

ENGINEERING & TECH

ENGINEERING PATHWAY:

Project Lead the Way (PLTW)

PLTW (Project Lead the Way) helps students develop the skills needed to succeed in our global economy. PLTW courses are aligned with State Standards for Math and English Language Arts, Next Generation Science Standards, and other national and state standards. Courses and units are designed to complement math and science courses. Courses can meet requirements for the Core 40 Academic Honors Diploma and Technical Honors Diploma.

PLTW INTRODUCTION TO ENGINEERING DESIGN (IED)

0605

2 Semesters 2 Credits Grades: 9-12

Prerequisite: Algebra I

Fee: \$30.00

This course is weighted on a 4.5 scale.

COURSE DESCRIPTION: [IDOE 4812] (IED) Introduction to Engineering and Design is an introductory course, which develops student problem solving skills with emphasis on the development of three-dimensional (3-D) solid models. Students will work both individually and in teams to design solutions to a variety of problems using 3D modeling software. Students use the design process, applying math, science, and engineering standards to hands-on projects. Models of product solutions are created, analyzed and communicated using Autodesk Inventor. This course also works in a variety of project based learning activities such as The Whirlpool Innovation Challenge, Canstruction, and The Hand of Grace.

PLTW INTRODUCTION TO ENGINEERING DESIGN (IED) All Girls

0606

2 Semesters 2 Credits Grades: 9-12

Prerequisite: Algebra I

Fee: \$30.00

This course is weighted on a 4.5 scale.

COURSE DESCRIPTION: [IDOE 4812] (IED) Introduction to Engineering and Design is an introductory course, which develops student problem solving skills with emphasis on the development of three-dimensional (3-D) solid models. Students will work both individually and in teams to design solutions to a variety of problems using 3D modeling software. Students use the design process, applying math, science, and engineering standards to hands-on projects. Models of product solutions are created, analyzed and communicated using Autodesk Inventor. This course also works in a variety of project based learning activities such as The Whirlpool Innovation Challenge, Canstruction, and The Hand of Grace.

PLTW PRINCIPLES OF ENGINEERING (POE)

0607

2 Semesters 2 Credits Grades: 10-12

Prerequisite: Introduction to Engineering Design (IED)

Fee: \$20.00

This course is weighted on a 4.5 scale, Quantitative Reasoning Course.

COURSE DESCRIPTION: [IDOE 4814] Principles of Engineering (POE) is a course that focuses on the process of applying engineering, technological, scientific and mathematical principles in the design, production, and operation of products, structures, and systems. This is a hands-on course designed to provide students interested in engineering careers to explore experiences related to specialized fields such as civil, mechanical, electrical and materials engineering. Students will engage in research, development, planning, design, production, and project management to simulate a career in engineering. The topics of ethics and the impacts

of engineering decisions are also addressed. Classroom activities are organized to allow students to work in teams and use modern technological processes, computers, CAD software, and projection systems in developing and presenting solutions to engineering problems.

PLTW AEROSPACE ENGINEERING* (AE)

0653

2 Semesters 2 Credits Grades: 10-12

Prerequisite: IED or POE or Algebra I

Fee: \$36.00

Quantitative Reasoning Course.

COURSE DESCRIPTION: [IDOE 4816] Aerospace Engineering ignites students' learning in the fundamentals of atmospheric and space flight. Aerospace Engineering is one of the specialization courses in the PLTW Engineering program. The course deepens the skills and knowledge of an engineering student within the context of atmospheric and space flight. Students explore the fundamentals of flight in air and space as they bring the concepts to life by designing and testing components related to flight such as an airfoil, propulsion systems, and a rocket. They learn orbital mechanics concepts and apply these by creating models using industry-standard software. They also apply aerospace concepts to alternative applications such as a wind turbine and parachute. Students simulate a progression of operations to explore a planet, including creating a map of the terrain with a model satellite and using the map to execute a mission using an autonomous robot. *Not a dual credit course*

PLTW CIVIL ENGINEERING AND ARCHITECTURE (CEA)

0655

2 Semesters 2 Credits Grades: 10-12

Prerequisite: IED or POE

Fee: \$20.00

This course is weighted on a 4.5 scale, Quantitative Reasoning Course.

