Mechatronics and Robotics

Mechatronics & Robotics is a NEW, exciting 2-year program of study offered to students in the junior and senior years. Successful completers of this STEM* based program will gain foundational knowledge and skills in the high-demand, multidisciplinary area of mechatronics. What is mechatronics? The term may be unfamiliar, but it simply comes from combining the words mechanical and electronics, though it actually includes even more; mechatronic systems are also computer-controlled. Mechatronics integrates principles and processes drawn from four engineering disciplines: electrical, mechanical, computer, and industrial. Thus, students will learn about machines, electronics, hydraulics & pneumatics, electrical motor controls, sensors, computer-aided design (CAD), programming, programmable logic controls (PLC), diagnostics, computer numeric control (CNC), and other topics that together form the basis of "smart" devices like robotics and advanced automated systems. This important knowledge is needed not only by highly skilled technicians who help install, program, trouble-shoot and fix problems, but also by engineers who plan, design, develop, or otherwise work with complex mechatronic systems. This diagram helps describe the mix of "ingredients" that make up mechatronics and a few of the industries and applications that need this expertise:

*STEM refers to the integration of science, technology, engineering, and math.

Course Description:

**Mechatronics & Robotics 1A (2 Hr Block)**

Prerequisites: An interest in hands-on learning and the interface between humans, machines and technology. Within a state-of-the-art lab, students will begin the journey into learning the various disciplines (see above overview) involved in mechatronics. Underlying theory and principles will gradually come together, and come to life, through a combination of learning strategies including: hands-on learning, computer-based lessons, use of high tech trainers and equipment, industry experts and site visits, and (perhaps most importantly), periodic, student-created projects that apply learning and allow students to develop novel solutions to challenges. Students can expect to improve their understanding of many physics principles that are naturally embedded in mechatronics. In addition to appropriate STEM* knowledge and skills, 21st century skills like critical thinking, collaboration, creative problem-solving and effective communication will be developed. Opportunities for student leadership, participation in competitions, and work-based learning experiences, will also be woven in throughout the 2-year program.

**Mechatronics & Robotics 1B (2 Hr Block)**

Prerequisites: Mechatronics & Robotics 1A

This is a seamless continuation of Mechatronics 1A. (See above.)

**Mechatronics & Robotics 2A (2 Hr Block)**

Prerequisites: Mechatronics & Robotics 1A/1B

In the second year, students will incorporate and build upon their knowledge of mechatronics learned in the first year through more complex, project-based application. Additional opportunity for work-based learning, student leadership, and competition will be incorporated. (See Mechatronics & Robotics overview at top of page and description for Mechatronics 1A for details about mechatronics content.)

**Mechatronics & Robotics 2B (2 Hr Block)**

Prerequisites: Mechatronics & Robotics 1A/1B and 2A

This is a seamless continuation of Mechatronics 2A (see above) and the course in which a capstone experience or project should be concluded and shared.
Is the Mechatronics & Robotics program right for me? If you answer yes to two or more of these questions, it may be a good indicator:

1. I have always enjoyed playing with LEGOS.
2. I enjoyed participating in LEGO robotics.
3. I like to take things apart to see how they work.
4. I enjoy working with my hands.
5. I am interested in working with robots and programming.
6. I like to troubleshoot problems with machines and computers.
7. I enjoy working with tools and creating things.

There are so many reasons to consider Mechatronics & Robotics. Did you know?

- Our nation is facing a critical shortage of highly skilled workers in STEM occupations. In 2010, the # of college graduates and technicians with postsecondary STEM credentials was 225,000; far short of the 400,000 needed by 2015.
- Women are particularly underrepresented in STEM occupations and, therefore, missing out on some great scholarships and high-earning opportunities for which they are equally well-suited.
- The skills-gap problem is being compounded by an aging workforce and the 79 million Baby Boomers retiring between 2000 and 2020.
- Meanwhile, in 2012, nearly half of college graduates were unemployed or underemployed (working in jobs not commensurate with their education), many with significant college debt; and 10% of young adults moved back in with their parents (for 26 year olds, 20%).
- Reshoring - Up to 3 million manufacturing jobs are projected to return to the U.S. by 2020 in part because off-shoring cost savings have diminished significantly in the past 8 years. Mechatronics & robotics are a critically important part of advanced, high tech manufacturing.
- A 4-year degree is not necessary to begin working in mechatronics. This program coupled with some additional postsecondary training will prepare successful students for high skill technician jobs. Many companies support continuing education costs for employees who subsequently wish to pursue related engineering or management degrees.

There is such strong demand for mechatronics expertise that Governor Snyder began a program in 2013 called MAT2 (Michigan Advanced Technician Training) that provides FREE TUITION and paid employment to qualified applicants accepted into the post high school training program. Students who successfully complete Chippewa Valley Schools’ Mechatronics & Robotics program will be ideal candidates for this opportunity. To learn more about MAT2 go to: www.mitalent.org/mat2/

NOTE - The Mechatronics & Robotics program qualifies to fulfill math-related credit (for seniors) and VPAA credit. The first year mechatronics experience will cover the 12 content segments required by a Michigan state-approved, career technical education (CTE) mechatronics program: (1) Systems integration/mechatronics (2) System design/prototype /CADD (3) Electrical/motor controls/VFD/servo/sensor driven (4) Mechanical (5) Control systems/electrical controls (6) PLC/diagnostics (7) Fluid power/ pneumatics (8) Robotics (9) Electronics/sensors (10) Manufacturing/machining /CNC (11) Quality/Measurements, and (12) Blueprint/schematics/drafting. (Segment distribution: Mechatronics & Robotics 1A = 1,3,4,7,9,11; 1B = 2,5,6,8,10,12) The second year mechatronics experience will build upon and go deeper with this content and allow more time for student-created projects and work-based learning experiences. Mechatronics & Robotics is part of the National Career Cluster called STEM*. To learn more about this or any of the 16 National Career Clusters, visit: www.careertech.org/career-clusters

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