

TECHNOLOGY & ENGINEERING STUDIES DEPARTMENT

Technology Studies is intended to be an integral part of the general education of all students. Courses are organized to accommodate students of all ability levels, making it possible for activities to be planned in line with individual interests and aptitudes and for students to progress at a rate of speed commensurate with their abilities. It is the aim of this department to provide the student with exposure, knowledge and skills in Technology Studies. Exposure to this all-encompassing area is a must in today's fast paced technologically oriented society and will help the students in the following ways: they will gain a conceptual understanding of technology's effect on society and the individual; become problem solvers, creative thinkers and wise consumers; understand and be better prepared to focus on possible career choices; become technologically functional and effective manipulators of tools and materials; and learn skills and concepts.

COURSES OFFERED

Grade	Course #	Course Title	Credits
9, 10, 11, 12	7360	Intro to Engineering Design	1
10, 11, 12	7361	Principles of Engineering	1
10, 11, 12	7362	Digital Electronics	1
10, 11, 12	7363	Civil Engineering & Architecture	1
12	7364	Engineering Design & Development	1
9, 10, 11, 12	7640	Multimedia Communications	1/2
10, 11, 12	7645	Advanced Multimedia Communications	1/2
10, 11, 12	7950	Photography/Digital Imaging	1/2
10, 11, 12	7951	Advanced Photography/Digital Imaging	1/2
9, 10, 11, 12	7970	Adaptive Technology Education	1/2
9, 10, 11, 12	7980	Independent Studies in Tech. Educ.	1/2 or 1

PRE-ENGINEERING *Project Lead the Way*

Project Lead The Way is a national pre-engineering organization that has joined forces with business, industry, government and universities for the purpose of attracting and preparing both male and female students for the science, technology, engineering and math related fields at the college level.

The Ohio Department of Education, the Ohio Board of Regents and the National PLTW organization have awarded WKHS "National Accreditation" for excellence in program delivery in the PLTW program. This award is reserved for a small percentage of programs that are distinguished in their overall impact to the students and the school community.

Students will combine the content knowledge they are learning in their core courses with the technology and engineering skills they are mastering in the Project Lead the Way courses to engage with a wide variety of interesting challenges. All Project Lead the Way courses are lively, active and hands on - they also develop partnerships with local professionals who will work directly with the students in a variety of capacities. This college prep, pre-engineering program is known to be fast paced and rigorous. It is also known for the enthusiasm of the students as their gifts, talents and curiosities are explored and assessed. Being an elective, homework is minimal, but it should be noted that most of the courses have a quick pace and require students to make the most of the time they have in class. All PLTW courses require the development of a professional portfolio that the student will take with them at the end of the class. There are also a variety of design, engineering and prototyping projects - some of which will require the students to work in teams.

Though the program's intent is for students to take all of the associated classes in sequence, it is not required to stay in the program if a student's interests lead them elsewhere.

Project Lead the Way articulates with hundreds of colleges and universities throughout the country. In all PLTW courses, students have the opportunity to earn university and/or college credit simultaneous to the high school credit they are receiving.

For those students who complete the necessary prerequisites, this program offers a special independent study opportunity for seniors. This capstone experience will allow students to mentor with professionals in various career fields as the students apply knowledge gained throughout their high school career toward the design and development of an intriguing project/experience.

Special Note to women:

Young men have always been interested in pursuits associated with Project Lead the Way, but it should be noted that women are in extremely high demand in these fields. If you are a young woman who is comfortable with your math and science abilities, you should definitely explore the possibilities that PLTW could lead to. By taking IED - the first course in the PLTW series, you will gain a competitive edge over your peers, and will know if it is worth pursuing these interests in college.

PLTW Program Sequence

Year 1 - IED (Intro to Engineering Design)

Year 2 - POE (Principles of Engineering)

Year 3 - DE (Digital Electronics)

and/or

CEA (Civil Engineering & Architecture)

Year 4 - EDD (Engineering Design & Development)

and/or

CEA or DE (Civil Engineering & Architecture or Digital Electronics)

Note: Civil Engineering & Architecture is also open to non-PLTW students who are juniors or seniors and are concurrently enrolled in FST.