COURSE DESCRIPTION: [IDOE 4820] Civil Engineering and Architecture introduces students to the fundamental design and development aspects of civil engineering and architectural planning activities. Application and design principles will be used in conjunction with mathematical and scientific knowledge. Computer software programs (Revit) will allow students opportunities to design, simulate, and evaluate the construction of buildings and communities. During the planning and design phases, instructional emphasis will be placed on related transportation, water resource, and environmental issues. Activities will include the preparation of cost estimates, structure design, surveying, model building, as well as a review of regulatory procedures that would affect the project design.

PLTW DIGITAL ELECTRONICS (DE)

0613

2 Semesters 2 Credits Grades: 10-12

Prerequisite: IED or POE or concurrently enrolled in Algebra II

Fee: \$20.00

This course is weighted on a 4.5 scale, Quantitative Reasoning Course.

COURSE DESCRIPTION: [IDOE 4826] Digital Electronics is a course of study in applied digital logic that encompasses the design and application of electronic circuits and devices found in video games, watches, calculators, digital cameras, and thousands of other devices. Instruction includes the application of engineering and scientific principles as well as the use of Boolean algebra to solve design problems. Using computer software that reflects current industry standards, activities will provide opportunities for students to design, construct, test, and analyze simple and complex digital circuitry. Software will be used to develop and evaluate the product design. This course engages students in critical thinking and problem-solving skills, time management and teamwork skills.

ROBOTICS PATHWAY:

FIRST TECH CHALLENGE IED – FTC9

0602 (0614 – 0 Hour)

2 Semesters 2 Credits Grade: 9

Fee: \$40.00

COURSE DESCRIPTION: [IDOE 4802] Students can choose to take this course as a 0 hour class or a normal class. 0 hour class will meet outside the school day. FTC is designed for students to work together solving an engineering problem. Teams of students are responsible for designing, building, and programming their competition robots. Competitions are held throughout Indiana and the nation. Students will learn and use the design process to guide their work in class. Families will be expected to attend informational meetings in the evenings. Many skills and processes are learned in FTC to build the individual towards an effective team member for the Robotics Classes (FRC 11th and 12th grade years). Students get to:

- Design, build, and program robots
- Apply real-world math and science concepts
- Develop strategic problem solving, organizational, and team building skills
- Compete and cooperate in Alliances at tournaments
- Earn a place in the World Championships
- Qualify for scholarships at over 100 colleges/universities

***There will be evening and weekend commitments to participating in this class. Students will ride a school bus and stay overnight at certain competitions.**

FIRST TECH CHALLENGE POE – FTC10

0612 (0616 – 0 Hour)

2 Semesters 2 Credits Grade: 10

Fee: \$40.00

Quantitative Reasoning Course

COURSE DESCRIPTION: [IDOE 5644] Students can choose to take this course as a 0 hour class or a normal class. 0 hour class will meet outside the school day. FTC is designed for students to work together solving an engineering problem. Teams of students are responsible for designing, building, and programming their competition robots. Competitions are held throughout Indiana and the nation. Students will learn and use the design process to guide their work in class. Families will be expected to attend informational meetings in the evenings. Many skills and processes are learned in FTC to build the individual towards an effective team member for the Robotics Classes (FRC 11th and 12th grade years). Students get to:

- Design, build, and program robots
- Apply real-world math and science concepts
- Develop strategic problem solving, organizational, and team building skills
- Compete and cooperate in Alliances at tournaments
- Earn a place in the World Championships
- Qualify for scholarships at over 100 colleges/universities

***There will be evening and weekend commitments to participating in this class. Students will ride a school bus and stay overnight at certain competitions.**

