

## **District Career & Technical Education (CTE) Pathway Proposal**

The Career & Technical Education (CTE) Pathway proposal is to be submitted to the CTE Coordinator for prior approval and should include the following information:

**Name of State approved (CCCS) CTE Program:** STEM (Science, Technology, Engineering, Math)

**CCCS Student Rights Assurance:** Approved programs must assure and have strategies in place to ensure that no student is unlawfully: • Discriminated against the basis of age, race, religion, color, national origin, sex/gender, pregnancy status, gender identity, sexual orientation, or disability in its activities or programs as required by Title VI, Title IX, and Section 504, Age Discrimination Act, and Title II of the Americans with Disabilities Act. • Denied an equal opportunity to benefit from occupational education solely on the basis of race, color, religion, national origin, sex, age, or disability. Additionally, CTE staff must work with students with qualified disabilities (including the learning disabled and those with physical, sensory, and temporary disabilities) to provide appropriate assistance to students so that they may participate in approved CTE programs as fully as possible. Each program is responsible for providing evidence of each of these in the case of an audit or upon CCCS request.

### **I. GOALS**

A. Provide a brief overview of the CTE Pathway. The engineering pathway empowers students to develop the qualities that will be needed in the role of an engineer, and adopt a problem-solving mindset. The courses engage the students in compelling, real-world challenges that help them become a better collaborator and thinker. They will learn in-demand knowledge and skills that they will use in high school and in their chosen career path.

B. How does this CTE Pathway fit into the overall educational program? CTE programs significantly increase not only the high school graduation rate, but also results in a higher percentage of students going to college and persisting through graduation. Students taking both academic and technical courses have lower dropout rates and better achievement gains than other students.

C. What benefits would students receive from this CTE pathway? The STEM program would help students develop problem-solving skills and learn how to work as a team. Students are offered the opportunity to earn industry certifications that will increase their workforce readiness after high school. Students that develop an interest in STEM in high school are more likely to study STEM subjects in college.

**II. CAREER & TECHNICAL EDUCATION (CTE) PATHWAY COURSES**

Complete the table below indicating the course sequence students would take within the CTE program. Other courses may be added or changed within the program, based upon the need of students or program modifications. **New course names will be indicated in red text.**

<i>Pathway Name:</i>	STEM
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<i>Sub-Pathway Name (if applicable):</i>	Engineering & Technology
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<i>Level:</i>	<i>State Approved Course Name:</i>	<i>State Approved Description:</i>	<i>CIP Code</i>
Level 1	<b>Principles of Engineering &amp; Technology</b>	Principles of Engineering and Technology is designed to introduce students to the STEM cluster for students interested in learning more about careers in engineering and technology. This course covers basic skills required for engineering and technology fields of study. Upon completion of this course, students are able to identify and explain the steps in the engineering design process. They can evaluate an existing engineering design, use fundamental sketching and engineering drawing techniques, complete simple design projects using the engineering design process, and effectively communicate design solutions to others.	140101
Level 1	<b>Introduction to Drafting &amp; Design Concepts (A &amp; B)</b>	This course offers students the opportunity to combine design principles with technology to produce authentic projects. The initial focus will be on developing an understanding of the visual elements and the principles of design. Students will study both two and three-dimensional applications and problems. Students will explore areas such as: graphic design, architectural design, landscaping design, manufacturing design and interior design. Students will use drafting skills to produce detailed working drawings, sectionals, auxiliary, fasteners, and simple architectural floor plans. Students will also work in design teams to create pattern development and design and produce prototypes. They will be introduced to computer design software such as Google Sketch, SolidWorks, AutoCAD, and ArchiCad.	140101