PLTW Endorsement:

- The Ohio State University
- President of the Board of Commissioners
- Ventura Engineering, Inc.
- Lockheed Martin
- Worthington Chamber of Commerce
- Columbus State Community College
- Worthington Board of Education
- Abbott Labs

Additional Information:

<http://www.pltw.org/index.cfm>

<http://osin.org/state/making-the-case/why-stem.php>

<http://pltwohio.org/>

<http://pltw.org/curriculum/college-credit-for-students.html>

http://pltwohio.org/pltw_paths.cfm

INTRODUCTION TO ENGINEERING DESIGN

2 Semesters

Credits 1

Grade 9, 10, 11, 12

Prerequisite: Algebra 1

(may take concurrently)

Graded: Conventional or pass/fail

This is the first course in the Project Lead the Way program. It is designed to nurture student gifts, talents and curiosities about the design, technology and engineering related fields. Students will work side by side and on teams to develop innovative solutions to interesting design challenges. Along the way, students learn sophisticated design software applications, and practice the common sense problem solving skills that professionals use. This introductory program is a great opportunity for students to develop an awareness of or pursue their emerging interests in the technology, design and engineering related fields.

Upon completion of the course, students will have a hard copy of a professional portfolio containing research, photographs, drawings and samples of solutions for all of the works they were involved in throughout the year. They will also have an electronic copy of this portfolio. In addition, they will possess many fun artifacts from the design/build prototyping activities they participated in.

This college prep class is known to be fast paced and rigorous. It is also known for the enthusiasm of the students. Being an elective, homework is minimal, but it should be noted that the course can have a quick pace and will require students to make the most of the time they have in class. The course applies and concurrently develops knowledge and skills in mathematics, science, and technology.

The course of study includes:

- Design Process
- Modeling
- Sketching
- Prototyping
- Measurement, Statistics, and Applied Geometry
- Presentation Design and Delivery
- Engineering Drawing Standards
- CAD Solid Modeling
- Reverse Engineering
- Consumer Product Design
- Innovation
- Marketing
- Graphic Design
- Engineering Ethics
- Virtual Design

Students earn one full high school credit AND have the opportunity to simultaneously earn college credit at two-year community colleges AND 4-year universities. The amount of college credit is dependent upon which college the student wants credit from. Complete listings of the details for this part of the program are provided to the students throughout the year.

All students enrolled in this program will be given a special key code to download the most recent version of all Autodesk software products, such as: Inventor, Revit, AutoCAD, Maya, 3-D Studio Max, etc. (List prices for these products add up to thousands of dollars). The student will be able to keep this software for 13 months or as long as they are in a PLTW course. Note that the school is not responsible for, or obligated to help the student download and install these software packages. The school simply provides the key code access. It is up to the student to have enough technical knowledge to install the software. It is not a requirement of this course for students to have this software at home – this is simply a great opportunity for those who want to take advantage of it.

PRINCIPLES OF ENGINEERING

Grades: 10,11,12

2 Semester Prerequisite: Intro to Engineering Design
1 Credit (Prerequisites may be taken concurrently with POE)
Graded: Conventional or Pass/Fail

This course provides an overview of engineering and engineering technology. Students develop problem-solving skills by tackling real-world engineering problems. Through theory and practical hands-on experiences, students address the emerging social and political consequences of technological change. Students will build simple and complex machines designed to perform specific tasks, apply power and actuate.

Principles of Engineering is a foundation course in the Project Lead The Way® Engineering Academy. The course applies and concurrently develops secondary level knowledge and skills in mathematics, science, and technology. **This course articulates for college credit.**

All students enrolled in this program will be given a special key code to download the most recent version of AutoDESK Design Academy Software for FREE, (List prices for these products are over \$5,000). The student will be able to keep this software for 13 months or as long as they are in a PLTW course. AutoDESK Design Academy includes programs such as Inventor, AutoCAD, Revit, etc. Activities may include virtual and real life model development and construction; the development of an electronic and paper portfolio of all your work; and a variety of interesting problem solving activities.

