

EMTNR ACADEMY



Engineering, Manufacturing Technologies & Natural Resources

EMTNR Career Pathways:

Agriculture, Food and Natural Resources

Architecture and Construction

Manufacturing

Science, Technology, Engineering, and Mathematics

Watch for these symbols in the course descriptions.

- The “pillars” by a course description indicates that the course offers college credit or potential college credit through AP, CLEP, or PLTW testing opportunities.
- The “star” by a course description indicates the course counts toward the AAHS “Arts” credit requirement for graduation.
- Practice CLEP tests are available in the College & Career Center to help determine your level of readiness to test. There is a \$80 fee for each CLEP test, plus a \$25 administrative fee. These fees are subject to change by The College Board and test centers.
- The ‘caps’ graphic by a course description reflects our membership in the CAPS (Center for Advanced Professional Studies) network of programs. This network enhances our Academies of Alexandria model. A ‘caps’ course involves a post-secondary partner and a business partner. Through our post-secondary partners, ‘caps’ coursework will allow students to earn both college and high school credit while working within the local partner business.

INFOGRAPHIC KEY



College Credit
Opportunity



Counts Toward
Arts Credit



CLEP

EMTNR Career Pathways

Grade	Agriculture, Food & Natural Resources	Architecture & Construction	Manufacturing	Science, Technology, Engineering & Math
12		• CAPS (EMTNR)	• CAPS (EMTNR)	• CAPS (EMTNR)
11,12	<ul style="list-style-type: none"> • Environmental Science • Horticulture -School Garden • MN Rocks & Waters • Plant Breeding & Biotechnology • Wildlife Studies 	<ul style="list-style-type: none"> • Environmental Science • MN Rocks & Waters 		<ul style="list-style-type: none"> • Environmental Science • Plant Breeding & Biotechnology
10, 11,12	<ul style="list-style-type: none"> • Animal Health • Astronomy & Meteorology • Get Your Green Thumb • MN Habitat & Wildlife Management • Small Engines 	<ul style="list-style-type: none"> • Architectural Drafting & Design • Building Trades • Computer Integrated Manufacturing • Industry Trades & Manufacturing • Intro to Engineering Design • MN Habitat & Wildlife Management • Small Engines 	<ul style="list-style-type: none"> • Building Trades • Computer Integrated Manufacturing • Foundations in Manufacturing • Industry Trades & Manufacturing • Intro to Engineering Design • Introduction to Robotics • Metal Fabrication • Principles of Engineering • Small Engines 	<ul style="list-style-type: none"> • Architectural Drafting & Design • Astronomy & Meteorology • Building Trades • Computer Integrated Manufacturing • Foundations in Manufacturing • Industry Trades & Manufacturing • Intro to Engineering Design • Introduction to Robotics • Metal Fabrication • MN Habitat & Wildlife Management • Principles of Engineering • Small Engines
9,10	<ul style="list-style-type: none"> • Engineering, Manufacturing & Architecture • Forestry • Landscape Design • Intro to Agriscience • Natural Resources / Agriculture 	<ul style="list-style-type: none"> • Engineering, Manufacturing & Architecture • Landscape Design • Natural Resources / Agriculture • Woods and Cabinetry 	<ul style="list-style-type: none"> • Engineering, Manufacturing & Architecture • Woods and Cabinetry 	<ul style="list-style-type: none"> • Engineering, Manufacturing & Architecture • Natural Resources / Agriculture • Woods and Cabinetry

EMTNR ACADEMY ADVISORY BOARD

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 Todd Dahlseid, High School Science Teacher
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 Abby Strom, Alexandria Area Economic Development Commission
 Dustin Tomosan, Ringdahl Architects
 Brad Vandertuin, Aagard Group

ANIMAL HEALTH

Course Number: 1004
Length/Credit: .5 credit – 1 semester
Grade Level: 10,11,12
Prerequisite: None

If you are interested in being a veterinarian or other animal health provider, consider this course. Instruction will include reproduction, genetics, feedings and nutrition, selection, disease and parasite control, facilities and current management. This class will focus on domesticated animals including farm animals and pets.

ARCHITECTURAL DRAFTING & DESIGN

Course Number: 0907
Length/Credit: .5 credit – 1 semester
Grade Level: 10,11,12
Prerequisite: None

The course includes an introduction to many of the varied factors involved in building design and construction including building components and systems, structural design, site design, utilities and services, cost estimation, energy efficiency, and careers in the design and construction industry. The major focus of the course is to expose students to the design and construction of residential building projects, design teams and teamwork, communication methods, engineering standards, and technical documentation.

