EMTNR ACADEMY

Engineering, Manufacturing Technologies & Natural Resources

EMTNR Career Pathways:

Agriculture, Food and Natural Resources

Architecture and Construction

Manufacturing

Science, Technology, Engineering, and Mathematics

INFOGRAPHIC KEY

College Credit Opportunity

Counts Toward Arts Credit

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 $87 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.

Grade	Agriculture, Food & Natural Resources	Architecture & Construction	Manufacturing	Science, Technology, Engineering & Math
12	• CAPS (EMTNR)	• CAPS (EMTNR)	• CAPS (EMTNR)	• CAPS (EMTNR)
11,12	• Advanced Small Engines • Biotechnology • Environmental Science • Horticulture • MN Rocks & Waters • Wildlife Studies	• Advanced Small Engines • Environmental Science • MN Rocks & Waters	• Advanced Small Engines	• Advanced Small Engines • Biotechnology • Environmental Science • MN Rocks & Water
10, 11,12	• Astronomy & Meteorology • Companion Animal Science • Get Your Green Thumb • Large Animal Production • MN Habitat & Wildlife Management • Small Engines	• Architecture: Drafting & Design • Building Trades • Computer Integrated Manufacturing • Industry Trades & Manufacturing • Intro to Engineering Design • MN Habitat & Wildlife Management • Small Engines	• Advanced Robotics & Automation • Building Trades • Computer Integrated Manufacturing • Foundations in Manufacturing • Industry Trades & Manufacturing • Intro to Engineering Design • Metal Fabrication • Principles of Engineering • Small Engines	• Advanced Robotics & Automation • Architecture: Drafting & Design • Astronomy & Meteorology • Building Trades • Computer Integrated Manufacturing • Foundations in Manufacturing • Industry Trades & Manufacturing • Intro to Engineering Design • Metal Fabrication • MN Habitat & Wildlife Management • Principles of Engineering • Small Engines
9,10, 11,12	• Agriculture, Food, and Natural Resources • Engineering, Manufacturing & Architecture • Forestry • Intro to Agriscience • Landscape Design	• Agriculture, Food, and Natural Resources • Engineering, Manufacturing & Architecture • Landscape Design • Woods and Cabinetry	• Engineering, Manufacturing & Architecture • Introduction to Robotics • Woods and Cabinetry	• Agriculture, Food, and Natural Resources • Engineering, Manufacturing & Architecture • Intro to Agriscience • Introduction to Robotics • Woods and Cabinetry

EMTNR ACADEMY ADVISORY BOARD

Claire Anderson, Academy Coach
Todd Carlson/Kaitlin Sahli, Alexandria Industries
Todd Dahlseid, High School Science Teacher
Chad Duwenhoegger, High School Principal
Tom Ellison, High School Industrial Technology Teacher
Todd Emmons, Innovative Builders
Ryan Hjelle, Ellingson's
Shawn Green, Aagard Group
Jason Lattimer, Douglas Machine
Todd Kemper, Standard Iron
Mandy Kor, High School English Teacher
Linda Maiers, High School Guidance Counselor
Todd Peterson, 3M Abrasives
Jeff Pokorney, High School Agriculture Teacher
Jeff Reed, Glenwood Area Fisheries-MN DNR
Jacob Schumacher, High School Industrial Techology Teacher
Abby Strom, Alexandria Area Economic Development Commission
Dustin Tomoson, Ringdahl Architects
Brent Urke, Douglas Scientific

ADVANCED ROBOTICS AND AUTOMATION

Course Number: 0925
Length/Credit: .5 credit – 1 semester
Grade Level: 10,11,12
Prerequisite: Introduction to Robotics

This course gives students an opportunity to continue to explore robotics and automation by having them 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.

ADVANCED SMALL ENGINES

Course Number: 0934
Length/Credit: .5 credit – 1 semester
Grade Level: 11,12
Prerequisite: Small Engines grade C or better

In Advanced Small Engines, students will learn advanced theories on small engine operation. Students will be exposed to differences in engines and the applications for uses in marine, winter/cold weather, and standard applications. Students will learn about different industries standards and have the opportunity to attain Briggs and Stratton industry certification. Students would be able to work on a super mileage car and prepare it for competition.

