



Technology Education
Program of Academic Studies
2005-2006

North Penn High School Technology Education
Grades 10-12
<http://www.npteched.org>

North Penn High School Engineering Academy
Grades 10-12
<http://www.engineering.npteched.org>

The first portion of this booklet contains the elective Technology Education courses.

The second section, beginning on page two of this guide, details the Engineering Academy courses and their sequence. These courses are outlined in a gray background.

❖ Technology Education

The Technology Education curriculum presents courses in Communications, Power/Transportation, and Manufacturing and Construction Technologies. Specific course offerings include Mechanical Drawing, Graphic Communications (Printing), Manufacturing and Construction, Electricity/Electronics, and Principles of Technology. Courses are designed to assist students to understand industry and technology and to make informed and meaningful educational and career choices.

Major Electives

GRAPHIC COMMUNICATION SYSTEMS 5034 Level 4.0 (6 periods – 1 credit)

Communication systems technology introduces students to many ways information is produced, used, and exchanged through printed and electronic media. Students learn and use graphic communication, desktop publishing, graphic arts, photography, CAD, and graphic design as they complete individual and group activities in screen printing and lithography. Students investigate other printing processes as well as the industries that support them. Students explore electronic communications through the video editing module, audio/video module and digital camera. Students also use computer programs such as Adobe Illustrator, Adobe PageMaker, Adobe Photoshop, Apple Works and assorted other programs to generate copy for the activities. The products include: T-shirts, signs, mirrors, tote bags, pictures, mugs, etc. in screen printing process; in lithography: business cards, letterheads, memo pads, booklets, brochures, and our schools literary magazine. In audio/video a radio and video program is created. With the video editing module students create and edit videos.

ADVANCED GRAPHIC COMMUNICATION SYSTEMS 5044 Level 4.0 [Juniors & Seniors] (6 periods – 1 credit)

Advanced students build on the knowledge gained in the level 1 course as they complete more in-depth and challenging assignments. Emphasis is placed on the use of the computer in the exploration and completion of activities such as: halftones, duotones, posterization, flat multi-color and process color printing in both screen printing and lithography. Also included are more advanced desktop publishing activities such as booklets and brochures. Further electronic communication is explored through the audio/video module, video editing module, and digital photography.

Prerequisite: Graphic Communication Systems or a teacher recommendation from the minor level

With the approval of the instructor and the advanced level course, **students may elect a third year of Communication Systems Technology.** Students develop an independent study program with the help of the instructor.

MANUFACTURING AND CONSTRUCTION 5134 Level 4.0 (6 periods – 1 credit)

The Manufacturing and Construction course is designed to use wood, wood substitutes, metals, and plastics in the manufacturing and construction of today's products. Student activities include an overview of the woodworking and metalworking industries, safe use of hand tools and machines, technical research product planning, problem solving, and experimentation in the manufacturing laboratory. Students participate in individual and group problems and activities.

ADVANCED MANUFACTURING AND CONSTRUCTION 5144 Level 4.0 [Juniors & Seniors] (6 periods – 1 credit)

Advanced Manufacturing and Construction challenges students to identify, research solution, and develop individual products with instructor approval. Group manufacturing and construction activities are used to teach the industrial process from concept through marketing and distribution with emphasis on efficiency, accuracy, and cooperative working. Students are

encouraged to combine materials (wood, metal, plastics) in the design and production of products.

Prerequisite: Manufacturing and Construction.

With the approval of the instructor, **students may elect a third year of Advanced Manufacturing and Construction.** Students develop an independent study program with the help of the instructor.

PRINCIPLES OF TECHNOLOGY 5234
Level 4.0 (6 periods – 1 credit)

In this introductory course, students explore the physical principles underlying modern technology. Demonstrations, discussions, large and small group activities, and “hands-on” activities are based on the principles of force, work, rate, and resistance as they apply to mechanical, fluid, electrical and thermal systems. Technical content area reading skills are taught in conjunction with the high school reading specialist. This course is designed for students interested in a technical career, and meets the requirement for science credit.

Prerequisite: Modified Algebra 1

PRINCIPLES OF TECHNOLOGY 5235
Level 5.0 (6 periods – 1 credit)

In this academically challenging course, students explore the physical principles underlying modern technology. Demonstrations, discussions, large and small group activities and “hands-on” activities are based on the principles of force, work, rate, and resistance as they apply to mechanical, fluid, electrical and thermal systems. This course meets the requirement for science credit and prepares students for pursuing post-secondary degrees in an engineering/technical field.

