Indiana Department of Education
Academic Standards Course Framework

AEROSPACE ENGINEERING

Aerospace Engineering provides students with the fundamental knowledge of atmospheric and space flight. Emphasis includes investigation and research of flight characteristics, physiology, orbital mechanics, and application of aerospace technology in various industries. Lab-based classroom instruction provides creative thinking and problem-solving activities that simulate flight and space vehicles and their environments.

- PLTW DOE Code: 4816
- NON-PLTW DOE Code: 5518
- Recommended Grade Level: Grade 11-12
- Recommended Prerequisites: Introduction to Engineering Design and Principles of Engineering
- Credits: 2 semester course, 2 semesters required, 1 credit per semester, 2 credits maximum
- Counts as a Directed Elective or Elective for all diplomas
- Qualifies as a quantitative reasoning course
- If PLTW course code is used, PLTW training is required of the teacher.

Dual Credit
This course provides the opportunity for dual credit for students who meet postsecondary requirements for earning dual credit and successfully complete the dual credit requirements of this course. The Dual Credit crosswalk can be accessed here.

Application of Content and Multiple Hour Offerings
Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences.

Implementation Guidance
Domain Zero (0) was created much like a process standard to be implemented throughout the length of the course. These standards should be taught in conjunction with Content Area Standards in Domains 1-7.

Career and Technical Student Organizations (CTSOs)
Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in a Career and Technical Student Organization, such as the Technology Student Association (TSA)

Domain 0 – Project Management	
Core Standard 1	**Students will exhibit appropriate safety practices while working with tools and equipment.**
ETE – 0.1.1	Demonstrate relevant safety practices when using tools and equipment as determined by task, materials, environment, and protective attire.
ETE – 0.1.2	Apply corrective action(s) to eliminate hazards. Understand the format and content of industry based Material Safety Data Sheets (MSDS).
Core Standard 2	**Students will investigate various careers within the fields of engineering and technology.**
ETE – 0.2.1	Identify engineering and technology occupations and the roles and responsibilities of each.
ETE – 0.2.2	Report job outlook, demand, and projected wages for engineering and technology careers.
ETE – 0.2.3	Explore job opportunities that are available in engineering and technology.
ETE – 0.2.4	Investigate post-secondary training opportunities and industry certifications that are available.
ETE – 0.2.5	Explore student professional organizations related to engineering and technology.
Core Standard 3	**Students will communicate the design process.**
ETE - 0.3.1	Explain the importance of documentation.
ETE - 0.3.2	Apply sketching and annotation skills to document work.
ETE - 0.3.3	Produce working drawings using appropriate drawing styles and techniques.
ETE - 0.3.4	Construct design models or finish models to display concepts of design or theory investigated.
ETE - 0.3.5	Document project components into an engineering notebook (digital or paper).
ETE - 0.3.6	Communicate technical knowledge in a variety of formats.
ETE – 0.3.7	Utilize presentation software to create a presentation that outlines team or individual priorities for design and share with peers.
ETE – 0.3.8	Document best work in a portfolio (digital or paper).
Core Standard 4	**Students will apply appropriate research techniques.**
ETE - 0.4.1	Formulate unbiased research questions to collect information/data.
ETE - 0.4.2	Apply appropriate investigative strategies.
ETE - 0.4.3	Evaluate sources appropriate for academic research.
ETE - 0.4.4	Select resources relevant to the identified problem.
ETE - 0.4.5	Synthesize information collected during the research process.
ETE - 0.4.6	Generate a list of sources used to gather information using APA or MLA format.

Content Standards

Domain – Basic Aerodynamics

Core Standard 1 Students evaluate the design of an airfoil to analyze aerodynamic forces.

Standards

ASE-1.1 Calculate associated forces and atmospheric conditions that affect flight.

ASE-1.2 Identify the control surfaces of an aircraft and the impact of each on the axis of rotation and motion.

ASE-1.3 Utilize information from avionics systems to provide stable and controlled flight.

ASE-1.4 Hypothesize the flight characteristics of an aerospace surface based on test data.

ASE-1.5 Investigate the historical impact of the design of aerospace technologies.

ASE-1.6 Compare and contrast the various methods by which different aerospace technologies achieve and maintain stable flight.

Domain – Aerospace Materials

Core Standard 2 Students validate the selection of materials and processes to produce cost-effective and structurally sound aerospace products.

Standards

ASE-2.1 Describe how various material types are used.

ASE-2.2 Analyze the impact of stress on the different material types to infer the best application.

ASE-2.3 Differentiate between proper and improper structural shapes within specific aerospace applications.

ASE-2.4 Design, construct, and test an alternative aerospace material.

ASE-2.5 Predict the future of aerospace materials and their impact on air and space travel

Domain – Propulsion Systems

Core Standard 3 Students evaluate differing methods of propulsion to verify the proper application given a specific aerospace need.

Standards

ASE-3.1 Differentiate between the various types of propulsion systems in terms of structure, operation, placement, and specific use.

ASE-3.2 Predict and explain the flight path taken by a suborbital rocket.

ASE-3.3 Connect propulsion systems to the four forces of flight.

Domain – Avionics and Flight Systems

Core Standard 4 Students apply and adapt navigation tools and skills to demonstrate the rules of flight planning and navigation.

Standards

ASE-4.1 Cite evidence for the development of different navigational techniques.

ASE-4.2 Plan a successful flight using modern (GPS) and traditional (VOR and “dead-rekoning”) navigation aids.

ASE-4.3 Analyze the constraints that impact cost effective flight planning.

ASE-4.4 Assess the functionality of GPS in terms of accuracy and reliability.

Domain – Space Travel

Core Standard 5 Students investigate space systems in order to better understand the correlation between space travel and orbital mechanics.

Standards

ASE-5.1 Justify the regulation of the use of space.

ASE-5.2 Describe the history of space travel emphasizing the impact of the space race on society.

ASE-5.3 Utilize Kepler's Laws to describe and predict the path of an orbiting satellite

Domain – Aerospace Physiology

Core Standard 6 Students understand the limitations on space travel due to human physiology.

Standards

ASE-6.1 Identify flight constraints based on the limitations of the human body.

ASE-6.2 Investigate human involvement in aerospace incidents.

ASE-6.3 Suggest modifications for flight control based upon structure and function of the human body.

ASE-6.4 Justify the use of unmanned aerial vehicles (UAVs) based on the limitations imposed on flight by humans.

ASE-6.5 Examine the effects of spaceflight on the human body.

ASE-6.6 Prescribe accommodations used during short-term and long-term space travel to maintain functioning body systems.

Domain – Alternative Applications of Aerospace Engineering

Core Standard 7 Students investigate non-flight applications of aerospace engineering concepts.

Standards

ASE-7.1 Correlate processes used in aerospace engineering design to profitability, cost effectiveness, and impact on the environment.

ASE-7.2 Develop a working system that can operate remotely and/or autonomously at a remote location.

ASE-7.3 Differentiate amongst the various control systems used in distant operations.

ASE-7.4 Determine the obstacles to delivering and operating a system at a remote location.

ASE-7.5 Justify the need for unmanned aerial and terrestrial vehicles for both military and civilian purposes.