

# PreEngineering, Mechatronics and Mechanical Design



## For Students Who Enjoy

- working with their hands
- using computers to design
- using math to design
- troubleshooting and problem solving

### Certifications Earned

Autodesk Inventor Certified User

## Possible Careers

Engineer    Application Engineer

Architect    Project Planner

Industrial Maintenance

### Additional Electives

Mechanical Design I & II  
(formerly known as Drafting)

### Courses Offered at Clover High School

(DESCRIPTIONS FOR EACH COURSE ON BACK)

Introduction to  
Engineering & Principles of  
Engineering

CIM (Computer Integrated  
Manufacturing)

EDD (Engineering Design &  
Development)

CEA (Civil Engineering  
and Architecture)  
EDD

CEA  
CIM  
may also take EDD

Mechantronics 1 (Electrical  
Components/Industrial Safety)  
Mechantronics 2 (Electrical Drives/  
Hand&Power Tool Operation)  
Students will have option to begin Industrial  
Maintenance courses at York Technical College for  
Dual Credit

PLTW: PreEngineering  
Completer

(For students interested in  
Mechanical and Electrical  
Engineering)

PLTW: PreEngineering  
Completer

(For students interested in  
Civil or Architectural  
Engineering)

PLTW: PreEngineering  
Completer

(For students interested in  
all types of Engineering)

PLTW: PreEngineering  
Completer

(For students interested in  
Advanced Manufacturing)

## Course Descriptions

### Introduction to Engineering Design (IED) – 1 Unit – Grades 9–10

*College Preparatory: Algebra 1*

*Honors Prerequisites: Algebra 1 and English 1*

IED is an entry-level course into the world of engineering. Emphasis is placed on solving problems: identifying related factors, analyzing potential solutions, and communicating ideas. Through the use of a problem-solving model, students work to improve existing products and invent new ones. They learn how to apply this model to solve other problems in and out of the classroom. Using Autodesk Inventor, a sophisticated three-dimensional modeling software, students are able to model and communicate the details of their products. **[6051000CW, 605100HW]**

### Principles of Engineering (POE) - 1 Unit – Grades 10–11

*Honors Prerequisite: IED*

This course explores the wide variety of careers in engineering and technology and covers various technology systems and manufacturing processes. Using activities, projects and problems, students learn first-hand how engineers and technicians use math, science and technology in an engineering problem-solving process to benefit people. The course also addresses concerns about social and political consequences of technological change. **[605000HW]**

### Engineering Design and Development (EDD) – 1 Unit – Grades 11-12

*Honors Prerequisite: CEA, or CIM*

This course is an engineering research course in which students work in teams to research, design, and construct a solution to an open-ended engineering problem. The product development lifecycle and a design process will be used to guide and assist teams to reach a solution to the problem. Teams will present and defend their solution to a panel of outside reviewers at the end of the school year. Engineering Design and Development serves as the capstone course within the Project Lead The Way® (PLTW) course sequence and allows students to apply all the skills and knowledge learned in the previous PLTW courses. **[605409HW]**

### Civil Engineering and Architecture (CEA) - 1 Unit – Grades 11-12

*Honors Prerequisite: Mechanical Design 2 or POE*

Civil Engineering and Architecture (CEA) is an advanced course that teaches students the skills in the design and development of property. Working in teams, students explore hands-on activities and projects that develop problem-solving skills in civil engineering and architecture. The use of 3-D design software is a major component of the process. Students will develop skills in the documentation, presentation, and communication of their solutions to their peers and members of the professional community. **[605800HW]**

### Computer Integrated Manufacturing (CIM)

*Honors prerequisite: Principles of Engineering (POE) or Mechantronics 2 (MIT 2)*

This course introduces students to CIM, the manufacturing approach where all production operations are controlled by computers and have a common storage and distribution. While manufactured items are part of everyday life, most individuals have not been introduced to this high-tech and innovative form of modern manufacturing. This course covers the major steps in manufacturing processes, product design, concepts of lean manufacturing, automation & robotic mechanisms, programmable logic controllers (PLC's), as well as career opportunities related to CIM. **[605300HW]**

### MIT 1: Mechatronics Electrical Components/Industrial Safety – 1 Unit – Grades 10–11

*College Preparatory Prerequisites: Principles of Engineering (POE)*

Mechatronics Integrated Technology (MIT) is an interdisciplinary field involving mechanical, instrument, electronic, robotic, computer integrated, and control systems. This course covers safety, power & hand tool operation, and the integration of mechanical, electrical, and control systems in a high-tech production environment. The program is

geared for students who like to work with their hands and prepares them for entry into this diverse field where problem solving is a daily routine. Participation in VEX robotics is encouraged. **[621000CW]**

## **MIT 2: Mechatronics Electrical Drives/Hand & Power Tool Op.** – 1 Unit – Grades 10–11

*College Preparatory; Prerequisites: Mechatronics 1*

Mechatronics 2 is a continuation of the basic principles and technologies studied in MIT 1. Level 2 goes further into the integration of mechanical systems, pneumatic systems, hydraulic systems, electrical circuits and program logic control (PLC) technology. Students will learn the basics of robotic assembly and production. Hands-on experiences with the integration, maintenance, and troubleshooting of automated robotic systems is part of the course. Students are encouraged to participate in VEX robotics competition. **[621100CW]**

## **Mechanical Design 1** - 1 Unit - Grades 10-11

*College Preparatory Prerequisite: Geometry or currently enrolled in Geometry*

College-prep Mechanical Drawing 1 is designed for college-bound students who are interested in architecture and/or engineering and possess a strong background in math. The course introduces drafting concepts for both manual drawing and Computer Assisted Drawing (CAD). Students learn fundamental drafting techniques, geometric constructions, freehand sketching, and shape/size description. Students will also become proficient in the use of architect/engineering scales and other related equipment. Given the necessary equipment, materials and instruction, students will become confident in their abilities to perform entry level drafting tasks under the supervision of an experienced drafting technician. **\*\*Students who complete this course with an average of 85 or higher and have teacher recommendation may be eligible to take a competency exam through York Technical College (YTC) which could earn course exemption status toward a degree/certification program at YTC. [617200CW]**

## **Mechanical Design 2** – 1 Unit – Grades 10-12

*College Preparatory Prerequisite: Mechanical Design 1*

College-prep Mechanical Drawing 2 is a continuation of drafting technique in both manual and CAD formats. Students in level 2 develop skills in geometric constructions, dimensional/working drawing skills, auxiliary views, basic descriptive geometry, sectional views, fasteners and pictorial drawing. **\*\*Students who complete this course with an average of 85 or higher and have teacher recommendation may be eligible to take a competency exam through York Technical College (YTC) which could earn course exemption status toward a degree/certification program at YTC. [617300CW]**