



Fairbanks North Star Borough School District

Career & Technical Education Curriculum



2023 – 2024 Revision, Draft 1

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Acronyms

AKCIS	Alaska Career Information System
CTC	Community and Technical College
CTE	Career Technical Education
CTEPS	Career and Technical Education Program of Study
CTSO	Career Technical Student Organization
FNSBSD	Fairbanks North Star Borough School District
PLCP	Personal Learning and Career Plan
PLTW	Project Lead the Way
RPC	Recognized Post-secondary Credential
STEM	Science, Technology, Engineering, and Math
TSA	Technology Student Association
WS	Writing Standards

Explanation of Terms

General Terms and Definitions

Career Cluster: A career cluster is a structure for organizing and delivering quality CTE programs around occupations and broad industries.

Career Pathway: A career pathway is a strand of a career cluster that centers on a common set of academic, technical, and workplace skills and knowledge. It is a sector from the broader career cluster.

CTEPS: CTEPS stands for “Career and Technical Education Program of Study” which is also called Program of Study or POS. It is a coherent and aligned sequence of educational elements that begins at secondary school and continues without duplication or remediation into postsecondary education/training, and that leads to an industry recognized credential or certificate, or an associate or baccalaureate degree. (See Program of Study)

Program of Study (POS): A program of study is designed to provide successful student transitions between secondary and postsecondary education. A program of study is a comprehensive, structured approach for delivering academic and career and technical education to prepare students for postsecondary education and career success. (See CTEPS)

Sequence: A sequence is a group of courses that a student may take within a cluster, usually in a progression of foundational skills to more focused and higher level skills.

CTE Specific Terms

Career and Technical Student Organization (CTSO): A CTSO is an organization for students enrolled in a CTE program that engages in CTE activities as an integral part of the instructional program. Alaska has six (6) recognized CTOS: Business Professionals of America (BPA); Family, Career, and Community Leaders of America (FCCLA); Health Occupations Students of America (HOSA)- Future Health Professionals; DECA – an Association of Marketing Students; FFA – Agricultural Education; and SkillsUSA.

Concentrator: A secondary student who has earned two (2) courses in a single CTE pathway within those career clusters where 2 credit sequences are recognized by the State and its local eligible recipients, or where the student has documented proficiencies that are equivalent to this criteria.

Concurrent Enrollment: A written agreement between a secondary and a postsecondary program that allows a high school course taught by a high school teacher to qualify for postsecondary credit.

Participant: A secondary student who has earned credit in one or more approved courses in any career and technical education (CTE) program area.

Curriculum Terms

Alaska Content Standards: Content standards are broad statements, adopted by the State Board of Education and Early Development, indicating what students should know and be able to do as a result of their public school experience.

Alaska Cultural Standards: The Alaska Cultural Standards for Students were developed by the Alaska Native Knowledge Network and adopted by the State Board of Education & Early Development in 1998. Cultural Standards are meant to enrich the Content Standards and provide guidelines for nurturing and building in students the rich and varied cultural traditions that continue to be practiced in communities throughout Alaska. The standards are broad statements of what students should know and be able to do as a result of their experience in a school that is aware of and sensitive to the surrounding physical and cultural environment.

Alaska Employability Standards: Alaska's Employability standards are to be used in conjunction with Alaska's academic content and performance standards to ensure Alaska's student have the skills and knowledge necessary to be good citizens, effective parents, productive workers, and most of all, life-long learners. Alaska's students are expected to learn how to learn and apply their skills and knowledge in a variety of settings to create a satisfying and productive life. These standards are designed to promote successful student transition from school to work.

Alaska Performance Standards: Performance standards are measureable statements of learning expectations, adopted by the State Board of Education and Early Development, indicating what students should know and be able to do as a result of their public school experience. Alaska has adopted Performance Standards in reading, writing, mathematics, and science.

All Aspects of Industry: All Aspects of Industry essentially provides a set of standards for all CTE courses. All Aspects of Industry defines nine aspects common to any business or enterprise: planning; management; finance; technical and production skills; principles of technology; labor issues; community issues; health, safety and environment; personal work habits.

Personal Learning Plan: A personal learning plan is developed by students – typically in collaboration with teachers, counselors, and parents – as a way to help them achieve short- and long-term goals, most commonly at the middle and high school levels. Students can chart a personal educational program that will allow them to achieve their educational and aspirational

goals, while also fulfilling school requirements such as particular credit or course requirements for graduation. A personal learning plan also documents major learning accomplishments or milestones.