The course of study includes:

- Overview and Perspective of Engineering. Students learn about the types of engineers and their contribution to society.
- Communication and documentation. Students collect and categorize data, produce graphic
- Design Process. Students learn about problem solving and how products are developed to include how engineers work in teams, keep an engineer's notebook, and make written and oral presentations.
- Engineering Systems. Students learn about mechanical, thermodynamics, fluid, electrical, and control systems.
- Statics. Students learn about measurement, scalars and vectors, equilibrium, structural analysis, and strength of materials.
- Materials and Materials Testing. Students learn the categories and properties of materials, how materials are shaped and joined, and materials testing.
- Engineering for Quality and Reliability. Students will use precision measurement tools to gather and apply statistics for quality and process control. Students will also learn about reliability, redundancy, risk analysis, factors of safety, and liability and ethics.
- Dynamics. Students will be introduced to dynamics/kinematics.

DIGITAL ELECTRONICS

Grades: 11, 12

2 Semesters Prerequisite: Geometry and Principles of
1 Credit Engineering (may take concurrently)
Graded: Conventional or Pass/Fail

This course is designed to teach you about applied logic, which introduces you to the basics of electronics and digital systems – the building blocks to many products you use. The course is designed to expose students to engineering design and troubleshooting techniques that are used in the electronics field. Computer simulation software is used to design and test digital circuitry prior to actually

constructing them in order to see if the circuits work. The projects are traditional, such as those found in watches, digital cameras, and calculators to combinational logic using SSI chips to small subsystem implementation in programmable devices, in which you will learn how machines “think.” You will also learn a systematic approach that engineers use to design the electronics that is used every day.

This course is important for anyone exploring a career in engineering or engineering technology. The prerequisite for this course is POE AND that a student be enrolled in college preparatory mathematics. It is recommended that students enter the course while enrolled in Geometry, Algebra 2, or a higher mathematics course.

Digital Electronics is a foundation course in the Project Lead The Way® Engineering Academy. The course applies and concurrently develops secondary level knowledge and skills in mathematics, science, and technology. **This course articulates for college credit.**

All students enrolled in this program will be given a special key code to download the most recent version of AutoDESK Design Academy Software for FREE, (List prices for these products are over \$5,000). The student will be able to keep this software for 13 months or as long as they are in a PLTW course. AutoDESK Design Academy includes programs such as Inventor, AutoCAD, Revit, etc. Activities may include virtual and real life model development and construction; the development of an electronic and paper portfolio of all your work; and a variety of interesting problem solving activities.

CIVIL ENGINEERING & ARCHITECTURE

Grades: 11,12

2 Semesters Prerequisite: FST or higher
1 Credit (Can be taken concurrently)
Graded: Conventional

This course is open to all students, prior enrollment in PLTW is not required. For those that are involved with PLTW, you will take this course after POE and/or concurrently with Digital Electronics.

This course is recommended for those students who want nurture their gifts, talents and curiosities about the design, technology and engineering fundamentals associated with civil engineering, architecture, landscape design, interior design, community management, etc, fields. These are the fields that affect people's every day lives. Students will build virtual and real world models of sustainable structures and communities.

Students will study the history of societal evolution, and the role architects and civil engineers play. They will also examine current practices in these industries and consider how technological advances will change the way people build structures and cities of the future. Students will learn about the infrastructure within these communities that take care of all of our basic human needs.

Students will use design software to create virtual models of residential and commercial properties. They will also use professional surveying equipment to plot land areas. Many hands on activities will take place such as soil testing, real working models of structures, construction of foundation, framing, plumbing and electrical systems. Students will also consider how to provide basic needs to a community population, i.e.: transportation, potable water supply, waste removal, transportation, for a city of the future.

As students use the sophisticated design software and build real working models, they will practice the common sense problem solving skills that professionals use. This introductory program is a great opportunity for students to develop an awareness of or pursue their emerging interests in the technology, design and engineering related fields.