<p>Level 1</p>	<p>69110 PLTW: Introduction to Engineering</p> <p>Course is currently in the 69000s series in IC, but needs to be moved to be part of CTE courses and STEM pathway.</p>	<p>Through both individual and collaborative team activities, projects, and problems, students will solve problems as they practice common engineering design and development protocols such as project management and peer review. Students will develop skill in technical representation and documentation of design solutions according to accepted technical standards, and they will use current 3D design and modeling software to represent and communicate solutions. In addition the development of computational methods that are commonly used in engineering problem solving, including statistical analysis and mathematical modeling, are emphasized. Ethical issues related to professional practice and product development are also presented.</p>	<p>140101</p>
<p>Level 2</p>	<p>Introduction to Engineering Design</p>	<p>Introduction to Engineering Design is a fundamental course in the Engineering and Technology Program of Study for students interested in developing their skills in preparation for careers in engineering and technology. The course covers essential knowledge, skills, and concepts required for postsecondary engineering and technology fields of study. Upon completion of this course, proficient students are able to describe various engineering disciplines, as well as admissions requirements for postsecondary engineering and engineering technology programs in Colorado. They will also be able to identify simple and complex machines, calculate various ratios related to mechanisms, explain fundamental concepts related to energy, understand Ohm's Law, follow the steps in the engineering design process to complete a team project, and effectively communicate design solutions to others.</p>	<p>140101</p>
<p>Level 2</p>	<p>Digital Electronics (A &amp; B)</p>	<p>Digital Electronics is intended to provide students with an introduction to the basic components of digital electronic systems and equip them with the ability to use these components to design more complex digital systems. Proficient students will be able to (1) describe basic functions of digital components (including gates, flip flops, counters, and other devices upon which larger systems are designed), (2) use these devices as building blocks to design larger, more complex circuits, (3) implement these circuits using programmable devices, and (4) effectively communicate designs and systems. Students develop additional skill in technical documentation when operating and troubleshooting circuits. Upon completion of the Digital Electronics course, students will be able to design a complex digital system and communicate their designs.</p>	<p>140101</p>

Level 2	Introduction to Technical Drawing/Design (A & B)	This yearlong course develops skills in drafting and design of structures and products. This is accomplished by introducing a design process of refining sketches through technical hand and computer-aided drafting. The use of a CAD-CAM program will allow students to visually apply creative design elements to specific projects.	140101
Level 2	Drafting & Design Concepts (A & B)	This course offers students the opportunity to combine design principles with technology to produce authentic projects. The initial focus will be on developing an understanding of the visual elements and the principles of design. Students will study both two and three-dimensional applications and problems. Students will explore areas such as: graphic design, architectural design, landscaping design, manufacturing design and interior design. Students will use drafting skills to produce detailed working drawings, sectionals, auxiliary, fasteners, and simple architectural floor plans. Students will also work in design teams to create pattern development and design and produce prototypes. They will be introduced to computer design software such as Google Sketch, SolidWorks, AutoCAD, and ArchiCad.	140101
Level 2	69109 PLTW: Principles of Engineering  Course is currently in the 69000s series in IC, but needs to be moved to be part of CTE courses and STEM pathway.	Principles of Engineering (POE) is a foundation course of the high school engineering pathway. This survey course exposes students to some of the major concepts that they will encounter in a postsecondary engineering course of study. Through problems that engage and challenge, students explore a broad range of engineering topics, including mechanisms, the strength of materials and structures, automation, and kinematics. The course applies and concurrently develops secondary level knowledge and skills in mathematics, science, and technology.	140101
Level 3	Applied Engineering Design	Applied Engineering Design is an applied course for students interested in further developing their skills as future engineers. This course covers knowledge, skills, and concepts required for postsecondary engineering and technology fields of study. Upon completion of this course, proficient students are able to explain the differences between scientists and engineers, understand the importance of ethical practices in engineering and technology, identify components of control systems, create simple free body diagrams, use measurement devices employed in engineering, conduct basic engineering economic analysis, follow the steps in the engineering design process to complete a team project, and effectively communicate design solutions to others.	140101

