

# **2018-2019 Valley STEM + ME2 Academy-Coursework**

**Mission:** *To prepare students with skills necessary to compete in the global economy while nurturing the characteristics of discovery, invention, application, and entrepreneurship.*

The curriculum in Valley STEM + ME2 Academy was chosen to guide students in the mission of the program. Data from the current job market, student interests, and college/career readiness guides curriculum choices. Valley STEM + ME2 incorporates STEM Principles as the foundation for the curriculum. Advanced Career/[Clean Energy Technology](#) will be taught throughout the program. Specific course sequencing is below.



## **Freshmen Coursework 2018-2019 (descriptions below)**

- **FANUC/Motoman (RAMTEC Lab )**
  - *Students may have opportunity to earn 12-points in [Industry Credentials](#)*
- **Clean Energy Technology 1 & 2**
  - [Clean Energy Technology 1 & 2 Course Description](#)
- **Robotics 1 with Computer Programming**
  - Utilizing Start Up Tech Curriculum that incorporates Entrepreneurship and App Development
- **Exploratory Engineering**
- **21st Century Communications**
- **English Language Arts 9, or English Language Arts 9 Honors**
- **Math**
  - *Course depends on 8th grade math credit; per [Ohio Department of Education Graduation Requirements](#)*
- **World History or Honors World History**
- **Biology or Honors Biology**
- **PE and Health:** *Taken online semester 2, unless transcribed credit given at the middle school level per [ODE Graduation Requirements](#) (½ unit Health, ½ unit PE). Students have the option to take summer school prior to attending, or take the online coursework the summer prior to starting Valley STEM. Credit Flex options available as well per school policy.*

## **Sophomore Coursework 2017-2018 (descriptions below)**

- **FANUC/Motoman (RAMTEC Lab )**

- *Students may have opportunity to earn 12-points in [Industry Credentials](#)*
- **Robotics 2 with Computer Programming**
  - Utilizing Start Up Tech Curriculum that incorporates Entrepreneurship and App Development
- **Manufacturing Operations**
- **Journalism**
- **Biomedical Engineering**
- **English Language Arts 10 or English Language Arts 10-Honors**
- **Chemistry or Honors Chemistry (as long as Biology requirement met)**
- **American History or American History Honors**
- **Math (Geometry or Alg. 2, or honors)**
- **Online Elective(s) (see below)**

### FRESHMAN COURSES

#### **Clean Energy 1 & 2 - Clean Energy Systems:**

This course exposes students to sources of renewable energy: wind, solar, biofuels, nuclear power, steam generation, fuel cells, geothermal power, water power, AC/DC power generation, heat transfer and the laws of thermodynamics. Working with solar, thermal, chemical and mechanical sources of clean energy teaches students how to apply physics, geography, chemistry, biology, geometry, algebra and engineering fundamentals. Students learn the most efficient and appropriate use of energy production as they explore the relevant relationships among work, power and energy. Students will engage in a wide variety of hands-on projects and lab activities that both test their knowledge and illustrate the interrelationships between the various forms of clean energy.

#### **Robotics 1:**

Students will apply the knowledge and skills necessary to design, build, program, and operate Robots at an advanced level. The Students will learn robotic operations and system configurations. Students will code, compile, and debug programs using multiple robotic programming languages. Students will also be introduced to aspects of physical computing. A capstone project will allow for students to independently apply skills learned in this course by creating their choice of project at the end of the course.

#### **Exploratory Engineering:**

This course exposes students to the different types of engineering through conducting research about the different fields and careers of engineering and by completing hands on projects and lab activities. Each quarter students will learn new topics and engage in hands on projects, allowing them to directly experience the types of engineering and manufacturing in our world. Students will start by learning the basics of engineering such as the Design Process, technical writing, blueprint reading, and sketching. Students will then progress to learn Autodesk Inventor (CAD), simple machines, reverse engineering, AC/DC circuits, breadboard and soldering, CNC machining, CNC router, additive manufacturing and subtractive manufacturing. These projects will be supported with research quizzes on each module. These quizzes will help connect the learners hands-on experience with the engineering and design principles that accompany the modules.