ASTRONOMY & METEOROLOGY

Course Number: 0429
Length/Credit: .5 credit – 1 semester
Grade Level: 10,11,12
Prerequisite: None

Concepts of astronomy and meteorology will be presented within a lab-based format suitable for all students. The meteorology unit considers the atmosphere's composition and the ways in which temperature; moisture, wind and pressure affect the daily weather patterns in west-central Minnesota. The astronomy unit examines the structure of the cosmos; from the earth-moon-sun system to the observable limits of the universe. Methods of gathering and interpreting information from electromagnetic radiation will be researched. Emphasis will be given to understanding ways in which the earth is affected by extraterrestrial objects and events.

BUILDING TRADES

Course Number: 0924
Length/Credit: .5 credit – 1 semester
Grade Level: 10,11,12
Prerequisite: None

This course will cover the construction processes of wood frame construction. Students will use tools and machines to build utility sheds in order to gain an understanding of the processes and materials used in residential construction. Students will also study site layout, foundations, electrical, plumbing and services as they relate to residential construction.

CAPS (EMTNR)

Course Number: 1860-1861
Length/Credit: 1.0 credit – 1 semester
Grade Level: 12

Prerequisite: Introduction to Engineering Design or Computer Integrated Manufacturing; must complete and submit application (available in the College and Career Center)

EMTNR CAPS combines rigorous science and engineering fundamentals, entrepreneurship and innovation. You will use technical knowledge to create solutions to real-world problems. The course sequence begins with a broad introduction to industry based engineering. You will learn the essential components of engineering including the design process. The remainder of your experience is individually tailored to your engineering interest. Students will be collaborating with academy partners in the community, and will need parent permission and their own transportation to travel off-site. This course will meet two blocks back to back semester one.



COMPUTER INTEGRATED MANUFACTURING - PLTW

Course Number: 0926-0927
Length/Credit: 1.0 credit – Full Year
Grade Level: 10,11,12
Prerequisite: None

The course explores manufacturing history, individual processes, systems, and careers. In addition to technical concepts, the course incorporates finance, ethics, and engineering design. This reflects an integrated approach that leading manufacturers have adopted to improve safety, quality, and efficiency. Utilizing the activity-project-problem-based activities, students will analyze, design, and build manufacturing systems. While implementing these designs, students will continually hone their interpersonal skills, creative abilities, and understanding of the design process.



ENGINEERING, MANUFACTURING & ARCHITECTURE

Course Number: 0901

Length/Credit: .5 Credit – 1 semester

Grade Level: 9,10

Prerequisite: None

Students in this course would be exposed to Technologies that are used in the EMTNR Academy and also in local industry. Students would be exposed to working with many different types of materials while learning the properties and uses of those materials in our industrial world. Students would also be given instruction in the design processes used in industry to develop products for use in our world. With the instruction of materials and Design processes students would put that knowledge to work with machine technology to build projects that would simulate current industrial projects.

ENVIRONMENTAL SCIENCE

Course Number: 0425

Length/Credit: .5 credit – 1 semester

Grade Level: 11,12

Prerequisite: Biology

Environmental Science is a course that examines the current conditions of our planet in the 21st century and allows you to decide how a society puts a planet in peril. This class provides students with scientific principals and concepts required to understand the interrelationships of the natural world in order to analyze both natural and human-made environmental issues. Science journals, internet and research will be utilized to stay abreast of current research and students will be required to develop and communicate opinions and solutions for many of these problems.

FORESTRY

Course Number: 1021

Length/Credit: .5 credit – 1 semester

Grade Level: 9,10,11,12

Prerequisite: None

If your interest lies in the woods, this course will give you an opportunity to experience hands-on activities in the outdoors. You will learn deciduous and coniferous tree I.D. and tree inventory techniques such as timber cruising, log scaling and determining basal area. Make your own inventory stick and learn how to use it. Learn harvesting and silviculture methods commonly performed in Minnesota. Examine tree diseases, insects, and defects commonly found in our trees. The final project will include developing a woodland stewardship plan for a woodland property of your choice. Yes, you will spend a great deal of time outside! Please be prepared with outdoor clothing. Students are eligible for FFA membership.

FOUNDATIONS IN MANUFACTURING (FIM)

Course Number: 0902

Length/Credit: .5 credit – 1 semester

Grade Level: 10,11,12

Prerequisite: None

This course will provide instruction in foundational technologies used in engineering and manufacturing. Students will learn about design process and how it relates to manufacturing, and use that design process to make several manufactured parts. Students will use manual control machines as well as learn how to use Computer Numerical Control (CNC) machines. Programmable Logic Control (PLC) will also be studied with an industry standard Festo training system. Students will use the PLC language to control and coordinate the movement of motors and pneumatic actuators. Students will use a Power Systems training bench to gain understanding and applications of electric motors, gears, pulleys, sprockets and drives.



