
Following industry trends, Voronezh State Engineering University (VSEU) continuously updates its curriculum and teaching techniques. The University’s Department of Intellectual Computer-Aided Design Technologies offers an engineering curriculum which covers modern software solutions for product design and product lifecycle management (PLM). The software used in the academic process is from Siemens PLM Software. Solutions include NX™ software, Solid Edge® software, Teamcenter® software and the Tecnomatix® portfolio.

“We began our cooperation with Siemens PLM Software in 2010,” says Professor Vladimir R. Petrenko, VSEU’s rector. “We realized that a modern university student majoring in engineering must be able to use CAD/CAE/CAM (computer-aided design/computer-aided engineering/computer-aided manufacturing) systems and be able to learn new software solutions. These were the industry’s prerequisites for young engineers. Lack of such skills means failure in the job market.”

Since the department provides primarily aerospace-oriented programs, the solutions from Siemens PLM Software made good business sense as Professor Mikhail I. Chizhov, department head at VSEU, noted that they had become essentially a de-facto PLM standard for the industry. He explains, “It is no secret that the software solutions from Siemens PLM Software are widely used in our domestic as well as the global aerospace industry. It was one of the key factors in selecting the software for the academic process.”

Another reason to choose Siemens PLM Software’s information technology (IT) is the comprehensiveness of its portfolio. Using these solutions, a manufacturing company can quickly adopt an end-to-end, integrated development through production cycle. Siemens PLM Software’s line of
Engineering students begin using PLM technology as early as their first year at the university via the CAD history and CAD fundamentals courses. In addition, through pilot projects, students learn the fundamentals of 3D modeling (for example, using Solid Edge) and perform simple exercises.

“Students express great interest in the new design technologies,” says Professor Yuri S. Skripchenko, vice department head at VSEU. “They realize that their future is integrally tied to these very solutions. They enjoy the opportunity to experiment within the software environment. Design is a creative work. There may be hundreds of different solutions to a problem. Our students relish exploring multiple solutions and then choosing the best one.”

The faculty members have noticed that learning 3D modeling fundamentals promotes academic progress in other courses and helps with work studies at leading manufacturing companies. “We have observed that the students are now much better at descriptive geometry and manufacturing drawing,” says Skripchenko. “It is no wonder, since 3D modeling helps with understanding drawings and perceiving parts as a whole.”

In their first and second years, many students become so proficient at 3D modeling that they are able to independently make both bottom-top and top-bottom assemblies and further refine the designs. “This year, for the first time, we hosted an NX 3D modeling contest for freshmen, and we were pleasantly surprised with the students’ performance,” says Chizhov. “The participants were so enthusiastic and capable that they managed to solve problems more suitable for third year students. Unquestionably, the new technologies mean a new approach to learning, espe-
cially thanks to visualization. Using CAD, a student sees the model evolving during the course of design, notices mistakes and finds ways to eliminate them, which improves their motivation and commitment to making better decisions.

In the third and fourth years, engineering students learn NC programming, simulation, production planning, and assembly process visualization techniques, acquiring valuable skills. NX, Solid Edge, Teamcenter and Tecnomatix are all used to support the academic process.

The department has five computer labs, four servers and a dedicated classroom for learning CAM systems.

To help students learn NC programming, there are four workstations equipped with SinuTrain. This training software works like a real Sinumerik CNC controller and thus helps students to later transfer their knowledge to real machine tools. Besides, there is a tutorial desktop 3-axis NC milling machine used by the students, giving them experience in working with metals commonly used in aerospace industry.

The faculty members have developed a tutorial data model. Combined with Siemens PLM Software’s technologies, the model has enabled a comprehensive manufacturing product design and production planning cycle. Collaboration across geographically dispersed groups is managed.

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Professor Mikhail I. Chizhov
Intellectual Computer-Aided Design Technologies
Department Head
Voronezh State Engineering University
through the use of Teamcenter, which also provides secure data access over the internet so the students can work from home.

**Learning how to work together**

Siemens PLM Software’s solutions play a special role in developing course and graduation projects. The cooperation between VSEU and Voronezh Aircraft Manufacturing Enterprise, one of the leading aircraft manufacturers in central Russia, helps the students apply their skills to real-life situations. In these projects, students create digital mockups, develop NC code, make digital standard part libraries, perform finite element modeling (FEM), utilize motion analysis for assemblies, and more.

“Use of Siemens PLM Software’s products enables an integrated approach to project development, facilitates evenly distributed workloads among the stakeholders and provides traceability,” says Chizhov. “Collaboration, with the help of Tecnomatix, Teamcenter, Solid Edge and NX, enables students to learn teamwork principles, gets them ready for real-life production processes at modern manufacturing companies, and establishes an advanced production-management mindset.”

**Professor Mikhail I. Chizhov**

Intellectual Computer-Aided Design Technologies
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More specifically, that mindset is enhanced through the use of the Plant Simulation solution in the Tecnomatix portfolio, which was first introduced at the department in 2011. Its optimization and production flow analysis functionality and built-in genetic algorithms were instrumental in the faculty's redefining of course projects.

Real-world projects are especially helpful in accelerating learning. For example, ten students worked on planning for the digital manufacturing of airliner components, an integrated project supervised by Chizhov and Skripchenko. This large-scale research and development (R&D) project, involving Siemens PLM Software products, turned out to be extremely useful for actual production. A number of manufacturing equipment models, as well as manufacturing and assembly processes, have been developed. A production simulation model has been implemented and analyzed. In addition, the assembly process of a cargo hatch for a mid-range airliner has been simulated, with the ergonomics evaluated as well.

These are just a few of the many projects at VSEU that have been conducted using Siemens PLM Software’s solutions. Some projects have even won awards. For example, in 2012, Igor Karmakov, a VSEU student, earned second in the “Daring Ideas with Siemens PLM Software” student design contest. His “Sports Car Star Way” project was implemented with NX. The project included not only the vehicle’s basic geometry and models of its components, but also strength analysis, motion analysis, multiphysics exhaust system analysis and NC programming.

Another project, an assembly model of the Lectra Vector TechTex cutting machine, was developed by VSEU students Alexander Sergeenko and Mikhail Ogurtsov using NX. The project placed among the top ten in the contest.

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Voronezh State Engineering University
Customer’s primary business
Voronezh State Engineering University (VSEU) was established in 1956 and is one of the largest Russian schools. For several decades the University has been training engineers for the central Russia region. Over 65,000 engineers have graduated from VSEU.
www.vorstu.ru

Customer location
Voronezh Oblast
Russia

Among the most significant achievements by students and faculty are their contributions to the Antonov 148 regional jet, an integrated project supported by a government grant. The team provided high-tech avionics production development for this new generation airliner based on flexible production concepts and modern composites for serial production. The work was performed using Siemens PLM Software technology.

Graduating confident professionals
The university continues to further its productive use of solutions from Siemens PLM Software, launching CAX programs at the graduate level. For example, in 2012 the department opened a new M.Sc. program on PLM. “The program is fully based on Siemens PLM Software’s technologies,” says Skripchenko.

“The students gain very valuable skills as a result of working with modern CAD and PLM systems,” Chizhov adds. “In doing so, they can experiment and creatively solve engineering problems. A collaborative project development using Teamcenter is a way of mastering teamwork, as well as taking responsibility for delivering high-quality work on time.”

Skripchenko concludes, “Education today is not just theoretical learning, but doing real experiments. No wonder there is a high demand for our graduates on the job market. They are ready to use the newest and most advanced CAD/CAM/CAE/PLM tools.”