#### **21st Century Communications:**

This course gives students practice in communication skills of reading, writing, listening and speaking in their chosen vocations. Students learn to write professionally and deliver presentations that effectively convey information and persuade or entertain audiences. Students will practice speaking and technical

writing skills in combination with using the STEM lab machines and writing and speaking to community members. The purpose of this course is to prepare students for 21st century communication skills so that they will excel in professional communication both within their school and in the real world.

## **SOPHOMORE COURSES**

### **Biomedical Engineering**

Students will learn how the principles of human physiology, biology, and chemistry come together for the human body to function, and how the principles are used to treat disease. Students will participate in anatomical dissection, and gain an appreciation of human skeletal anatomy.

### **Journalism:**

This course will focus on empowering STEM students to build 21st century skills through communications, marketing, entrepreneurship, social media, and journalism. The purpose of the course will be to develop business relationships to reach the needs of the school and community.

### **Robotics 1:**

Students will apply the knowledge and skills necessary to design, build, program, and operate Robots. The Students will learn robotic operations and system configurations. Students will code, compile, and debug programs using multiple robotic programming languages. Students will also be introduced to aspects of physical computing. A capstone project will allow for students to independently apply skills learned in this course by creating their choice of project at the end of the course.

### **Robotics 2:**

This course expands upon the Robotics 1 Course and allows students to work independently on building and programming robots. Students will learn more in-depth about sensors, motors, gears, lift designs, and more complex computer programming strategies.

### **Manufacturing Engineering:**

This course is designed to build off what you learned in Exploratory Engineering. This class is a project based class that is also Inquiry Based. Students will again research and study areas of engineering and manufacturing and go more in depth on many of the same disciplines touched on in Exploratory Engineering. Some new concepts would likely include CNC turning, 4th Axis CNC router, CIM, Hydraulics, 3D Printing, Reverse Engineering and project design. This course will also include a Capstone type project which allows all students to showcase what they learned utilizing multiple machines.

### **FANUC/Motoman:**

#### **FANUC -**

This will be a survey course, allowing students to have exposure to the concepts below. The course provides an introduction to the terminology and basic operations that an operator or technician needs to setup, record and/or troubleshoot programs on an actual FANUC Robot. Each learner will interface with

FANUC RoboGuide 3-D Simulation software on a laptop computer connected to an actual FANUC robotic teach pendant.

Topics include:

- \* Robot Safety
- \* Basic Robot Systems and Components
- \* Teach Pendant Familiarization
- \* Jogging Fundamentals
- \* Error and Fault Recovery
- \* Frames
- \* Teaching the Robot
- \* Motion Programs and Motion Instructions
- \* Controlling Program Flow
- \* Copying and Editing Programs

Hands-on exercises include lab time working with an actual FANUC LR Mate 200iD/4S Robot in the RAMTEC lab.

## **Motoman -**

This will be a survey course, allowing students to have exposure to the concepts below. The course provides an introduction to the terminology and basic operations that an operator or technician needs to setup, record and/or troubleshoot programs on an actual MotoMan FS100 Robot. Each learner will interface with MotoSimEG-VRC 3-D Simulation software on a laptop computer.

Topics include:

- \* Working safely in and around the robot cell
- \* Powering up/down
- \* Jogging the robot using all coordinate systems
- \* Modifying points, motion type and speed
- \* Adding position levels
- \* Checking specified point
- \* Recovering from alarms and errors
- \* Cutting and pasting instructions
- \* Creating and working in user frames
- \* Defining and using Position Variables
- \* Programming SFTON and SFTOF Instructions

Hands-on exercises include lab time working with an actual MotoMan FS100 Robot in the RAMTEC lab.

## **Clubs Offered**

### **Book Club**

Students have the ability to choose a book of their choice and read/discuss in a group setting. This is an independent reading club that students can determine the structure and discussion for while a teacher leads the group as needed.

### **Chess Club**

Students will host their own tournaments to challenge each other and learn critical thinking skills and how to play chess.

### **Drama Club**

Students will focus on a play production of their choice and perform at group school events throughout the year.

### **LGBTQ+ Club**

Provides educational, social, and emotional content and support for LGBTQ+ communities.