AGRICULTURE, FOOD, & NATURAL RESOURCES

Course Number: 1014
Length/Credit: .5 credit – 1 semester
Grade Level: 9, 10
Prerequisite: None

How did that bacon get to your plate? To answer that question, students in this course will investigate the path of food from the farm to your fork. Topics to be covered in this introductory course include careers, natural resources such as wildlife and soil, animal science concepts such as animal health and nutrition and food products and processing such as meat science. This course provides opportunities to explore high school course offerings in the agriculture department. Students will be required to complete a Supervised Agricultural Experience (SAE) project and will be eligible to participate in leadership and career development opportunities through involvement in the FFA.

ARCHITECTURE: DRAFTING & DESIGN

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

This course teaches students about the design and drafting processes related to the Architecture and Construction Industry. Students will use a combination of 2D Sketching/ Drafting, 3D Modeling in Revit or Google Sketchup, and the Laser Engraver/Cutter to design, model, and build Architecture Design Proposals. Content includes building materials and estimating, the design process, blueprint reading and development, Architectural and Construction Building Requirements, and software skills. This class will help students thinking about majoring in Architecture prepare for the college studio experience, help students interested in Construction learn to read and develop blueprints, and other career interests develop skills related to the design process.

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.

BIOTECHNOLOGY

Course Number: 1020
Length/Credit: .5 credit – 1 semester
Grade Level: 11,12
Prerequisite: None

This advanced course provides students experiences in industry-appropriate applications of biotechnology related to plant and animal agriculture. Students will receive a comprehensive introduction to foundational concepts and research techniques in the biotechnology industry. Skills and topics taught include micropipetting, electrophoresis, genetic engineering and polymerase chain reaction. 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.

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, icehouses, or other related structures in order to gain 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: Application (available in the College and Career Center)

This course is for students who are interested in using the skills they've acquired in EMTNR electives to complete real-world projects and solve real-world problems for area industries in the Agriculture, Food and Natural Resources, Architecture & Construction, Manufacturing Technologies, and STEM fields. Prior to taking on their industry-assigned tasks, students will receive a broad introduction to industry-based engineering, manufacturing, construction and design solutions and will review professional skills and responsibilities required while working in local industries.The remainder of the student's experience is individually tailored to the student's EMTNR interests, e.g. agriculture (animals, plants), natural resources and the environment, architecture, construction, manufacturing technologies, engineering, math and science. All students will have hands-on, active-learning opportunities with full immersion in real-world projects sponsored by industry partners (local, national, and international organizations in the for-profit and not-for-profit sectors).

COMPANION ANIMAL SCIENCE

Course Number: 1022
Length/Credit: . 5 credit – 1 semester
Grade Level: 10,11,12
Prerequisite: None

Dogs, cats, horses and so much more! If you have ever considered pursuing a career related to veterinary medicine or owning a pet, you want to take this course. Students will investigate concepts relating to the everyday care of companion animals. Students will study the nutrition, safety, training, health, and general care of your favorite pets. The course will focus on veterinary practices for horses, dogs, cats, rabbits, birds, rodents, and fish. Laboratory activities will provide opportunities for problem-solving through practical applications to learn scientific concepts. Application to current issues will also be explored.

COMPUTER INTEGRATED MANUFACTURING (CIM)

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. Students who earn a B or better will receive articulated college credit at ATCC (valid for 5 years). Upon enrollment in an applicable program at ATCC students will be able to transfer this high school course, earning 1 of 3 credits toward MACH 1523 Machine Tool Theory I and 1 of 3 credits toward MACH 2523 Intro to Computer Aided Manufacturing.

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.

PROJECT LEAD THE WAY
PLTW

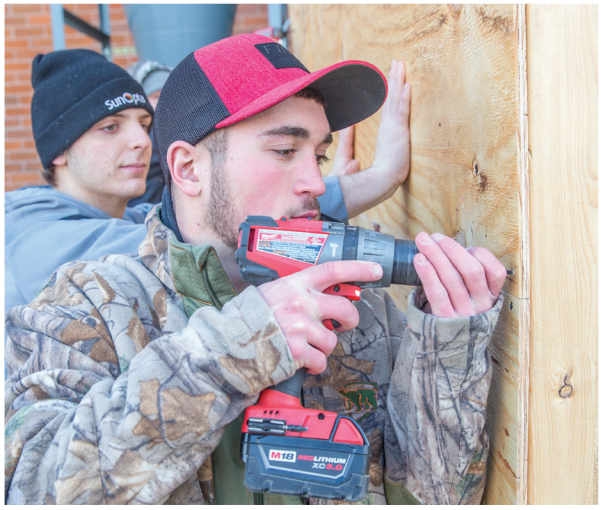
Project Lead The Way (PLTW) Pre-Engineering