Prerequisite: Algebra 1

**MECHANICAL DRAWING:
ARCHITECTURE/ MACHINE/ELECTRONICS** 5334
Level 4.0 (6 periods – 1 credit)

Mechanical Drawing is a course designed to teach people to communicate ideas through technical drawings. Students develop mechanical skills by using the instruments of a draftsman as they complete a series of introductory drawings. Students then select one area in which to work from three areas of study: Architecture – students develop a set of residential drawings, study today’s construction practices, and learn about the finances of building and buying a home; Machine – students develop the basic principles of the composition of drawings used by industry in developing manufactured products; Electronics – students work on designing, reading interpreting, and drawing electronic circuits. All students use the Computer-Aided-Drafting program in the completion of a required drawing. Mechanical Drawing is highly recommended to all students considering careers in engineering or technical fields.

ADVANCED MECHANICAL DRAWING 5344
Level 4.0 [Juniors & Seniors] (6 periods – 1 credit)

Advanced Mechanical Drawing Students continue to develop skills and background within several areas from the previous year. Areas of study include Mechanical (machine) and Architectural drawing. All students use Computer-Aided-Drafting (CAD) software to develop a series of drawings in all areas. The various software packages will allow the student to develop 3-D images with full color rendering and modeling capabilities. Students work on both independent and team projects along with the required drawing assignments.

Prerequisite: 1 credit of Mechanical Drawing

With the approval of the instructor, **students may elect a third year of Advanced Mechanical Drawing.** Such students develop an independent study program with the help of the instructor.

ELECTRICITY/ELECTRONICS 5434
Level 4.0 (6 periods – 1 credit)

This course is designed to explore the fundamentals of electricity and electronics and its effects on a technologically changing world. Student centered activities include basic principles of electricity, direct current, solid state devices, alternating current, residential wiring, home/mobile audio and video systems, and career opportunities in the electricity and electronics field. Classroom theory is reinforced through comprehensive laboratory exercises which include designing, and testing a wide variety of circuits. Experimentation, circuit design and construction, and troubleshooting skills are enhanced through the use of industry leading circuit simulation and experimentation software. This course is designed for students interested in technical, industrial, engineering, or military careers in electronics or for those interested in the computer sciences field.

ADVANCED ELECTRONICS 5445
Level 5.0 [Juniors & Seniors] (6 periods – 1 credit)

The Advanced Electronics course is designed for students to further expand their knowledge of electricity and electronics. An in-depth study of power supply design and construction from the component level is utilized to reinforce DC and AC theories and applications. The use of analog and digital meters, oscilloscopes, and power supplies in conjunction with Integrated circuits (chips), audio and video circuits, digital theory, and computer applications help to reinforce the knowledge and skills acquired. Experimentation, circuit design and construction, and troubleshooting skills are enhanced through the use of industry leading circuit simulation and design software.

Prerequisite: Electricity/Electronics

With the approval of the instructor, students may elect a **third year independent study program** or with a **final grade of a B or better**, students may elect to take the **Digital Electronics** course (based upon seating availability).

❖ Engineering Academy

The Engineering Academy represents a course sequence that addresses the educational needs of students planning on a post high school educational program in a two or four year college leading to a career in engineering or engineering technology. The program offers students an opportunity to explore a potential occupational path, and if appropriate, to prepare for the college experience. The Engineering Academy is for any 5.0 or 6.0 level student who is contemplating a career in Engineering. Students who wish to enroll in The Engineering Academy must complete the application process available from guidance counselors.

➦ **INTRODUCTION TO ENGINEERING
AND DESIGN (IED)** 5455
Level 5.0 (6 periods – 1 credit)

Introduction to Engineering Design is an introductory course that develops students’ problem-solving and critical-thinking skills and emphasizes the concepts of developing three-dimensional models and solid renderings of an object. Students focus on the application of visualization processes and tools provided by current, state-of-the-art computer hardware and software programs. IED emphasizes the design-development process of a product and how a product model is produced, analyzed, and evaluated, using a Computer-Aided Design System. Various design applications and possible career opportunities are explored and discussed in detail.

This course is a requirement for Grade 10 students in The Engineering Academy.

🎓 **PRINCIPLES OF ENGINEERING (POE)** 5465
Level 5.0 (6 periods – 1 credit)

Principles of Engineering is a broad-based survey course designed to help students understand the field of engineering and engineering technology and its unlimited and diverse career opportunities. Students continue the development of problem-solving and critical-thinking skills required in their post-secondary pursuits and engineering careers. In exploring various and numerous engineering systems and manufacturing processes, the students also learn how engineers address concerns about the social and political consequences of technological changes. Through theory, guest speakers, field trips, and hands-on problem-solving activities, students experience firsthand what engineering is all about and are able to answer this question: "Is a career in engineering or engineering technology for me?"