ARCHITECTURE PATHWAY:

ARCHITECTURAL DESIGN I

0604

2 Semesters 2 Credits Grades 9-12

Fee: \$20.00

COURSE DESCRIPTION: [IDOE 5640] Architectural Drafting and Design I gives students a basic understanding of the detailing skills commonly used by architectural technicians. Areas of study include: sketching, proper use of equipment, geometric constructions, and general residential design. This course includes the creation and interpretation of construction documents. Methods of geometric construction, three-dimensional drawing techniques, and sketching will be presented as well as elementary aspects of residential design and site work. Areas of emphasis will include print reading and drawing. This course also provides

students with a basic understanding of the features and considerations associated with the operation of a computer-aided design (CAD) system. They will be expected to complete several projects relating to command topics. Topics include: 2D drawing commands, coordinate systems, editing commands, paper and model space, inquiry commands, layers, plotting, text, and basic dimensioning.

ARCHITECTURAL DESIGN II

0656

2 Semesters 2 Credits Grades 10-12

Prerequisites: Architectural Design I

Fee: \$20.00

Quantitative Reasoning Course.

COURSE DESCRIPTION: [IDOE 5652] Architectural Design II builds on the concepts of Architectural Design I and presents a history and survey of architecture with a focus on the creative design of buildings in a studio environment. This course covers site analysis, facilities programming, space planning, conceptual design, and the proper use of materials. Students will develop presentation drawings, give oral presentations, and critique works. Generation of form and space is addressed through basic architectural theory, related architectural styles, design strategies, and a visual representation of the student's design process. This course will focus on advanced Computer Aided Design (CAD) techniques. It includes an overview of modeling, graphical manipulation, part structuring, and modeling strategies. Various Architectural software packages and applications will be used.

TECHNOLOGY PATHWAY:

INTRO TO DESIGN PROCESSES

0601

2 Semesters 2 Credits Grades: 9-12

Fee: \$20.00

COURSE DESCRIPTION: [IDOE 4794] Introduction to Design Processes is a course that specializes in modern design and engineering processes with a focus on creative problem solving in developing, testing, communicating, and presenting post-evaluation of products. Students use the design process to analyze research, develop ideas, and produce products solutions. This process gives a framework through which they design, manufacture, test and present their ideas. Students will demonstrate and utilize design principles and elements for visual presentations. Designing aspects will also cover aesthetics, ergonomics, the environment, safety, and production. The design process is a core-learning tool for many courses enabling the student to solve problems in a systematic, logical and creative manner. Students develop a good understanding of the way the process helps them think creatively and developing aesthetic ideas. The design process encourages the students to engage in higher level thinking to create solutions for many types of problems.

COMPUTERS IN DESIGN & PRODUCTION

0603

2 Semesters 2 Credits Grades: 10-12

Prerequisite: Introduction to Design Processes

Fee: \$20.00

COURSE DESCRIPTION: [IDOE 4800] Computers in Design and Production is a course that specializes in using modern technological processes, computers, design, and production systems in the production of products and structures through the use of automated production systems. Emphasis is placed on using modern technologies and on developing career related skills. Students apply ingenuity using tools, materials, processes, and resources to create solutions. Students will address major technological content related to topics such as: Architectural drawing and print design, design documentation using CAD systems, assignments involving the interface of CAD, CNC, CAM and CIM technologies; computer simulation of products and systems; publishing of various media; animation and related multimedia applications; 3-D modeling of products or structures; digital creation and editing of graphic and audio files; control technologies; and automation in the modern workplace.