Student Performance Standards: Student performance standards are statements of the essential skills, knowledge, and tasks that FNSBSD students are expected to master in the course. These are developed at the district level.

Science, Technology, Engineering, & Mathematics (STEM) Overview

The Science, Technology, Engineering, and Mathematics (STEM) curriculum and pathway gives clearer guidance on starting points and pathway options for students. In general, most students new to STEM would begin with *Introduction to Engineering Design* or *Computer Programming* (see the [Math Curriculum](#) or [Information Technology Curriculum](#) for more information). A second or third year of STEM could involve any of the concentration courses listed below that fit both student interests at schools as well as instructor certifications and knowledge. A final capstone course would most likely be the *Engineering Design and Development* course, where students get to apply what they have learned in previous STEM, math, and science courses in solving real world problems of their own choosing.

One proposed pathway is shown in the two charts below. Other students may take alternate pathways through these courses by starting with a concentration course if their math background meets the prerequisites and perhaps they are a junior or senior looking for something specific.

The goal of these courses is to give every student a chance to learn the STEM content that interests them in a logical sequence that can culminate in a capstone experience. In addition, each course is intended to be tied to either industry certifications, university credit through CTC dual credit, or university credit in participation with UAF School of Engineering. Specific certifications and credit options are suggested in this document.

Middle School STEM Overview	
Grade 6	Grades 7 & 8
<ul style="list-style-type: none"> Computer Science for Innovators & Makers (See IT Curriculum for more information) 	<ul style="list-style-type: none"> Exploring STEM 1 Exploring STEM 2

High School STEM Overview		
Grade 9	Grades 10 & 11	Grade 12
Introductory	Concentrator Courses	Capstone Courses
<ul style="list-style-type: none"> Introduction to Engineering Design Computer Essentials (See IT Curriculum for more information.) 	<ul style="list-style-type: none"> Aerospace Engineering AP Computer Science A Civil Engineering & Architecture Digital Electronics Autodesk Inventor (See the Architecture & Construction Curriculum for more information.) Principles of Engineering 	<ul style="list-style-type: none"> Engineering, Design, & Development STEM: Independent Research (See the Introductory & Capstone Curriculum for more information.)
Various certifications are available through the high school pathway. Check specific course objectives.		

Archived Courses

Introduction to Engineering and Robotics A/B has been removed from the STEM curriculum and archived. If a teacher or school is interested in offering this courses in the future, they must fill out a pilot proposal form by the deadline listed at www.k12northstar.org/Page/8841; the course may be offered, pending Teaching and Learning and superintendent approval. If the school would like to look at the old course curriculum, they should contact Teaching and Learning at teachingandlearning@k12northstar.org or (907) 452-2000 ext. 11422.

Middle School STEM Courses



Grades 6 – 8

Exploring STEM 1

COURSE INFORMATION	
Course Name:	Exploring STEM 1
Course Number:	Quarter: CTE701 Semester: CTE70
Grade(s):	7
Length (# of semesters):	One quarter or one semester
Credit:	0.25 or 0.5
Foundational Course:	<input type="checkbox"/> This is a foundational CTE course (foundational courses are not technical)
Prerequisites:	None
Sequence or CTEPS:	Multiple high school sequences
Date of District Course Revision:	Spring 2024
CAREER & TECHNICAL STUDENT ORGANIZATION (CTSO)	
CTSO Embedded in this Sequence:	Skills USA (high school level)
TECHNICAL/OCCUPATIONAL STANDARDS	
Source(s) of Technical Standards:	<ul style="list-style-type: none"> • Occupational Safety & Health Administration (OSHA) • National Center for Construction Education & Research • AutoCAD • International Society for Technology in Education (ISTE) • International Test & Evaluation Association (ITEA)
Names/Numbers of Technical Standards:	<ul style="list-style-type: none"> • OSHA: www.osha.gov/dte/outreach/maritime/index.html • NCCER: www.nccer.org/findCenter.asp • AutoCad: www.usa.autodesk.com/adsk • ISTE: www.iste.org/standards.aspx • ITEA: www.itea.org
REGISTRATION INFORMATION	
Course Description: (Brief paragraph - as will be shown in the student course catalog)	<p><i>Exploring STEM 1</i> provides students with a broad understanding of STEM and associated careers. The course introduces students to various aspects of science, technology, engineering, and math through designing and problem solving activities. Instructors choose from approved topics depending on student interest and school resources. The course will vary from 9 to 18 weeks. A 9-week course will be introductory. An 18-week course will explore content in greater depth. This gateway course is intended to provide students with a broad understanding of career technology and will feed into and support CTE offerings at the secondary level.</p>
Instructional Topic Headings: (Separate each heading with a semi-colon.)	<p>Careers in STEM; Collaboration and Teamwork; Fundamentals of the Design Process; Manual and CAD drawing, Problem---Solving; Safe use of tools in material processing (i.e., hand drill, reciprocating saws, buffer, drill press, disk sander, scroll saw, random orbit, finish sander, belt</p>