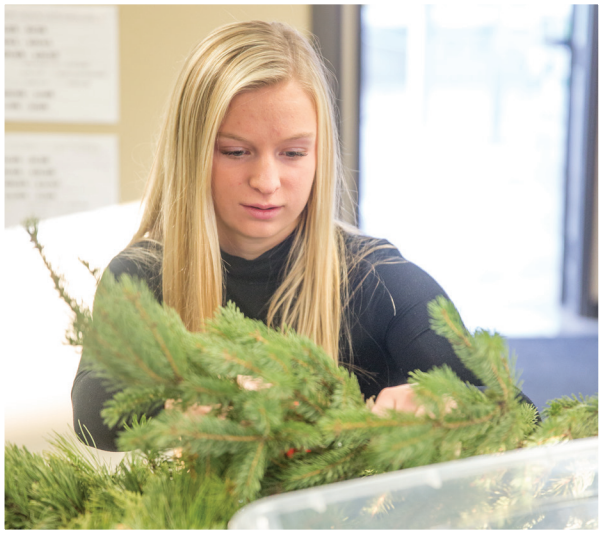
The PLTW Program offers a sequence of courses, when combined with high level math and science skill acquisition, that introduces students to the scope, rigor and discipline of engineering technology prior to entering college. The sequence and comprehensive curriculum will allow students to explore their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





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 tress 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

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.

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

Course Number: 1018
Length/Credit: .5 credit – 1 semester
Grade Level: 11,12
Prerequisite: None

"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 signature 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.

INTRODUCTION TO AGRISCIENCE

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

Corn, combines, and commodities - in this course students will learn how plants like corn and tomatoes have grown, how equipment like combines and drones are used to help harvest them and then how farmers market and sell the commodities they produce to make a living. Topics to be covered include careers, plant science, agriculture mechanics, and agriculture business. This course provides opportunities to explore high school course offerings in the agriculture department. Students will be required to complete a Supervised Agricultural Experience (SAE) project and will be eligible to participate in leadership and career development opportunities through involvement in the FFA.

INTRODUCTION TO ENGINEERING DESIGN (IED)

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. Students who earn a B or better will receive articulated college credit at ATCC (valid for 5 years). Upon enrollment in an applicable program at ATCC students will be able to transfer this high school course, earning 1 of 2 credits toward MACH 1505 Blueprint Reading/Geo Tolerancing I and 1 of 2 credits toward MFGT 1550 Engineering Drafting.

INTRODUCTION TO ROBOTICS

Course Number: 0911
Length/Credit: .5 credit – 1 semester
Grade Level: 9,10
Prerequisite: None

Students will learn about Automation and Robotics, Mechanical Systems and Automated Systems using a hands-on, minds-on approach. Students will build and program robots to achieve various tasks presented throughout the course.

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.

LARGE ANIMAL PRODUCTION

Course Number: 1023
Length/Credit: .5 credit – 1 semester
Grade Level: 10,11,12
Prerequisite: None

This course will focus on large animal production. It is designed to explore the animal science industry and the food system of the United States in order to foster an understanding of the steps involved in producing livestock products for consumers, as well as cover food safety issues. This course will involve the study of the biological processes, production and management practices of economically important food animals such as beef, dairy, swine, sheep and goats.

METAL FABRICATION

Course Number: 0905 (during the school day) or 0935 (evening class)
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. Students will use CAD software to design parts to be created in the shop, using available tools and machines. Technologies included in this course are welding, milling and turning with manually operated machines, CNC milling and plasma plate cutting.

Evening Class: Students who register for the evening Metal Fabrication class will have the opportunity to learn welding from professional welders who work in various industries in our community. The evening course will meet fall semester for 3 hours every Tuesday night from 5:30-8:30pm. In addition to Tuesday evenings, students will be required to attend periodic lab sessions throughout the semester. The evening class will count as 1 of a student's 8 fall semester classes, freeing students up one block during the school day.

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.

PRINCIPLES OF ENGINEERING (POE)

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. Students who earn a B or better will receive articulated college credit at ATCC (valid for 5 years). Upon enrollment in an applicable program at ATCC students will be able to transfer this high school course, earning 1 of 3 credits toward MEDR 1601 Engineering Drawing I and 1 of 3 credits toward MFGT 1560 Mechatronics I.

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 CABINETRY

Course Number: 0922
Length/Credit: .5 credit – 1 semester
Grade Level: 9,10,11,12
Prerequisite: None

Students in this course will use woods projects to learn design, fabrication joinery and finishing techniques used in the woodworking industry. 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.