

ENGINEERING

The Engineering Career Cluster focuses on the planning, designing, testing, building, and maintaining of machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles.

Engineering Foundations

The Engineering Foundations program of study focuses on opportunities associated with a wide range of skills applied in the Engineering industry. Students will design, test, and evaluate projects related to engines, machines, and structures. This program includes applying scientific, mathematical, and empirical evidence to solve problems through innovation, design, construction, operation, and maintenance of different engineering systems.

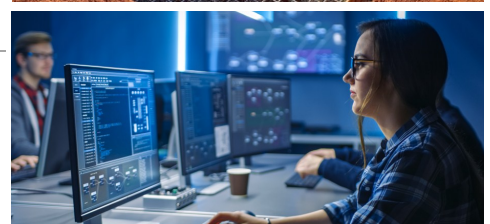
Engineering Foundations Course Pathway

Investigation	<ul style="list-style-type: none"> ◆ Gateway I (PLTW) ◆ Principles of Applied Engineering ◆ Engineering Design Process
Navigation	<ul style="list-style-type: none"> ◆ Engineering Science ◆ Architectural Engineering
Preparation	<ul style="list-style-type: none"> ◆ Digital Electronics ◆ Aerospace Design I (Sunset following 25-26sy)
Application	<ul style="list-style-type: none"> ◆ Scientific Research & Design ◆ Career Preparation for Program of Study

Aligned Advanced Placement Courses:

*These courses do not count toward Concentrator/Completer status.

- ◆ AP Calculus AB*
- ◆ AP Computer Science A*
- ◆ AP Physics I*
- ◆ AP Physics II*



ALIGNED ENDORSEMENT: Successful completion of the Engineering Foundations program of study fulfills the requirements of the Business & Industry endorsement. A STEM endorsement is also fulfilled with the required math and science credits.

ALIGNED OCCUPATIONS

Civil Engineering Technologists & Technicians

- ◆ Median Wage: \$61,138
- ◆ Annual Openings: 765
- ◆ 10-year Growth: 11%

Mechanical Engineers

- ◆ Median Wage: \$99,937
- ◆ Annual Openings: 483
- ◆ 10-year Growth: 18%

Aerospace Engineers

- ◆ Median Wage: \$115,694
- ◆ Annual Openings: 1,132
- ◆ 10-year Growth: 20%

WORK-BASED LEARNING

- ◆ Internship at an engineering, robotics, or aerospace company
- ◆ Job shadow an engineer

EXPANDED LEARNING

- ◆ TSA or SkillsUSA participation
- ◆ Participate in an engineering association

INDUSTRY-BASED CERTIFICATIONS

- ◆ Autodesk Associate Fusion 360
- ◆ Autodesk Associate Inventor for Mechanical Design
- ◆ Autodesk Associate Revit for Architecture

POSTSECONDARY LEARNING

Apprenticeships

- ◆ Industrial Engineering Technology

Associate Degrees

- ◆ Manu. Engineering Technology
- ◆ Robotics Technology/Technician

Bachelor's, Master's, Doctoral, & Professional Degrees

- ◆ Electrical & Electronics Engineering
- ◆ Engineering, General

Stackable IBCs/Licensures

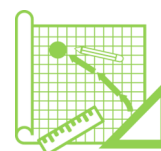
- ◆ Professional Engineer (PE License)
- ◆ Engineer in Training Cert (EIT)



Engineering Foundations Course Details

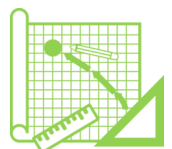
COURSE	GRADE LEVEL	PREREQUISITES	COURSE CODE BISD CODE COURSE CREDIT	ALIGNED IBC	CAMPUS
Gateway I (PLTW) [^] [^] Does NOT count toward POS concentrator or completer status	7	None	—		BMS LBMS NBMS SBMS
Principles of Applied Engineering* (Level 1)	7-8	None	13036200 27705 1 credit		BMS LBMS NBMS SBMS
Engineering Design Process* (Level 1)	9-12	None	12756001 27710 1 credit	Autodesk Associate Certified User Inventor for Mechanical Design	BHS LBHS
Engineering Science* (Level 3) (Satisfies a science requirement)	10-12	Algebra I Biology 1+ course for 1+ credit in Engineering career cluster	13037500 27715 1 credit	Autodesk Associate Certified User Inventor for Mechanical Design	BHS LBHS BNT
Architectural Engineering* (Level 3) (2 credit course scheduled for 1 period)	11-12	Recommended pre- or co- requisite: Introduction to Engineering Design	12756065 27729 2 credit	Autodesk Associate Certified User Revit Architecture	BHS LBHS
Digital Electronics* (Level 3) (Satisfies a math requirement)	10-12	Algebra I Geometry	13037600 27727 1 credit		BHS LBHS
Aerospace Design I* (Level 2)	11-12	One or more credits in a level 2 or higher Mechanical & Aerospace Engineering course	12756040 27726 1 credit	Autodesk Associate Certified User Inventor for Mechanical Design	LBHS BNT
Scientific Research & Design* (Level 4) (Satisfies a science requirement)	12	Biology Chemistry IPC or Physics 2+ courses for 2+ credits in Engineering career cluster	13037200 27735 1 credits		BHS LBHS BNT
Career Prep or Ext. Career Prep for POS* (Level 4) (Related job placement required—10 hrs/wk; or 15 hrs/wk)	12	2+ courses for 2+ credits (with level 2 or higher course) in aligned POS	12701121 27516 2 credits 12701141 27517 3 credits		BHS LBHS