	sander); Modeling; Robotics; Digital Photo and Video; Truss and Architectural Designs; Digital Copying and Fabrication; Troubleshooting Process; Technology and the Environment; Mechanical Advantage; Electronics; Woods.
POSTSECONDARY CREDENTIAL	
Recognized Postsecondary Credential (RPC): <i>(Replaces Technical Skills Assessment (TSA) - not all TSAs will qualify as an RPC, and RPC is not required for all courses)</i>	None
STANDARDS	
This course addresses (enter yes/no):	
Alaska English Language Arts and Math Standards:	No
Alaska Cultural Standards:	Yes
All Aspects of Industry (AAI):	Yes
Core Technical Standards:	Yes
Employability Standards:	No
EMPLOYABILITY STANDARDS	
Employability Standards source:	Alaska
DUAL CREDIT AGREEMENT	
CTSO participation is included:	No
Current Dual Credit Agreement: <i>(Agreements should be reviewed and updated annually)</i>	<input type="checkbox"/> <i>(If checked, complete the Dual Credit section below.)</i>
Date of Current Agreement:	n/a
Postsecondary Institution Name:	n/a
Postsecondary Course Name:	n/a
Postsecondary Course Number:	n/a
Postsecondary Course Credits:	n/a
AUTHOR	
Course Developed By:	Nicholas Baker
Course Adapted From:	Previous FNSBSD Curriculum
Date of Previous Course Revision:	May 13, 2014
COURSE DELIVERY MODEL	
Is this course brokered through another institution or agency? <i>(yes/no)</i>	No

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will explore career opportunities in STEM fields.		ST.5				E4			Class Assignments ; Projects
Students will undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.		ST.4				E4		Technology	Class Assignments ; Projects
Students will develop an understanding of the various types of technologies, for example: Medical Technologies, Agricultural Technologies, Biotechnologies, Energy and Power Technologies, Information & Communication Technologies, Transportation Technologies, Manufacturing Technologies, Construction Technologies, etc.		ST.4				E4		Technology	Class Assignments ; Projects
Students will recognize safety as a value while developing safe work habits.		ST.3				B2		Health/ Safety	Performance Assessment
Students will demonstrate the safe use of small hand and power tools while processing materials.		ST.3; ST-ET.3				B2		Tech/ Prod, Health/ Safety	Performance Assessment
Apply and Extend previous understanding of operations with fractions to add, subtract, multiply, and divide rational numbers.									

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will use tools, materials, and machines to safely diagnose, adjust, and repair systems or problems.		ST-ET.3				B2		Tech/ Prod	Class Assignment s; Performanc e Assessment
Students will use measuring, sketching and other manual and computer drawing techniques while solving problems.		ST.ET.1, 3						Tech/ Prod	Class Assignment s; Performanc e Assessment
Students will use both 2D & 3D CAD software and hardware. For example: Autocad, Inkscape, Fusion360, Tinkercad, Onshape, Cricut Machines, 3D printers, Laser Engraver, Plotting machines, etc.		ST.ET.1, 3						Technology, Tech/ Prod	Class Assignment s; Performanc e Assessment
Develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants.		ST.ET.1, 3, 6				D5		Technology, Tech/ Prod	Class Assignment s; Performanc e Assessment
Students will understand and apply the technology & engineering design process, including troubleshooting, research, development, invention, innovation, and experimentation.		ST.ET.1, 3, 6				D5		Technology, Tech/ Prod	Class Assignment s; Performanc e Assessment

