

Career and Technical Programs

Engineering Academy **(Engineering, Electronics/Robotics, Biotechnology)**

Numerous official studies and reports have identified STEM (Science, Technology, Engineering, Mathematics) related careers as being the most competitive and in-demand fields of the near- to mid-future. Entry to these professions requires a strong academic background in science and mathematics—as well as a mind trained for analysis, problem-solving, and design. Nashoba Tech's unique Engineering Academy is a program that is specifically constructed to be the ideal springboard into the leading edge of a high-tech future; one which has been awarded nearly \$230,000.00 in state grants aimed at advancing STEM education.

Structured on the nationally recognized Project Lead the Way framework, the Engineering Academy operates on an independent schedule and curriculum structure designed to maximize the integration of academic knowledge and technical skills. Freshman students explore the Academy as they do any other program; however, students with interest in the program face an additional, more comprehensive, level of evaluation than with other technical programs.

Freshmen and Sophomore students take a common set of foundational courses centered around core mathematic, scientific, design, and engineering concepts. In the Junior year, students can choose to specialize in a more focused branch of engineering: Aerospace Engineering, Bio-Engineering, Civil Engineering, Geophysical and Environmental Engineering, Electrical and Mechanical Engineering, Architecture or Telecommunications Engineering, Electronics, and Robotics.

Students are expected to take 4 years of English, Social Studies, Math and Science. They are further required to take the most challenging math and science courses available to them. To that end we have placed the Engineering Academy on a different schedule structure, creating a “school within a school”. Students take academic and technical courses on both weeks with an emphasis on practical engineering skills. Students entering Nashoba Valley Technical School as 9th graders will participate in the exploratory program and follow a normal course schedule of academics and their technical program on alternating weeks. Freshmen wishing to enter the Engineering Academy model will need to be prepared for the rigor and expectations. Once students choose the program, they will begin the Principles of Engineering course during their technical week, while continuing in their academic classes on the following week.

Students begin the alternate Academy schedule track beginning with their sophomore year. Academic courses meet for 45 minutes on both the technical and academic weeks. Science courses are taught at the Advanced Placement level and students are expected to take the corresponding AP exam. Additionally, English courses in both the junior and senior year, as well as math in the senior year are also at the AP level. Students who wish to receive AP designation for other courses in the upper grades will need to take the AP exam to receive this designation. Students who enter Nashoba Valley on the Algebra I, non-honors, math track will not be excluded from joining the Engineering academy; however, they will be required to take both Algebra II and Geometry during their sophomore year.

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The course of study for sophomore, junior and senior year is as follows:

	English	Math	Science	History	Technical
Grade 10	English 10 Honors	Algebra II: Required of all grade 10 students If students took Algebra I as freshmen, they will also be required to take Geometry	AP Physics I	US History I	Introduction to Engineering Design
Grade 11	AP English Language	Pre-Calculus	AP Chemistry	US History II*	Specialty Courses: Aerospace Engineering, Bio-Engineering, Civil Engineering and Architecture or Telecommunications Engineering
Grade 12	AP English Literature	AP Calculus	AP Biology, or AP Physics II (The choice will depend on engineering specialty)	Government*	Specialty Courses: Aerospace Engineering, Bio-Engineering, Civil Engineering and Architecture or Telecommunications Engineering

* Students who wish to receive an AP designation will need to take the corresponding AP exam

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Engineering

Using a well-developed program of study entitled Project Lead the Way (PLTW), students have a rigorous and detailed program of study backed up by project development. Each year launches skills and knowledge in several basic engineering subjects including Aerospace Engineering, Bio-Engineering, Civil Engineering, Geophysical and Environmental Engineering, Electrical and Mechanical Engineering, Electronics, Robotics, and Architecture.

The design process, modeling, prototyping, machines, material science, process development, manufacturing techniques and rapid prototyping are all part of the Engineering Academy curriculum. With real-world tools such as 3-D printing and CNC machining in our lab, students are exposed to a variety of design and build projects. Students work in a contemporary technical area complete with current learning stations and state-of-the-art equipment such as: a robotics trainer, analog and digital trainers, microprocessor trainers, digital multi-meters, and oscilloscopes. A robotic arm is utilized to teach programming and operations principles. Computer labs focus on the development of design and drafting skills, using Autodesk Inventor for solid modeling and Autodesk Revit for Civil Engineering and Architecture. The program also contains a seismograph and students work with Boston College to analyze and study seismic activity.

Electronics/Robotics

Students study engineering principles fundamental to robotics technology, and develop knowledge of electronic circuitry and the operation of motors, sensors, control systems, and programmable logic controllers. Students work with software, wiring, integrated circuits, and embedded controllers. Students work with several robot platforms, with significant projects both in-class and with regional competitions as part of the FIRST Robotics organization.

Biotechnology

Biotechnology is the use or manipulation of an organism or the components of an organism. This program is designed to give students a comprehensive introduction to the scientific concepts and laboratory research techniques currently used in the field of biotechnology. Students attain knowledge about the field of biotechnology and deeper understanding of the biological concepts used. In addition, students develop the laboratory, critical thinking, and communication skills currently used in the biotechnology industry. Furthermore, students will explore and evaluate career opportunities in the field of biotechnology through extensive readings, laboratory experiments, class discussions, research projects, guest speakers, and workplace visits. The objectives covered in this course are both academic and technical in nature and are presented in a progressively rigorous manner.

Students will learn the basic biological and chemical processes of cell, tissues, and organisms. They will also learn the historical experiments that led to the central dogma of molecular biology and understand the basic processes of DNA replication, transcription and translation. Students will also gain an understanding of and exposure to assorted topics/concepts in biotechnology. They will apply the principles learned to develop techniques that can indirectly measure the

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molecular status of cells. Students learn laboratory skills used in academic and industrial biotechnology laboratories, including methodologies used in the isolation and analysis of large macromolecules such as DNA and proteins. Students will also model the steps involved in the production of a recombinant DNA biotechnology product. Students will learn the significance of biotechnology in pharmaceutical development, agriculture, forensics, genetic testing, industrial products, and scientific research. Students will also learn how a biotechnology company works and the roles of its employees and understand how bioinformatics is used in research.

Articulation Agreements between Nashoba Valley Technical High School's Engineering Academy and post-secondary institutions:

New England Institute of Technology

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| • Electrical Circuit Theory I | 4 credits |
| • Electrical Circuit Theory II | 3 credits |
| • Basic Circuit Construction | 1 credit |
| • Electrical Circuit Theory II Lab | 4 credits |

Statewide Articulation Agreement

Colleges recognizing Project Lead the Way and granting course credits:

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| • Arkansas Tech University | • San Diego State University |
| • Dunwoody Institute of Technology | • St. Cloud University |
| • Indian University-Purdue University
Indianapolis | • University of Iowa |
| • Iowa State University | • University of Minnesota |
| • Milwaukee School of Engineering | • University of New Haven |
| • Minnesota State University | • University of Northern Iowa |
| • Northern Illinois University | • Worcester Polytechnic Institute |
| • Oregon Institute of Technology | |
| • Purdue University | |

Licenses, Certifications, and Affiliations

- American Heart Association Cardiopulmonary Resuscitation Certification (CPR)
- Occupational Safety and Health Administration (OSHA) General Safety 10 Hour Certification
- Autodesk Inventor Certification