Project Lead The Way Coursework at Chelmsford Public Schools

High School

PLTW Introduction to Engineering

Students are introduced to the engineering design process, applying math, science, and engineering standards to identify and design solutions to a variety of real problems. They work both individually and collaboratively to develop and document design solutions using engineering notebooks and 3D modeling software.

Essential Questions:

- What is the engineering design process and how is it used to develop new and innovative products?
- How are technical sketches and drawings used to visualize representations and communicate ideas within the engineering profession?
- How are modeling methods used to represent systems, components, and processes in design?
- How is the process of reverse engineering (which involves disassembling and analyzing a product or system in order to understand and document the visual, functional, and/or structural aspects of its design) useful to an engineer?
- How can advanced 3D computer modeling skills be useful when developing a new product?

PLTW Principles of Engineering

Through problems that engage and challenge, students explore a broad range of engineering topics, including mechanisms, the strength of structures and materials, and automation. Students develop skills in problem-solving, research, and design while learning strategies for design process documentation, collaboration, and presentation.

Essential Questions:

- What careers can one have working as an engineer?
- How are energy and power used in engineering?
- How are structures designed and how are materials chosen to be used in the final design?
- What are control systems and what are they used for in engineering?
- What basic physics principles used in many forms of engineering?

PLTW Computer Integrated Manufacturing NEW COURSE

H 10 Credits (#25513), Grade 10-12

tManufactured items are part of everyday life, yet most students have not been introduced to the ahigh-tech, innovative nature of modern manufacturing. Advanced Robotics is the core of this new modern manufacturing process. This course illuminates the opportunities related to professional careers in all fields of engineering. At the same time, it teaches students about maufacturing processes, product design, advanced robotic, and automation.

- **Prerequisite:** None

Computer Programming 1 (Dual enrollment with MCC)

This course is a project based course designed to provide students with an introduction to the processing of information by the computer, computer logic, memory, input/output processing, and programming in the C/C++ language. This course emphasizes the programming problem-solving process, problem organization, algorithms, coding, debugging and the elements of good programming style. Programming problems will include a wide variety of numeric and non-numeric applications. No prior programming experience necessary. This course is considered a practical art.

- **Prerequisite:** Algebra 1
- **Notes:** 10 Credits (#17723)…Open to grades 10, 11 and 12…Programming 1 is a Dual Enrollment 4 credit lab course with Middlesex Community College.

AP/PLTW Computer Science Principles (Dual enrollment with MCC)

The AP Computer Science Principles course is designed to be equivalent to a first-semester introductory college computing course. In this course, students will develop computational thinking skills vital for success across all disciplines, such as using computational tools to analyze and study data as well as working with large data sets to analyze, visualize, and draw conclusions from trends. The course engages students in the creative aspects of the field by allowing them to develop computer apps based on their interests. Students will also develop effective communication and collaboration skills by working individually and collaboratively to solve problems as well as discuss and write about the impacts these solutions could have on their community, society, and the world.

- **Prerequisites:** Algebra 1
- **Notes:** 10 credits (#17613)…Open to grades 10, 11 and 12…Dual enrollment course with Middlesex Community College…Visit College Board Advanced Placement online to see a complete list of topics

AP Computer Science A

AP COMPUTER SCIENCE A This course prepares students for the AP Computer Science A exam by emphasizing object-oriented programming methodology through problem solving and algorithm development and is meant to be the equivalent of a first-semester course in computer science. It also includes the study of data structures and abstraction. The course will cover Object-Oriented Program Design, Program Implementation, Program Analysis, Standard Data Structures, Standard Algorithms, and Computing in Context. This course is considered a practical art.

- **Prerequisite:** Completion of Programming 1, teacher recommendation and summer work
- **Notes:** 10 Credits (#17513)…Open to grades 11 and 12…Visit College Board Advanced Placement online to see a complete list of topics.

McCarthy Middle School
Gateway to Technology

PLTW Design and Modeling (7th Grade)

In this unit, students are introduced to the design process and skills essential to design and modeling. Students will participate in design challenges to create an optimal solution and prototype, learn thumbnail, perspective, isometric, and multi-view sketching for communicating without technology. Students will also use various software packages to be introduced to mathematical

modeling, simulation, and solid modeling. SketchUp 3D modeling software is used to create a virtual image of their design, which can then be printed on our in-classroom 3D Makerbot printers.

PLTW Automation and Robotics (8th Grade)
In this unit students trace the history, development, and influence of automation and robotics. They learn about mechanical systems, energy transfer, machine automation, and computer control systems. .Students use VEX Robotics® components along with ROBOTC to design, build, and program real-world desired objects such as traffic lights, toll booths, & motorized pull toys.

Parker Middle School

PLTW Computer Science for Innovators and Makers (5th Grade)
Physical computing projects will promote student awareness of interactive systems, including Internet of Things (IoT) devices, and broaden their understanding of abstract computer science concepts through meaningful and authentic applications.

PLTW App Creators (6th Grade)
This unit will expose students to computer science by computationally analyzing and developing solutions to authentic problems through mobile app development, and will convey the positive impact of the application of computer science to other disciplines and to society.

Elementary Schools

All K-4 students in Chelmsford engage in two PLTW modules as part of their Computer Lab course.
K - Animals and Algorithms
K - Structure and Function:Exploring Design

1- Animated Storytelling
1 - Animal Adaptations

2 - Grids and Games
2- Materials Science: Properties of Matter

3 - Programming Patterns
3 - Stability and Motion:Forces and Interactions

4 - Input/Output: Computer Systems
4: Input/Output: Human Brain