### **Robotics/Programming Club**

Allows students to build on their robotics

### **Farm Club**

### **Skills USA Club**

### **Yearbook Club**

This course is designed to build off what you learned in Exploratory Engineering. This class is a project based class that is also Inquiry Based. Students will again research and study areas of engineering and manufacturing and go more in depth on many of the same disciplines touched on in Exploratory Engineering. Some new concepts would likely include CNC turning, 4th Axis CNC router, CIM, Hydraulics, 3D Printing, Reverse Engineering and project design. This course will also include a Capstone type project which allows all students to showcase what they learned utilizing multiple machines.

## **Where do students go in 11th and 12th Grade?**

There are several paths a student could take after their sophomore year. Students will have the opportunity to choose from the following pathways:

- 1) Return to home district in traditional setting. All credits transfer.
- 2) Apply for for one of the MCCTC Programs that The Valley STEM + ME2 Academy pathway prepares students for: [Engineering](#), **Advanced Manufacturing** ([Welding](#) and [Precision Machine](#)), **Computer Science/Networking and Cybersecurity, Software Engineering, and [Biotechnology](#)** (see link below).
- 3) Apply for any of the [24 programs at MCCTC](#) (*starting fall 2017, Computer Science and Computer Software Engineering will be offered!*)

#### 4) Graduation Requirements: *How will these*

*be met?*

Credit Requirements	
Ohio requires students to take and complete a minimum of 20 required credits.	State Minimum
English language arts	4 units
Health	½ unit
Mathematics	4 units <sup>1</sup>
Physical education	½ unit <sup>2</sup>
Science	3 units <sup>3</sup>
Social studies	3 units <sup>4</sup>
Electives	5 units <sup>5</sup>
Additional credits, if any, in district requirements	
<b>Other Requirements</b>	
Economics and financial literacy <sup>6</sup>	
Fine arts <sup>6</sup>	

**\*\*Health and PE will be offered online through a blended learning format. PE Credits can also be obtained through credit flex. Foreign language will be provided in a blended learning environment, as well as additional electives. All appropriate grade level core-content is provided during the school day.**

1 Mathematics units must include one unit of algebra II or the equivalent of algebra II. Exceptions: a) Algebra II is not a requirement for students following a career-technical pathway. However, students still must have four units in mathematics, and b) A family may decide that their child is not prepared to meet the graduation requirement for a higher level math course. Or, their child may be planning a career that does not require higher level math. Algebra II may not be a requirement for this student. Here is more information on Curriculum Choices.

2 Physical education - School districts may adopt a policy that would exempt students who participate in interscholastic athletics, marching band or cheerleading for two full seasons or an approved Junior Reserve Officer Training Corps (JROTC) program for two years from the physical education requirement. Students must take another course, which cannot be a physical education course, of at least 60 contact hours.

3 Science units must include one unit of physical sciences, one unit of life sciences and one unit of advanced study in one or more of the following sciences: chemistry, physics or other physical science; advanced biology or other life science; astronomy, physical geology or other earth or space science. Exception: A family may decide that their student is not prepared to meet the graduation requirement for a higher level science course. Or, their student may be planning a career that does not require higher level science. Higher level science may not be a requirement for this student. Here is more information on Curriculum Choices.

4 Social studies units must include ½ unit of American history and ½ unit of American government in three units required for the classes of 2018 and 2019. The class of 2021 will need ½ unit in world history and civilizations in their required three units as well as American history and American government.

5 Elective credits must include one or any combination of foreign language, fine arts, business, career-technical education, family and consumer sciences, technology, agricultural education or English language arts, mathematics, science or social studies courses not otherwise required.

6 Other state requirements - All students must receive instruction in economics and financial literacy during grades 9-12 and must complete at least two semesters of fine arts taken any time in grades 7-12. Fine arts is not a requirement for students following a career-technical pathway.

7 The State Board of Education may decide to include an algebra II end-of-course examination in place of the algebra I end-of-course exam beginning for students entering ninth grade on or after July 1, 2016.

## Testing Requirements

STEM education incorporates scientific inquiry and technological design. It is a real world demonstration of learning, assessing content knowledge using methods directly aligned with scientific inquiry and/or technological design. At the same time, they actively demonstrate skills such as creativity, communication, collaboration and critical thinking. All freshmen will take the ACT Aspire, to determine ACT readiness. Some PLTW and Advanced Career requires End Of Course testing associated with the program All standards and competencies will be met per state law, and [Ohio Department of Education End of Course Assessments administered each spring.](#)



**For more information, email Mara Banfield,  
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