COMPUTER TECH SUPPORT

0615

2 Semesters 2 Credits Grades: 9-12

Fee: \$15.00

COURSE DESCRIPTION: [IDOE 5230] Computer Tech Support - A course that focuses on hands-on applications of computer and network fundamentals. Students will work toward CompTIA A+ Certification through lectures, assignments, and hands-on labs. Topics covered include: Basic PC Hardware, System Boards, I/O Systems, Mass Storage Systems, Data Communications, Printers, Portable Systems, Operating System Fundamentals, Windows XP, Windows 7, Windows 8, Windows 10, Basic Hardware and Software Troubleshooting, and Preventive Maintenance. Students will perform hardware, software, and network installations; operating system, software, and memory upgrades; system and network configuration; and computer troubleshooting and repairs. A major emphasis will be placed on developing employable skills such as; communication, time management, accountability, and ethics. Students are counseled and encouraged to become A+ Certified and to seek employment or post high school training in areas related to computers and/or computer repair. Students may use this course to meet one of the requirements for the Academic Honors Diploma if they fulfill the following: *Students completing the course with a grade of "B" or higher and completing the requirements for A+ certification will earn free college credit from Ivy Tech Community College.* Any student earning dual credit may apply those credits to the academic honors diploma. This course also qualifies for the Technical Honors Diploma.

MANUFACTURING PATHWAY:

PRECISION MACHINING I

0625

2 Semesters 2 Credits Grades: 9-12

Fee: \$25.00

Quantitative Reasoning Course

COURSE DESCRIPTION: [IDOE 5782] Precision Machining I is designed to provide students with a basic understanding of the precision machining processes used in industry, manufacturing, maintenance, and repair. The course instructs students in industrial safety, terminology, tools and machine tools, measurement and layout. Students will become familiar with the setup and operation of power saws, drill presses, lathes, milling machines, grinders, welding and an introduction to CNC (computer controlled) machines.

PRECISION MACHINING II

0627

2 Semesters 2 Credits Grades: 10-12

Prerequisite: Precision Machining I

Fee: \$25.00

Quantitative Reasoning Course

COURSE DESCRIPTION: [IDOE 5784] Precision Machining II is a more in-depth study of skills learned in Precision Machining I, with a stronger focus in CDN setup/operation/programming. Classroom activities will concentrate on precision set-up and inspection work as well as machine shop calculations. Students will develop skills in advanced machining and measuring parts.

WELDING TECHNOLOGY I

0620

2 Semesters 2 Credits Grades: 10-12

Prerequisite: Precision Machining I

Fee: \$25.00

COURSE DESCRIPTION: [IDOE 5776] Welding Technology I includes classroom and laboratory experiences that develop a variety of skills in oxy-fuel cutting and Shielded Metal Arc welding. This course is designed for individuals who intend to make a career as a Welder, Technician, Sales, Designer, Researcher or Engineer. Emphasis is placed on safety at all times. OSHA standards and guidelines endorsed by the American Welding Society (AWS) are used. Instructional activities emphasize properties of metals, safety

issues, blueprint reading, electrical principles, welding symbols, and mechanical drawing through projects and exercises that teach students how to weld and be prepared for college and career success. This course qualifies for the General, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas.

CONSTRUCTION PATHWAY:

INTRODUCTION TO CONSTRUCTION

0629

2 Semesters 2 Credits Grades: 9-12

Fee: \$30.00

Additional: *There may be additional costs for elective projects.

COURSE DESCRIPTION: [IDOE 4792] Introduction to Construction is an entry-level course that emphasizes the use of tools, materials, and techniques used in the construction industry. Students will learn how to safely operate various hand and power tools. Joinery and assembly methods will also be studied. Students will use these methods to produce a wide variety of projects.

CONSTRUCTION TRADES

0631

2 Semesters 2 Credits Grades: 10-12

Prerequisite: Introduction to Construction

Fee: \$40.00

Additional: *There may be additional costs for elective projects.

COURSE DESCRIPTION: [IDOE 5580] Construction Trades I is a specialized course that builds on the fundamentals acquired in the Introduction to Construction class to further understand the technological processes used in the building trades industry. Students will learn common processing and assembly methods and employ those techniques to create a wide variety of projects.