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Differentiate between inputs, processes, outputs and feedback in technological systems.									
Students will use problem-solving, teamwork, and management skills to complete a problem or task successfully. Students will present solutions and information both inside and outside of classrooms.		ST.ET.1, 3, 4-6				C4, D5		Technology, Tech/ Prod, Work Habits	Class Assignments; Performance Assessment

INSTRUCTIONAL RESOURCES	
List the major instructional resources used for this course:	
Websites:	
Textbooks:	
Essential Equipment:	
Reference Materials:	
Supplies:	

Exploring STEM 2

COURSE INFORMATION	
Course Name:	Exploring STEM 2
Course Number:	Quarter: CTE831 semester: CTE83
Grade(s):	8
Length (# of semesters):	One quarter or one semester
Credit:	0.25 or 0.5
Foundational Course:	<input type="checkbox"/> This is a foundational CTE course (foundational courses are not technical)
Prerequisites:	None
Sequence or CTEPS:	Multiple high school sequences
Date of District Course Revision:	Spring 2024
CAREER & TECHNICAL STUDENT ORGANIZATION (CTSO)	
CTSO Embedded in this Sequence:	Skills USA (high school level)
TECHNICAL/OCCUPATIONAL STANDARDS	
Source(s) of Technical Standards:	<ul style="list-style-type: none"> • Occupational Safety & Health Administration (OSHA) • National Center for Construction Education & Research • CAD Software • International Society for Technology in Education (ISTE) • International Test & Evaluation Association (ITEA)
Names/Numbers of Technical Standards:	<ul style="list-style-type: none"> • OSHA: www.osha.gov/dte/outreach/maritime/index.html • NCCER: www.nccer.org/findCenter.asp • AutoCad: www.usa.autodesk.com/adsk • ISTE: www.iste.org/standards.aspx • ITEA: www.itea.org
REGISTRATION INFORMATION	
Course Description: (Brief paragraph - as will be shown in the student course catalog)	<i>Exploring STEM 2</i> builds on student understanding of STEM and associated careers. Students develop understanding of science, technology, engineering, and math through designing and problems solving activities. Instructors choose from approved topics depending on student interest and school resources. Course will vary from 9 to 18 weeks. A 9-week course will be introductory. An 18- week course will explore content in greater depth. This gateway course is intended to provide students with a broad understanding of career technology and will feed into and support CTE offerings at the secondary level.
Instructional Topic Headings: (Separate each heading with a semi-colon.)	Careers in STEM; Collaboration and Teamwork; Fundamentals of the Design Process; Manual and CAD Drawing, Problem---Solving; Safe Use of Tools in Material Processing (e.g., Hand Drill, Reciprocating Saws, Buffer, Drill Press, Disk Sander, Scroll Saw, Random Orbit, Finish

	Sander, Belt Sander); Modeling; Robotics; Digital Photo and Video; Truss and Architectural Designs; Digital Copying and Fabrication; Troubleshooting Process; Technology and The Environment; Mechanical Advantage; Electronics; Woods.
POSTSECONDARY CREDENTIAL	
Recognized Postsecondary Credential (RPC): <i>(Replaces Technical Skills Assessment (TSA) - not all TSAs will qualify as an RPC, and RPC is not required for all courses)</i>	None
STANDARDS	
This course addresses (enter yes/no):	
Alaska English Language Arts and Math Standards:	No
Alaska Cultural Standards:	Yes
All Aspects of Industry (AAI):	Yes
Core Technical Standards:	Yes
Employability Standards:	Yes
EMPLOYABILITY STANDARDS	
Employability Standards source:	Alaska
DUAL CREDIT AGREEMENT	
CTSO participation is included:	No
Current Dual Credit Agreement: <i>(Agreements should be reviewed and updated annually)</i>	<input type="checkbox"/> <i>(If checked, complete the Dual Credit section below.)</i>
Date of Current Agreement:	n/a
Postsecondary Institution Name:	n/a
Postsecondary Course Name:	n/a
Postsecondary Course Number:	n/a
Postsecondary Course Credits:	n/a
AUTHOR	
Course Developed By:	Nicholas Baker
Course Adapted From:	Previous FNSBSD Curriculum
Date of Previous Course Revision:	May 13, 2014
COURSE DELIVERY MODEL	
Is this course brokered through another institution or agency? <i>(yes/no)</i>	No