*Course is included in additional programs of study.



Engineering Foundations Course Descriptions

Gateway I (PLTW Flight & Space + App Creators)	Students trace the history, development, and influence of automation and robotics as they learn about mechanical systems, energy transfer, machine automation, and computer control systems. Students use the VEX Robotics platform to design, build, and program real-world objects such as traffic lights, toll booths, and robotic arms.
Principles of Applied Engineering (PLTW Design & Modeling + Automation & Robotics)	Principles of Applied Engineering provides an overview of the various fields of science, technology, engineering, and mathematics and their interrelationships. Students develop engineering communication skills, which include computer graphics, modeling, and presentations, by using a variety of computer hardware and software applications to complete assignments and projects. Upon completing this course, students will have an understanding of the various fields of engineering and be able to make informed career decisions.
Engineering Design Process	Engineering Design Process is an engineering course applicable to all engineering fields. Students use an iterative engineering design process to solve problems, make decisions, and manage a project. Professional practices are addressed, including development of a problem statement, maintenance of documentation, use of an engineering notebook, research, project management, internal and external communication, and creation of technical drawings and prototypes. The student delivers a professional presentation detailing the experience of working through each step of the engineering design process.
Engineering Science	Engineering Science is an engineering course designed to expose students to some of the major concepts and technologies that they will encounter in a postsecondary program of study in any engineering domain. Students will have an opportunity to investigate engineering and high-tech careers. In Engineering Science, students will employ science, technology, engineering, and mathematical concepts in the solution of real-world challenge situations. 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.
Architectural Engineering	Students enrolled in Architectural Engineering use principles of engineering and design tools to create innovative, functional, and sustainable buildings. Students develop cursory knowledge and essential skills to understand the design of buildings, including the mechanical, electrical, plumbing, and structural systems, while also planning the construction process. They engage in project planning, building and system analysis, site investigation, and the integration of sustainable design and construction practices for an architectural engineering project.



Engineering Foundations Course Descriptions

Digital Electronics

Digital Electronics is the study of electronic circuits that are used to process and control digital signals. In contrast to analog electronics, where information is represented by a continuously varying voltage, digital signals are represented by two discrete voltages or logic levels. This distinction allows for greater signal speed and storage capabilities and has revolutionized the world of electronics. Digital electronics is the foundation of modern electronic devices such as cellular phones, digital audio players, laptop computers, digital cameras, and high-definition televisions. The primary focus of Digital Electronics is to expose students to the design process of combinational and sequential logic design, teamwork, communication methods, engineering standards, and technical documentation.

Aerospace Design I

Students enrolled in Aerospace Design I demonstrate knowledge and skills associated with the design evolution and emerging trends of aircraft and aerospace systems. Fundamental concepts such as forces of flight, structures, aerodynamics, propulsion, stability and control, and orbital mechanics are introduced as related to design decisions for atmospheric and space flight. These concepts are related to mission requirements and solution approaches.

Scientific Research & Design

Scientific Research and Design is a broad-based course designed to allow districts and schools considerable flexibility to develop local curriculum to supplement any program of study or coherent sequence. The course has the components of any rigorous scientific or engineering program of study from the problem identification, investigation design, data collection, data analysis, formulation, and presentation of the conclusions. All of these components are integrated with the career and technical education emphasis of helping students gain entry-level employment in high-skill, high-wage jobs and/or continue their education.

Career Preparation for Program of Study

Career Preparation I provides opportunities for students to participate in a work-based learning experience that combines classroom instruction with business and industry employment experiences. The goal is to prepare students with a variety of skills for a changing workplace. Career preparation is relevant and rigorous, supports student attainment of academic standards, and effectively prepares students for college and career success.