This course is a requirement for Grade 10 students in the Engineering Academy.

DIGITAL ELECTRONICS 5475
Level 5.0 (6 periods – 1 credit)

Digital Electronics is a course of study in applied digital logic and is patterned after first semester digital electronics courses taught in two and four year post secondary schools typically found in watches, calculators, video games, and computers, and they utilize Boolean logic in the solution of problems. Smart circuits are present in virtually all parts of our lives, and their use is rapidly increasing, making DE a critical course of study for any student pursuing a career in engineering/engineering technology. Using the latest software systems available to industry, students also test and analyze simple and complex digital circuitry. Students design circuits; export their designs to a printed circuit autorouting program that generates printed circuit boards; and construct designs, using chips and other DE components.

Course is for Grade 11 Engineering Academy students.

Prerequisite: Introduction to Engineering and Design, and Principles of Engineering

COMPUTER INTEGRATED MANUFACTURING (CIM) 5485
Level 5.0 (6 periods – 1 credit)

The Computer-Integrated Manufacturing course builds upon the solid-modeling and three-dimensional skills students developed in Introduction to Engineering Design. Students solve design problems, using state-of-the-art Computer-Assisted Design software programs. They evaluate their solutions, using mass-property analysis (relationship study of the design, function, and materials); determine appropriate modifications; and use prototyping equipment in producing a three-dimensional model of the solution. Students present the progress and results of their work through oral and portfolio-quality written communications. Course is for Grade 11 and 12 Engineering Academy students.

Prerequisite: Successful completion of courses associated with The Engineering Academy including Introduction to Engineering and Design and Principles of Engineering.

ENGINEERING DESIGN AND DEVELOPMENT (EDD) 5495
Level 5.0 [Seniors only] (6 periods – 1 credit)

In the Engineering Design/Development course, students continue the development of their teamwork skills by working in teams of two to four to select, design, and construct a solution to an engineering problem. The project requires the application of theories, principles, and processes learned in the previous four courses. The design problem may be selected from a database of engineering problems, a recognized national/global con-

cern/challenge, or an original engineering problem identified by the team and approved by the PLTW Partnership Team and staff. The scope of the problem should involve a wide range of engineering applications (e.g., school robot-mascot, automated solar water heater, remote-control hovercraft). The students' portfolios consist of a journal, oral/written progress reports, and final oral/written presentations of their projects to their peers and a panel selected from the Partnership Team. The portfolio is an invaluable asset to students as they go through the college-admissions process.

Course is for Grade 12 Engineering Academy students as it is part of the final component of The Engineering Academy.

Prerequisite: Successful completion of courses associated with The Engineering Academy including Introduction to Engineering and Design, Principles of Engineering, Digital Electronics and Computer Integrated Manufacturing.

Minor Electives

COMMUNICATIONS SYSTEM 8500
(2 periods – 0.3 credit)

The Communications System minor is designed to explore the basic methods used to produce, use and exchange information. Students use the computer to create a product by screen printing and lithography. Students explore electronic communications through an audio/video module, video editing module, digital photography along with other forms of communication and the industries that support them.

MANUFACTURING AND CONSTRUCTION: MATERIALS 8510
(2 periods – 0.3 credit)

The Manufacturing and Construction Minor provides the opportunity to explore woodworking and metalworking as students design, develop, and construct projects in selected areas of interest. Students use handtools, portable power tools, and machinery as they complete individual/group activities in the Manufacturing Laboratory.

POWER TECHNOLOGY MINOR 8520
Level 4.0 (2 periods – 0.3 credit)

The Power Technology Minor consists of a survey of energy, power, and transportation. Human muscle, simple and compound machines, gears, levers, pneumatics and hydraulics, internal combustion engines, automotive, aviation, and rocketry are explained. Future modes of energy, power, and transportation, such as: alternative energy sources and power systems, magnetic levitation, solar vehicles, and tidal energy stations are studied. Student activities include laboratory activities and hands-on experiences.

MECHANICAL DRAWING MINOR 8530
(2 periods – 0.3 credit)

Mechanical Drawing Minor is an introductory course enabling students to explore and develop technical drawing skills. Students complete a variety of drawings as they learn to use the instruments of a draftsman. Emphasis is placed on basic drawing skills, simple machine drawings, and architectural floor plans.

Minor Electives – 2nd/3rd Year

With the guidance of the instructor, students who elect to take a minor course for a 2nd or 3rd year develop an independent study program.