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will explore career opportunities in STEM fields.		ST.5				E4			Class Assignments; Projects
Students will develop an understanding of the various types of technologies, for example: Medical Technologies, Agricultural Technologies, Biotechnologies, Energy and Power Technologies, Information & Communication Technologies, Transportation Technologies, Manufacturing Technologies, Construction Technologies, etc.		ST.4				E4		Technology	Class Assignments; Projects
Students will describe the relationship between technology and the environment.		ST.4				E4	5, 11	Technology; Community	Class Assignments; Projects
Students will analyze how different technological systems often interact with economic, environment, cultural, and social systems. (.e.g. recycling, energy, climate change, waste, discharge).		ST.4				E4	5, 11	Technology; Community	Class Assignments; Projects
Students will solve real world problems that connect various STEM technologies to careers.		ST.ET.1, 3, 6				B2, B4	5-6, 8, 11	Technology; Tech/Prod	Class Assignments; Performance Assessment

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.								Technology; Tech/ Prod; Work Habits	Class Assignments; Performance Assessment
Students will apply technology and engineering design process, including troubleshooting, research, development, invention, innovation, and experimentation.		ST.ET.1, 3, 6				D5		Technology; Tech/Prod	Class Assignments; Performance Assessment
Students develop, test, and refine prototype designs as part of a cyclical design process.								Technology; Tech/Prod	Class Assignments; Performance Assessment
Students will recognize safety as a value while developing safe work habits.		ST.3				B2		Health/ Safety	Performance Assessment
Students will demonstrate the safe use of small hand and power tools while processing materials.		ST.3; ST-ET.3				B2		Tech/ Prod; Health Safety	Performance Assessment
Students will choose and use correct tools and materials (e.g., software, simulators, manipulatives, construction tools) to solve specific problems.		ST-ET.3				B2		Tech/ Prod	Class Assignments; Performance Assessment

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will use measuring, sketching and other manual and computer drawing techniques while solving problems.		ST.ET.1, 3						Tech/ Prod	Class Assignments; Performance Assessment
Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories, and pursuing answers and solutions.		ST.ET.1, 3, 6				D5	2, 4-5, 7-8, 12	Technology; Tech/ Prod	Class Assignments; Performance Assessment
Students will understand basic electrical theory.		ST.ET.1, 3, 6				D5	2, 4-5, 7-8, 12	Technology; Tech/ Prod	Class Assignments; Performance Assessment
Students will modify an existing artifact to improve or customize it using CAD software and hardware.								Technology; Tech/ Prod	Class Assignments; Performance Assessment
Students will design projects that combine hardware and software components to collect and exchange data.								Technology; Tech/ Prod; Work Habits	Class Assignments; Performance Assessment
Students will optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and retesting.								Technology; Tech/ Prod; Work Habits	Class Assignments; Performance Assessment
Students will modify an existing artifact to improve or customize it using CAD software and hardware.		ST.ET.1, 3, 5-6				C4, D5		Technology; Tech/ Prod; Work Habits	Class Assignments; Performance Assessment

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.		ST.ET.1, 3, 5-6				C4, D5		Technology; Tech/ Prod; Work Habits	Class Assignments; Performance Assessment
Students will communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations.									Class Assignments; Performance Assessment

INSTRUCTIONAL RESOURCES	
List the major instructional resources used for this course:	
Websites:	
Textbooks:	
Essential Equipment:	
Reference Materials:	
Supplies:	