Upon completion of the course, students will have a hard copy of a professional portfolio containing research, photographs, drawings and samples of solutions for all of the works they were involved in throughout the year. They will also have an electronic copy of this portfolio. In addition, they will possess many fun artifacts from the design/build prototyping activities they participated in.

This college prep class is known to be fast paced and rigorous. It is also known for the enthusiasm of the students. Being an elective, homework is minimal, but it should be noted that the course can have a quick pace and will require students to make the most of the time they have in class. The course applies and concurrently develops knowledge and skills in mathematics, science, and technology.

The course of study includes:

- Design Process
- Modeling

- Sketching
- Prototyping
- Project Planning
- Presentation Design and Delivery
- Engineering Drawing Standards
- CAD Solid Modeling
- Site Planning
- Building Design
- Innovation
- Project Documentation & Presentation
- Engineering Ethics
- Virtual Design

Students earn one full high school credit AND have the opportunity to simultaneously earn college credit at two-year community colleges AND 4-year universities. The amount of college credit is dependent upon which college the student wants credit from. Complete listings of the details for this part of the program are provided to the students throughout the year.

All students enrolled in this program will be given a special key code to download the most recent version of all Autodesk software products, such as: Inventor, Revit, AutoCAD, Maya, 3-D Studio Max, etc. (List prices for these products add up to thousands of dollars). The student will be able to keep this software for 13 months or as long as they are in a PLTW course. Note that the school is not responsible for, or obligated to help the student download and install these software packages. The school simply provides the key code access. It is up to the student to have enough technical knowledge to install the software. It is not a requirement of this course for students to have this software at home – this is simply a great opportunity for those who want to take advantage of it.

ENGINEERING DESIGN & DEVELOPMENT

1 Semester
1 Credit

Grades: 12
Prerequisite: Intro to Engineering Design, Principles of Engineering, & Digital Electronics
Graded: Conventional

This course lets student apply what they have learned in core academic and Project Lead the Way course as they complete challenging, self-directed projects. Students work individually and in teams to design and build solutions to authentic engineering problems. An engineer or other appropriate business professional from the school's partnership team mentors each student. Examples of projects may include a robotic mascot for the school, a remote-controlled hovercraft, or a solar-powered device. Other project examples might include designing a device that helps the elderly or disabled maintain more functionality in their lives, or a project that improves some aspect of the Worthington community. The student will pick something to work on that is of personal interest to them. Students keep journals of notes, sketches, mathematical calculations and scientific research, etc during the development of their project. Student teams make progress reports to their peers, mentor and instructor and exchange constructive criticism and consultation. At the end of the course, individuals and teams present a multimedia portfolio that chronicles their journey. This presentation will include a hard cover portfolio, digital images and video. The presentation of their projects will be to a panel of engineers, business leaders, college educators, etc for professional review and feedback.

This course equips students with the independent study skills that they will need in post secondary education and careers associated with the business of engineering and engineering technology.

MULTIMEDIA COMMUNICATIONS

1 Semester
1/2 Credit

Grades: 9,10,11,12
Prerequisite: Grade 9 requires teacher recommendation
Graded: Conventional or pass/fail

Multimedia Communications is a course that provides students with the opportunity to gather, arrange and manipulate computer-based digital media. Audio, video, text and graphics are integrated to create the final product. Students learn how to make presentations, manipulate files, scan images and use both a digital camera and video equipment. Problem solving skills are developed as students create, design and produce copy ready work for posters, brochures, videos or web pages for school or community groups. Students develop knowledge and skills in using a complete suite of Adobe software, including Adobe Illustrator, DreamWeaver, Photoshop and Flash. This is a production type course that requires students to learn multimedia skills and concepts and then apply them in a meaningful way. This is a fun, fast, hands-on course. Skills will benefit high school, college or

professional career. Evaluation is based on completed in-class assignments, tests and projects. There is no homework.