Level 3	<b>Robotics &amp; Automated Systems</b>	Robotics & Automated Systems is an applied course for students who wish to explore how robots and automated systems are used in industry. Upon completion of this course, students will have an understanding of the historical and current uses of robots and automated systems; programmable circuits, interfacing both inputs and outputs; ethical standards for engineering and technology professions; and testing and maintenance of robots and automated systems.	140101
Level 3	<b>DC/AC Electricity and Electronics</b>	This course introduces the basic principles of electronics including the fundamentals of Direct Current (DC), Alternating Current (AC), and robotics. Topics include basic circuits, voltage, current and resistance measurement, Ohm's Law, series and parallel circuits, magnetism, motors and generators, electromagnetic induction, and robotics. Electronic theory is reinforced through breadboarding circuits in the lab. Students fabricate printed circuit board projects. Utilization of electronic test equipment is emphasized.	140101
Level 3	69106 PLTW: Aerospace Engineering  <b>Course is currently in the 69000s series in IC, but needs to be moved to be part of CTE courses and STEM pathway.</b>	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 system, 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.	140101
Level 3	69108 PLTW: Civil Engineering & Architecture  <b>Course is currently in the 69000s series in IC, but needs to be moved to be part of CTE courses and STEM pathway.</b>	In CEA students are introduced to important aspects of building and site design and development. They apply math, science, and standard engineering practices to design both residential and commercial projects and document their work using 3D architectural design software. Utilizing the activity-project-problem-based (APB) teaching and learning pedagogy, students will progress from completing structured activities to solving open ended projects and problems that require them to develop planning, documentation, communication, and other professional skills.	140101
Level 4	<b>Work-based Learning (WBL)</b>	Students build on prior knowledge and skills in the	140101

		program of study to further develop and apply employability and technical skills that prepare them for success in future career and postsecondary education, as deemed developmentally appropriate.	
Level 4	Capstone	This course allows for individualized, advanced, and/or cumulative work in a program of study. This work is individualized to the student within a specific program of study to allow for specialized study. It may include problem-/project-based learning or preparation for industry certification. The specific content and course design is determined by the instructor, in collaboration with the individual student.	140101
Level 4	69107 PLTW: Engineering Design and Development  Course is currently in the 69000s series in IC, but needs to be moved to be part of CTE courses and STEM pathway.	Engineering Design and Development (EDD) is the capstone course in the PLTW high school engineering program. It is an open-ended engineering research course in which students work in teams to design and develop an original solution to a well-defined and justified open-ended problem by applying an engineering design process. Students will perform research to select, define, and justify a problem. After carefully defining the design requirements and creating multiple solution approaches, teams of students select an approach, create, and test their solution prototype. Student teams will present and defend their original solution to an outside panel. While progressing through the engineering design process, students will work closely with experts and will continually hone their organizational, communication and interpersonal skills, their creative and problem solving abilities, and their understanding of the design process.	140101

Signature Page

Does the Career and Technical Education (CTE) Coordinator approve adoption of this program?

*\*\* Your signature below indicates your approval of the program.*

Signature   
Joy Griffin (Feb 2, 2021 12:11 MST)

Does the Director of CIPG approve adoption of this program?

*\*\* Your signature below indicates your approval of the program.*

Signature   
Erica Mason (Feb 3, 2021 16:27 MST)


Does the Chief Assessment Officer approve adoption of this program?

*\*\* Your signature below indicates your approval of the program.*

Signature   
Matt Reynolds (Feb 3, 2021 16:37 MST)

Does the Assistant Superintendent approve adoption of this program?

*\*\* Your signature below indicates your approval of the program.*

Signature 

Does the Board of Education approve adoption of this program?

Yes

No

Date of BOE Meeting \_\_\_\_\_

Signature \_\_\_\_\_

## Superintendent File: IGA-E-2

**Office use:** The following information is required to build individual courses into Infinite Campus.

Credit Type: ( FNA, PRA, MAT, etc)	
Department Code:	
Course Number:	
Course entered in NCAA database if applicable.	
Update <a href="#">Graduation Competencies</a> course document if applicable for Math and English courses.	
VIP Code:	
CIP Code:	
Add to HEAR list, if applicable.	
Course Mapping SCED code:	
Date entered into Infinite Campus	
Credit amount:	