High School STEM Courses



Grades 9-12

Aerospace Engineering

COURSE INFORMATION	
Course Name:	Aerospace Engineering
Course Number:	TBD
Grade(s):	10-12
Length (# of semesters):	Two semesters
Credit:	1 (First semester: 0.5 CTE elective credit second semester: 0.5 Science elective credit.)
Foundational Course:	<input type="checkbox"/> This is a foundational CTE course (foundational courses are not technical)
Prerequisites:	Completion of two other STEM courses.
Sequence or CTEPS:	
Date of District Course Revision:	Spring 2024
CAREER & TECHNICAL STUDENT ORGANIZATION (CTSO)	
CTSO Embedded in this Sequence:	
TECHNICAL/OCCUPATIONAL STANDARDS	
Source(s) of Technical Standards:	Project Lead the Way (PLTW)
Names/Numbers of Technical Standards:	PLTW
REGISTRATION INFORMATION	
Course Description: (Brief paragraph - as will be shown in the student course catalog)	Students will explore the fundamentals of flight in air and space as they bring concepts to life by designing and testing components related to flight, such as an airfoil, propulsion system, and rockets. They learn orbital mechanic concepts and apply these by creating models using industry-standard software. They also apply aerospace concepts to alternative applications such as wind turbines and parachutes. 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.
Instructional Topic Headings: (Separate each heading with a semi-colon.)	Evolution and physics of flights; flight planning and navigation; materials and structures, propulsion; space travel; orbital mechanics; remote sensing and remote systems; aerospace engineering careers
POSTSECONDARY CREDENTIAL	
Recognized Postsecondary Credential (RPC): <i>(Replaces Technical Skills Assessment (TSA) - not all TSAs will qualify as an RPC, and RPC is not required for all courses)</i>	PLTW

STANDARDS	
This course addresses (enter yes/no):	
Alaska English Language Arts and Math Standards:	Yes
Alaska Cultural Standards:	Yes
All Aspects of Industry (AAI):	Yes
Core Technical Standards:	Yes
Employability Standards:	Yes
EMPLOYABILITY STANDARDS	
Employability Standards source:	Alaska
DUAL CREDIT AGREEMENT	
CTSO participation is included:	No
Current Dual Credit Agreement: (Agreements should be reviewed and updated annually)	<input type="checkbox"/> (If checked, complete the Dual Credit section below.)
Date of Current Agreement:	n/a
Postsecondary Institution Name:	n/a
Postsecondary Course Name:	n/a
Postsecondary Course Number:	n/a
Postsecondary Course Credits:	n/a
AUTHOR	
Course Developed By:	Chris Benshoof
Course Adapted From:	PLTW and FNSBSD pilot course
Date of Previous Course Revision:	FNSBSD pilot course approved in 2017
COURSE DELIVERY MODEL	
Is this course brokered through another institution or agency? (yes/no)	No

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will understand the history of the development of flight and opportunities in various aerospace and aeronautics engineering careers.	PLTW		RT.10			A1	A3, A5, B1, B2	Technology, Community	PLTW Assessment
Students will learn about the parts of an airplane, the function of control surfaces, and how airplanes are controlled while flying.	PLTW				HS-ETS1-3			Technology, Community	PLTW Assessment
Students will understand the basic physics behind flight.	PLTW			A-SS E: 2, 3	HS-PS2-1			Technology, Community	PLTW Assessment
Students will learn about how pilots navigate.	PLTW			N-VM 1, 3	HS-ETS1-4	A7	B1, B2	Technology, Community	PLTW Assessment
Students will learn about materials properties and applications in space travel.	PLTW				HS-PS2-1			Technology, Community	PLTW Assessment
Students will learn about human physiology and how the body changes when in a zero-gravity environment.	PLTW				HS-LS1-2			Technology, Community	PLTW Assessment
Students will learn about the distances and sizes associated with describing objects in space and space travel.	PLTW		RT.10	N-Q1, 2, 3	HS-ESS1-4			Technology, Community	PLTW Assessment
Students will learn about orbital mechanics as well as how simulation software can be used to plan orbits and space flight.	PLTW			A-REI: 10	HS-ESS1-4			Technology, Community	PLTW Assessment

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will learn about mechanical efficiency and mechanical advantage.	PLTW			A-CE D:1, 2	HS-PS3-1, 3			Technology, Community	PLTW Assessment
Students will learn about remote systems including remote sensing and surveying as well as satellites and map making.	PLTW				HS-ETS1-1, 2	B4		Technology, Community	PLTW Assessment

INSTRUCTIONAL RESOURCES	
List the major instructional resources used for this course:	
Websites:	
Textbooks:	
Essential Equipment:	
Reference Materials:	
Supplies:	

