

Interview: Vladimir Vantsevich

Dr. Vladimir Vantsevich is a professor and director of the Mechatronic Systems Engineering Program at Lawrence Technological University in Southfield, Michigan. He discussed his school's program and the education of students in this field with the editors of *They Teach That in College!*?

Q. What is mechatronics systems engineering?

A. In general, mechatronic systems engineering (MSE) is an interdisciplinary, high technology field in engineering. MSE synergizes the knowledge outcome by integrating the specific areas of mechanical engineering, electrical and computer engineering, and math and computer science.

The major objective of MSE is the design and implementation of mechatronic systems as a new type of system in which mechanical, electro, and electronic subsystems are naturally designed into a whole system.

As an interdisciplinary field, mechatronic systems engineering interfaces with other engineering fields and natural and technical sciences. This has led to novel areas in research and engineering such as biology-inspired systems, optomechatronics, biomedical engineering, and innovative material-based systems.

Q. Please tell us about your program.

A. This program is unique in the United States and offers the degree of master of science in mechatronic systems engineering (MSMSE). Graduates will:

1. Learn the principles in mechanical design for mechatronic systems
2. Develop strong analytical and application skills in the analytical and adaptive dynamics of mechatronic systems
3. Obtain expert knowledge in the areas of logic design of mechatronic systems, the classical and modern intelligent/robust control algorithm development, and the design of mechanical systems in conjunction with their control systems
4. Develop analytical skills in the optimization of mechatronic systems
5. Learn principles of design and will be capable to implement control algorithms in hardware-mechatronic systems.

The MSMSE program relates to various types of systems. Emphasis is placed on mechatronic systems engineering for land vehicles and industrial robots, and the program will provide a skill set much in demand. Land vehicles include (i) autonomous (unmanned, mobile robotic) vehicles for various applications and (ii) conventional vehicles such as trucks, cars, and tractors.

The MSMSE program and its new laboratory of mechatronic systems offers deep analytical product-oriented courses and hand-on laboratory work. Balanced sets of lectures and hands-on labs on pneumatically and hydraulically controlled mechatronic systems, industrial robotic manipulators, and measurement and data acquisition systems are included in the program. Software products such as MATLAB and Simulink, LabVIEW, MSC.ADAMS, and dSPACE are in use. A special feature of the MSMSE program is the unique 4x4 vehicle chassis dynamometer with independent wheel control. Professionals can get the training in classes that are conveniently scheduled in the

evenings. More details about the program and scholarship are available at <http://www.ltu.edu/engineering/mechanical/mechatronics.asp>.

Q. What type of internship opportunities are provided by your program?

A. Multiple branches in the industry seek mechatronic systems engineers. The International Industry Advisory Board of the MSMSE Program is comprised of engineers, executives, and other working professionals from 20 companies, governmental research agencies, and professional societies. The board provides input on the needs of industry, advice on curriculum, course, and laboratory development. The board also recommends potential research topics and assists in program assessment. Human resources departments from various industries have established relations with the university's office of career service and offer attractive internships and co-ops.

Q. What are the most important personal and professional qualities for mechatronics engineering students?

A. Admission to the program is competitive. Applicants with strong analytical and creative engineering skills must:

- Hold a bachelor of science degree in mechanical engineering, electrical, or computer engineering or an equivalent degree from an Accreditation Board for Engineering Technology-accredited college or university. Individuals with a bachelor of science in mathematics or computer science, or an equivalent degree from an accredited college or university, and three to five years of experience working in mechatronic systems engineering, may apply.
- Have a minimum undergraduate overall GPA of 3.0.

The diversity of the MSMSE program and student population provides professional growth and a competitive advantage for stable employment opportunities in today's and future job markets. The ages of the student population ranges from under 30 to over 50. All students are practicing engineers, with a range of graduate and undergraduate degrees, including one student who holds a Ph.D. degree in materials.

Q. What is the employment outlook in mechatronics engineering? How will the field change in the future?

A. Mechatronic systems engineers combine sets of engineering skills, bridging mechanical engineering and electronic/computer engineering, and are attractive to employers because they are so versatile. 25 percent of the MSMSE current students have been promoted or obtained better jobs after the program started in September 2006. Such engineers can find positions and work in many fields, including:

- Aerospace and Automotive
- Robotic Industry and Manufacturing
- Military Vehicle and Autonomous Vehicle Engineering
- Defense Systems Engineering
- Biomedical Engineering
- Truck and Agricultural Tractor Engineering
- Climate Control Systems Engineering
- Material Processing

- Machine Test Systems Engineering
- Communication Systems and Media
- Big and small business companies in countless fields of human activities.

The way that the MSMSE program was designed provides high-level expertise and skills for a stable and multiple-year professional career. Emerging research trends in biomechanics and chemistry, bio-materials, and biology in general will bring new horizons in mechatronic systems engineering.