ADVANCED MULTIMEDIA COMMUNICATIONS

1 Semester
1/2 Credit

Grades: 10,11,12
Prerequisite: Multimedia Communications
Graded: Conventional or pass/fail

Advanced Multimedia Communications builds on the fundamental knowledge and skills developed in Multimedia Communications. This course is for students who are interested in the areas of computer graphics, digital imaging, electronic publishing, multimedia presentation, and web page design. Students will learn about creating graphic images using painting and drawing programs; using the computer with scanners, digital cameras, and other digitizing hardware and software; digitizing artwork, still photographs, video and audio; editing digital files using appropriate software; using digital files to create graphic designs, do electronic publishing, create multimedia presentations, ad design and web pages. Throughout the course students are guided to develop a portfolio of their work. Skills will benefit high school, college or professional career. Evaluation is based upon completed in-class assignments, tests and projects.

BEGINNING PHOTOGRAPHY/DIGITAL IMAGING

1 Semester
1/2 Credit

Grades: 10,11,12
Prerequisite: None
Graded: Conventional or pass/fail

Beginning Photography/Digital Imaging is a course that acquaints students with the history of photography, the basic principles of photography, and the basic techniques employed in the use of a camera, film developing, digital imaging and print making. The course is designed around classroom activities which include lectures, discussions, reading assignments, photographing subjects, and instruction in the use of photographic darkroom equipment. No prior knowledge of photography is necessary. Students should have their own camera, some type of 35mm camera or digital camera, to use. Students are expected to purchase some materials such as film, enlarging paper and matte board. During the semester students will also explore and discuss digital photography and Adobe Photoshop. All lab activities use black and white photographic technology. Evaluation will be based on tests and the completion of photographic assignments, which involve the taking of pictures outside of class, developing the film, and making enlargements in the darkroom.

ADVANCED PHOTOGRAPHY/DIGITAL IMAGING

1 Semester
1/2 Credit (repeatable)

Grades: 10,11,12
Prerequisite: Beginning Photography
Graded: Conventional or pass fail

Advanced Photography/Digital Imaging will give students a chance to further pursue their knowledge and skills in photography. This course will differ from the beginning photography course by being more student centered. Students will be responsible for deciding the areas of photography they will pursue in more depth and contract with the instructor as to how they will achieve the goals which they have set. In addition, students will be able to work on photographs that may be used for the school newspaper, the yearbook, or the literary magazine. Students will have more opportunity to create a personal portfolio of their work which could be very useful for applications to some colleges or art schools. It is recommended (though not required) that students have access to a 35mm or digital single lens reflex camera with manual settings for use in this course. Students are expected to purchase some materials such as film, enlarging paper and matte board. This course uses black and white photographic technology but also explores digital imaging and the use of the computer in refining and manipulating the photographic image. Evaluation will be based upon successful completion of contracts with the instructor and portfolios of photographic work. There may also be some tests over required knowledge.

ADAPTIVE TECHNOLOGY EDUCATION

1 Semester
1/2 Credit, repeatable

Grades: 9,10,11,12
Prerequisite: IEP Placement
Graded: Conventional or pass/fail

The Adaptive Technology program provides both academic and pre-vocational experiences for special education students. Students are exposed to a variety of technological processes such as tools and machines, electricity, photography and computers. They learn in a laboratory setting with hands-on activities. Learning

experiences are created to help meet the needs of each student as identified in the Individualized Education program (IEP). Although specific instructional objectives are tailored to the need of each student, some fundamental goals are designed for all special education students who take this course.

INDEPENDENT STUDIES IN TECHNOLOGY EDUCATION

Grades: 9,10,11,12

1 or 2 Semesters
1/2 or 1 Credit

Prerequisite: Department approval and
teacher recommendation
(based on 160 hours)

Graded: Conventional or pass/fail

Independent Studies in Technology Education is offered to enable students to study in-depth selected Technology Education areas beyond what is normally covered in the classroom. Faculty members and departmental facilities are available resources for the student. The student is expected to keep a detailed record of his own progress and work directly with a staff member. Credit will be granted upon successful completion of appropriate advanced study in the selected area. Evaluation and the amount of credit will be determined by the Industrial Technology department upon the recommendation of a staff member.