

PLTW (Project Lead the Way): Course Descriptions

Financial Note: In addition to normal book rental, students taking PLTW pre-engineering courses will be required to pay a lab fee of \$15 for each course.

Note: The following courses are recommended for students who are interested in pursuing a post-secondary degree in an engineering field of study. All courses count as Directed Electives or Electives for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas. Students passing the college portion of the Nation End Course Exam are eligible for trans-scripted college credit through many national universities.

* = Course qualifies for Dual Credit through IVY TECH.

***Introduction to Engineering Design (IED)** 2 semesters, 2 credits 9, 10, 11,12

Prerequisite: It is recommended students passed Alg. 1 with a C+, or taking Alg. 1 concurrently w/ IED.

IED is an introductory course that develops student problem solving skills, with emphasis placed on the development of three-dimensional solid models. Students will work from sketching simple geometric shapes to applying a solid modeling computer software package. They will learn a problem solving design process and how it is used in industry to manufacture a product. The Computer Aided Design System (CAD) will also be used to analyze and evaluate the product design. 3D printers will produce student designed products. The techniques learned, and equipment used, are state-of-the-art and are currently being used by engineers throughout the United States. Course qualifies for dual college credit though Ivy Tech.

Activities Include: Engineer's Notebook and Design Process, Pencil Sketches, Prototype Construction, 3D CAD Drawings, Precision Measurement, Reverse Engineering, Statistics, Power Points, 3D Printing.

***Digital Electronics (DE)** 2 semesters, 2 credits 10, 11, 12

Prerequisite: It is recommended students passed Alg. 1 with a C+ or better.

DE is a course of study in applied digital logic. Students will be introduced to digital circuits found in video games, watches, calculators, digital cameras, and thousands of other devices. Students will study the application of digital logic and how digital devices are used to control automated equipment. The use of digital circuitry is present in virtually all aspects of our lives and its use is increasing rapidly. This course is similar to a first semester college course and is an important course of study for a student exploring a career in engineering or engineering technology. Course qualifies for dual college credit though Ivy Tech.

Activities Include: Electron Theory, Number Systems, Logic Gates and Circuit Design, Binary Adding, Shift Registers and Counters, Microprocessors, Computer Simulated Circuits, and Hardwiring of Digital Circuit Boards.

***Principles of Engineering (POE)** 2 semesters, 2 credits 10, 11, 12

Prerequisite: Introduction to Engineering Design (IED)

POE is broad-based course in engineering and engineering technology. Students will develop engineering problem solving and communication skills and apply higher-level mathematics in preparation for post-secondary engineering programs. Topics include: Engineering History and Careers, Creativity and Problem Solving, Energy and Power, Materials and Structures, Control Systems, Statistics and Kinematics. Course qualifies for dual college credit though Ivy Tech.

Activities Include: Engineering Notebook, Simple Machines and Mechanisms, Basic Electricity, Circuits, Energy and Solar-Hydrogen Vehicle, Thermal Dynamic Testing, Structural Property Analysis of Beams and Trusses, Precision Measurement, Materials Science and Destructive Testing, VEX Automation, Robotics and Programming, Statistics, Kinematics-Ballistics Device, Technical Reports and Power Points.

Civil Engineering & Architecture (CEA)	2 semesters, 2 credits	11, 12
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Prerequisite: Introduction to Engineering Design (IED) and Principles of Engineering (POE)

This course provides an overview of the fields of Civil Engineering and Architecture, while emphasizing the interrelationship and dependence of both fields on each other. Students use state-of-the-art software to solve real-world problems and communicate solutions to hands-on projects and activities. The course covers topics such as the roles of civil engineers and architects; project planning; site planning; building design; and project documentation and presentation.

Activities Include: Surveying, Residential Floor Plans, Elevations and Renderings, Electrical/Mechanical Drawings, House Design Prototypes, Commercial Structures, and Topographical Mapping.

*Computer Integrated Manufacturing (CIM)	2 semesters, 2 credits	11, 12
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Prerequisite: Introduction to Engineering Design (IED) and Principles of Engineering (POE)

This course builds upon the computer solid modeling design skills developed in Introduction to Engineering Design. Students will be presented with design problems that require the use of Inventor to develop solutions to the problems. They will evaluate the solutions using mass property analysis (study of the relationship of design, function, and materials used), make appropriate modifications and use prototyping equipment to produce three-dimensional models of the solutions. Students are expected to communicate the process and results of their work through oral and written reports.

Activities Include: CAD Drawings, CNC Mill, Lathe and Router Projects, Robotic Work Cell Programming and Automation, Manufacturing Cell Design and Simulations, and Precision Measurement.

Engineering Design and Development (EDD)	2 semesters, 2 credits	12
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Prerequisite: Completion of IED, POE and one of the following: CIM or CEA or DE.

EDD is year-long Project Based Learning (PBL) activity. Students will be involved in four-person teams who research an open-ended problem and then design and construct a solution following the Engineering Design Process. Each team member must submit progress reports and a final research paper. The team members will defend the solution with a multi-media presentation before an outside engineering review panel. This is the capstone class for the Engineering pathways.

Activities Include: Project Research, Timelines, Brainstorming, Development and Optimization, CAD Drawings, Data and Documentation, Testing, Evaluation and Engineering Presentations.

Principles of Biomedical Sciences (PBS)	2 semesters, 2 credits	9, 10, 11
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Prerequisite: 3.0 GPA (9th graders), taken or taking concurrently with Biology

In the introductory course of the PLTW Biomedical Science program, students explore concepts of biology and medicine to determine factors that led to the death of a fictional person. While investigating the case, students examine autopsy reports, investigate medical history, and explore medical treatments that might have prolonged the person's life. The activities and projects introduce students to human physiology, basic biology, medicine, and research processes while allowing them to design their own experiments to solve problems.

Human Body System (HBS)	2 semesters, 2 credits	10, 11, 12
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Prerequisite: Principles of Biomedical Sciences

Students examine the interactions of human body systems as they explore identity, power, movement, protection, and homeostasis. Exploring science in action, students build organs and tissues on a skeletal Maniken®; use data acquisition software to monitor body functions such as muscle movement, reflex and voluntary action, and respiration; and take on the roles of biomedical professionals to solve real-world medical cases.

Medical Interventions (MI)

2 semesters, 2 credits

11, 12

Prerequisite: Principles of Biomedical Sciences and Human Body Systems

Students follow the life of a fictitious family as they investigate how to prevent, diagnose, and treat disease. Students explore how to detect and fight infection; screen and evaluate the code in human DNA; evaluate cancer treatment options; and prevail when the organs of the body begin to fail. Through real-world cases, students are exposed to a range of interventions related to immunology, surgery, genetics, pharmacology, medical devices, and diagnostics.