Project Lead The Way (PLTW) Pre-Engineering

The PLTW Program offers a sequence of courses, when combined with high level math and science skill acquisition, that introduces students to the scope, rigor and discipline of engineering technology prior to entering college. The sequence and comprehensive curriculum will allow students to explore their interests in engineering as a career.

Project Lead The Way courses offered during the 2017-18 school year are:

- Computer Integrated Manufacturing (CIM)
- Introduction to Engineering Design (IED)
- Principles of Engineering (POE)

The Project Lead The Way (PLTW) program at Alexandria Area High School has been awarded site certification by national Project Lead The Way.





GET YOUR GREEN THUMB

Course Number: 1017
Length/Credit: .5 credit – 1 semester
Grade Level: 10,11,12
Prerequisite: None

Time to get your green thumb growing! Growing and caring for plants in the greenhouse and the community garden is the major focus of this course. Students will learn hands-on about factors that influence plant growth such as light, media, fertility and water as they relate to basic greenhouse and garden management. Other units of study may include floral design, fruits and vegetables and hydroponics. Students will be required to complete a Supervised Agricultural Experience (SAE) project and involvement in FFA is encouraged as an integral part of the curriculum.

HORTICULTURE – SCHOOL GARDEN

Course Number: 1018
Length/Credit: .5 credit – 1 semester
Grade Level: 11,12
Prerequisite: Get Your Green Thumb

“Mary, Mary, quite contrary, how does your garden grow?” This question and more will be answered as you investigate principles of plant and soil science through practical application in the greenhouses and Agriculture Education Center. Basic plant science concepts students will study in this course include plant parts, growth, reproduction and health. This course is a hands-on experience involving an in-depth study of how these concepts relate to soils, fertilizers, landscaping, irrigation, floriculture and general plant production and marketing. Students will be required to complete a Supervised Agricultural Experience (SAE) project and involvement in FFA is encouraged as an integral part of the curriculum.

INDUSTRY TRADES & MANUFACTURING

Course Number: 0928
Length/Credit: .5 credit – 1 semester
Grade Level: 10,11,12
Prerequisite: Instructor approval or successful completion of at least two of the following: Building Trades; Metal Fabrication, Woods and Cabinetry, Geometry in Construction.

This class is designed for students who are interested in the Construction or Manufacturing Industry. Throughout the semester, this class will introduce area trade opportunities including: General Contractor, Construction, Cabinetry, Electrical, HVAC, Landscaping, etc. Content will be presented through guest speakers, jobsite visits, and hands-on labs. The rest of the class will allow the students to study and create their own manufacturing project that utilizes the many technologies provided by our school. Content will include in-depth training in the manufacturing process from raw material to finished products. Projects will be determined by students’ career interests and approved by the Industrial Technology Department. Connections with local industry resources will be strongly encouraged. Students may take this elective one or more semesters.

INTRO TO AGRISCIENCE

Course Number: 1019
Length/Credit: .5 credit – 1 semester
Grade Level: 9,10
Prerequisite: None

Agriculture plays an important role in the lives of humans, from feeding us to clothing us to providing fuel and so much more. In this course, students will learn scientific inquiry methods and biological sciences to investigate how agriculture is doing just that. Topics to be covered include the science of agriculture, plants, animals, and natural resources as students learn the important role agriculture science serves as industry moves into the 21st century.

INTRODUCTION TO ENGINEERING DESIGN - PLTW

Course Number: 0912-0913
Length/Credit: 1.0 credit – Full Year
Grade Level: 10,11,12
Prerequisite: None

The major focus of the course is learning how to take an idea through a design process that will eventually be manufactured or produced. As you learn about various aspects of engineering and engineering design, such as how engineers communicate through drawing, you will apply what you learn through various activities, projects, and problems. In addition, you will use 3D drafting software to help you design solutions to different design projects. Working in teams, you will learn about documenting your solutions, solving problems, and communicating your solutions to other students and members of the professional community of engineering and engineering design.

INTRODUCTION TO ROBOTICS

Course Number: 0925
Length/Credit: .5 Credit – 1 semester
Grade Level: 10,11,12
Prerequisite: None

Introduction to Robotics is an introductory course that gives students an opportunity to work with a partner to design, build, and program a robot from the ground up. Throughout the course, students will not only program their own robot to perform various tasks but they will also see how robots work and impact their daily lives.

LANDSCAPE DESIGN

Course Number: 1016
Length/Credit: .5 credit – 1 semester
Grade Level: 9,10,11,12
Prerequisite: None

This course will focus on the aspects of a well-planned landscape design. Students will study: plant identification, plant anatomy and physiology, soils and their properties, turf grass maintenance, nursery grown plant material and irrigation design, and installation principles. Hands on activities, field trips, and guest speakers will be incorporated into this class.

