

PLTW – Principles of Engineering (POE) (1 Semester)

Course Description:

Principles Of Engineering (POE) is a high school-level survey course of engineering. The course exposes students to some of the major concepts that they will encounter in a post secondary engineering course of study. Students have an opportunity to investigate engineering and high tech careers. POE gives students the opportunity to develop skills and understanding of course concepts through activity-, project-, and problem-based (APPB) learning. Used in combination with a teaming approach, APPB learning challenges students to continually hone their interpersonal skills, creative abilities, and problem solving skills based upon engineering concepts. It also allows students to develop strategies to enable and direct their own learning, which is the ultimate goal of education.

To be successful in POE, students should be concurrently enrolled in college preparatory mathematics and science. Students will employ engineering and scientific concepts in the solution of engineering design problems. Students will develop problem-solving skills and apply their knowledge of research and design to create solutions to various challenges. Students will also learn how to document their work and communicate their solutions to their peers and members of the professional community.

Principles Of Engineering is the second of two foundation courses in the Project Lead The Way high school engineering program. The course applies and concurrently develops secondary level knowledge and skills in mathematics, science, and technology.

What will my classes be like?

Go beyond “myth buster” to solution builder! As you master the basic concepts needed to continue your education in engineering or engineering technology, you’ll apply them — tackling real world challenges:

- Energy sources and applications
- Machine systems
- Fluid power
- Testing the strength and durability of materials
- Understanding how things move and applying that knowledge to projects

You are not in this alone: team up with other students to test and share your developing skills and problem-solving ability through hands-on projects and presentations.

Course Goals / Objectives:

The Project Lead the Way curriculum, including Principles of Engineering, focuses on making math and science relevant for students. The approach used is called APPB-learning (activities, projects, and problem-based learning). By engaging in hands-on, real-world projects, students understand how the material covered in class can be applied in their everyday lives. Learning activities will include teacher-led instruction, cooperative learning, and project-based learning. Technology will be used to enhance students learning, and provide real-world applications.

Engineering is a profession that contributes to change and improvements in our world. It creates imaginative and visionary solutions to the challenges of the 21st century – the problems of feeding the world, how we will use energy and continue to protect our environment. Engineering and technology play a vital role in the quality of everyday life and wealth creation. Appropriate attitudes relative to the professional social obligations of the engineer, and the relationships between math, science, technology and society need to be learned. Real world, open-ended engineering problems that cover a wide range of content will be presented.

Course Outline: (1 Semester)

Unit 1 Energy and Power (25 days)

- Lesson 1.1 Mechanisms (8 days)
- Lesson 1.2 Energy Sources (5 days)
- Lesson 1.3 Energy Applications (5days)
- Lesson 1.4 Design Problem –Energy and Power (6 days)

Unit 2 Materials and Structures (20 days)

- Lesson 2.1 Statics (7 Days)
- Lesson 2.2 Material Properties (5Days)
- Lesson 2.3 Material Testing (5Days)
- Lesson 2.4 Design Problem – Materials and Structures (2 Days)

Unit 3 Control Systems (23 days)

- Lesson 3.1 Machine Control (8days)
- Lesson 3.2 Fluid Power (7 days)

Unit 4 Statistics and Kinematics (7 days)

Lesson 4.1 Statistics (2 Days)

Lesson 4.2 Kinematics (5 Days)

Assessment Standards / Grading Practices:

- Grades will be calculated on a straight point basis. Projects will be based on a scale of 1 to 100 points depending on the assignment or project. Daily work and participation grades will be based on completion of the Engineering Notebook and Portfolio. Weekly quizzes, cumulative unit exams and a National PLTW Assessment will be given during the semester.
- All students must maintain an Engineering Notebook and Portfolio to pass the class. They will be checked periodically throughout semester.

College Credit Opportunities:

Northern Illinois University College of Engineering and Engineering Technology (CEET)

PLTW students who have successfully completed all courses in the pre-engineering high school curriculum with at least a grade B in each course will be awarded a maximum of 7 credit hours towards their degree completion in one of engineering or engineering technology programs offered by CEET. Students must have completed *ALL FOUNDATION COURSES AND THE ONE CAPSTONE COURSE* with a grade of B or better in order to be eligible for the 7 credit hours. PLTW students will be awarded a maximum of 7 credit hours from the following list of courses:

- UEET101: Introduction to Engineering (1)
- TECH294: Technology and Cultural Relevance (3)
- MEE270: Engineering Graphics (3)
- TECH211: Computer Aided Design (3)
- MEE101: Energy and the Environment (3)

For further information, please contact the Associate Dean's office at Northern Illinois University at (815) 753-9961.

*NOTE: *IED and POE are the foundation courses in the PLTW “Pathway to Engineering” course sequence. In order to receive recognition or credit from PLTW-affiliated colleges or universities, a student must successfully complete these two foundation courses, one specialized course, and one capstone course.*

Field Experiences / Competitive Opportunities:

The PLTW Engineering programs offer students an array of advantages, from career readiness and hands-on experience to college preparatory–level classes, labs and creative exercises. PLTW students succeed in the classroom and in life.

Our programs are designed to appeal to all students, from those already interested in STEM-related fields, to those whose experience in the sciences and math has been less comprehensive or who find themselves uninterested in traditional science and math curricula.

PLTW classes are hands-on, based in real-world experience, and engaging for students and teachers. We set the highest standards for rigorous, focused and relevant study, and develop students’ innovative, collaborative, critical-thinking, and problem-solving skills.

Our relationships with teachers, parents, local and national business leaders and university partners allow us to offer a complete experience both for students wishing to pursue a post-secondary degree in a STEM-related field and for those planning to join the workforce after high school. STEM literacy reduces dropout rates, increases attendance and helps students find better-paying jobs after school.

College and Career Pathways:

- Science & Mathematics
- Engineering & Technology

For sample occupations and postsecondary educational requirements, visit: www.careertech.org and click on “Career Clusters & Pathways”

Placement Guidelines / Recommendations:

We are confident that the Technology Center of DuPage experience is a positive and productive learning opportunity for DuPage County students. With this in mind, the following academic guidelines are recommendations intended to assist in scheduling students for success. If a student considering Pathway to Engineering does not meet one or more of these guidelines, contact Brian Clement or Judy Johnson to clarify individual situations.

Academic:

- **Attendance** - *Being present and actively participating in class. If absent, it is the student's responsibility to see what he or she has missed and make that work up as soon as possible.*
- **Mathematics** - *Suggested that students have Algebra and Geometry completed with a grade of B or better.*
- **Reading/Writing** - *Suggested that students have a 9th -10th grade reading level. Technical writing in this class is required.*
- **Science** - *Suggested that students have taken or are currently enrolled in Physics.*

Professional Skills:

- **Time Management** - *Students need to apply themselves on a daily basis.*
- **Personal Motivation** - *Actively seeking and taking part in any undertaking relating to the chosen skill area.*
- **Problem-Solving Ability** - *This course encourages and teaches students to problem solve and use critical thinking to solve problems.*
- **Reliability/Dependability** - *Demonstration by the student that he/she can be relied upon to do what is expected in class and in group work. This includes completing assignments on time and in a professional manner and working with their group partner.*
- **Ability to Work with Others** - *A variety of skills including teamwork are addressed. In this course students must work in groups on various tasks and projects for solving problems, generating ideas, stimulating critical thinking, etc. by unrestrained spontaneous participation in discussion. Students will acquire strong teamwork and communication skills throughout this course.*