METAL FABRICATION

Course Number: 0905
Length/Credit: .5 credit – 1 semester
Grade Level: 10,11,12
Prerequisite: None

Students will learn the materials and processes used in the metal fabrication industry. Students will learn to identify different types of metals and their properties. Use CAD software to design parts to be created in the shop using available tools and machines. Technologies included in this course would include Welding, Milling and Turning with manually operated machines, CNC processes of Milling and plasma plate cutting.

MN HABITAT & WILDLIFE MANAGEMENT

Course Number: 1015
Length/Credit: .5 credit – 1 semester
Grade Level: 10,11,12
Prerequisite: None

This is an activity oriented course which focuses on the management of MN animals. The course will explore current concepts that Minnesota is using to manage animal populations, habitats and issues. Hands-on labs in this class will include: prairie grass identification, insect display, fishing pole building and activities of big game herds.

MN ROCKS & WATERS

Course Number: 0426

Length/Credit: .5 credit – 1 semester

Grade Level: 11,12

Prerequisite: None

Concepts of geology and hydrology will be presented within a lab-based format suitable for all 11-12 grade students. This course will investigate not only the ways our state's geological past has created our natural resources, but also the ways we choose to make use of these resources. Students will construct plausible models for explaining the formation of the state's varied natural resources and examine current issues surrounding their use in today's society. Focus areas might include, but are not limited to: Frac sand mining, Karst and groundwater mitigation, aggregate use and applications, Iron range geology, Water quality issues, Copper/Nickel mining proposals, Geographic Information Software (GIS) use, Flood diversion proposals on the Red River and any other relevant land and/or water related issues that develop. Students signing up for this class need to be able to work independently of others and collaboratively with others.

NATURAL RESOURCES / AGRICULTURE

Course Number: 1014

Length/Credit: .5 credit – 1 semester

Grade Level: 9,10

Prerequisite: None

This course introduces freshmen to virtually every agriscience/tech class offered at Alexandria Area High School. One to two week units on the following topics may be presented: Minnesota Wildlife management, small engines, animal health and nutrition, plant science, welding, computer integrated manufacturing, as well as other areas of student interest. This class is also the gateway into the National FFA Organization that prepares students for Premier Leadership, Personal Growth, and Career Success.

PLANT BREEDING & BIOTECHNOLOGY

Course Number: 1020

Length/Credit: .5 credit – 1 semester

Grade Level: 11,12

Prerequisite: Get Your Green Thumb, or Animal Health, or Biology or teacher approval

This advanced course provides students experiences in industry-appropriate applications of plant breeding and biotechnology as it relates to agriculture and improving the production of plants to supply the world's need for food, fiber and fuel. Students will receive a comprehensive introduction to foundational concepts and research techniques in the plant breeding and genetics industry. The greenhouse will be used for real-life application of the concepts as students conduct agriscience research projects and perform basic genetics and plant breeding exercises.

PRINCIPLES OF ENGINEERING - PLTW

Course Number: 0918-0919

Length/Credit: 1.0 credit – Full Year

Grade Level: 10,11,12

Prerequisite: Algebra skills

This course that helps students understand the field of engineering/engineering technology. Exploring various technology systems and manufacturing processes help students learn how engineers and technicians use math, science and technology in an engineering problem solving process to benefit people. The course also includes concerns about social and political consequences of technological change. At the end of course, students will be given an opportunity to take a test for PLTW certification and college credit.



SMALL ENGINES

Course Number: 0929

Length/Credit: .5 credit – 1 semester

Grade Level: 10,11, 12

Prerequisite: None

Small Engines is offered to any student in grades 10 through 12. It will cover all types of internal combustion engines with emphasis on the smaller two and four-cycle engines. Small Engine Theory will be studied to learn the history of generating power in equipment. Laboratory time will be devoted to disassembly, examination and analysis, and assembly of these engines.

WILDLIFE STUDIES

Course Number: 1011

Length/Credit: .5 credit – 1 semester

Grade Level: 11, 12

Prerequisite: MN Habitat & Wildlife Management

In this course students will design and implement wildlife investigations. This exciting and challenging wildlife management course will take a science-based approach to identifying species population counts, habitat requirements and cultural factors. Students will also be required to apply their knowledge to create grade-appropriate lessons for elementary students.

WOODS AND CABINERY

Course Number: 0922

Length/Credit: .5 credit – 1 semester

Grade Level: 9,10,11,12

Prerequisite: None

Students in this course will use an industry standard procedure to design, estimate material quantity; estimate materials cost and then working from that plan, build the cabinets. Students will study the different types of materials used in the woodworking industry including composite materials along with the many different varieties of woods used in industry. Students will learn the proper use of woodworking machinery while building projects that they have designed.