Advanced Placement Computer Science A

COURSE INFORMATION	
Course Name:	Advanced Placement (AP) Computer Science A
Course Number:	TBD
Grade(s):	9-12
Length (# of semesters):	Two semesters
Credit:	1 (both semesters: math elective credit)
Foundational Course:	<input type="checkbox"/> This is a foundational CTE course (foundational courses are not technical)
Prerequisites:	<i>Computer Programming, Algebra 2</i> , or teacher recommendation
Sequence or CTEPS:	STEM
Date of District Course Revision:	Spring 2024
CAREER & TECHNICAL STUDENT ORGANIZATION (CTSO)	
CTSO Embedded in this Sequence:	
TECHNICAL/OCCUPATIONAL STANDARDS	
Source(s) of Technical Standards:	
Names/Numbers of Technical Standards:	
REGISTRATION INFORMATION	
Course Description: (Brief paragraph - as will be shown in the student course catalog)	<p>This yearlong course is designed for learners capable of college level work, follows the description put forward by the College Board, and prepares them to take the Advanced Placement exam.</p> <p>AP Computer Science A introduces students to computer science through programming. Fundamental topics in this course include the design of solutions to problems, the use of data structures to organize large sets of data, the development and implementation of algorithms to process data and discover new information, the analysis of potential solutions, and the ethical and social implications of computing systems. The course emphasizes object-oriented programming and design using the Java programming language.</p> <p>AP Computer Science A is equivalent to a first-semester, college-level course in computer science.</p> <p>Please visit the College Board-AP Central website for more information (http://apcentral.collegeboard.com).</p>
Instructional Topic Headings: (Separate each heading with a semi-colon.)	Primitive Types; Using Objects; Boolean Expressions and if Statements; Iteration; Writing Classes; Array; ArrayList; 2D Array; Inheritance; Recursion

POSTSECONDARY CREDENTIAL	
Recognized Postsecondary Credential (RPC): <i>(Replaces Technical Skills Assessment (TSA) - not all TSAs will qualify as an RPC, and RPC is not required for all courses)</i>	
STANDARDS	
This course addresses (enter yes/no):	
Alaska English Language Arts and Math Standards:	Yes
Alaska Cultural Standards:	Yes
All Aspects of Industry (AAI):	Yes
Core Technical Standards:	Yes
Employability Standards:	Yes
EMPLOYABILITY STANDARDS	
Employability Standards source:	Alaska
DUAL CREDIT AGREEMENT	
CTSO participation is included:	No
Current Dual Credit Agreement: <i>(Agreements should be reviewed and updated annually)</i>	<input type="checkbox"/> <i>(If checked, complete the Dual Credit section below.)</i>
Date of Current Agreement:	n/a
Postsecondary Institution Name:	n/a
Postsecondary Course Name:	n/a
Postsecondary Course Number:	n/a
Postsecondary Course Credits:	n/a
AUTHOR	
Course Developed By:	
Course Adapted From:	FNSBSD Mathematics Curriculum
Date of Previous Course Revision:	June 7, 2022
COURSE DELIVERY MODEL	
Is this course brokered through another institution or agency? (yes/no)	No

Standards Alignment							
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Empl C Re Sta
This course follows the College Board Advanced Placement Curriculum. Please visit the College Board-AP Central website for more information (http://apcentral.collegeboard.com).							

INSTRUCTIONAL RESOURCES	
List the major instructional resources used for this course:	
Websites:	http://apcentral.collegeboard.com
Textbooks:	<i>Fundamentals of Java: AP Computer Science Essentials</i> , 4 th edition
Essential Equipment:	
Reference Materials:	
Supplies:	

Civil Engineering & Architecture

COURSE INFORMATION	
Course Name:	Civil Engineering & Architecture
Course Number:	Semester 1: CTEO309 semester 2:CTEO310
Grade(s):	10 – 12
Length (# of semesters):	Two semesters
Credit:	1 (First semester: 0.5 CTE elective credit semester two: 0.5 math elective credit.)
Foundational Course:	<input type="checkbox"/> This is a foundational CTE course (foundational courses are not technical)
Prerequisites:	<i>Introduction to Engineering and Design</i> or teacher recommendation
Sequence or CTEPS:	STEM, Engineering
Date of District Course Revision:	Spring 2024
CAREER & TECHNICAL STUDENT ORGANIZATION (CTSO)	
CTSO Embedded in this Sequence:	None
TECHNICAL/OCCUPATIONAL STANDARDS	
Source(s) of Technical Standards:	Project Lead the Way (PLTW)
Names/Numbers of Technical Standards:	PLTW C1:1
REGISTRATION INFORMATION	
Course Description: (Brief paragraph - as will be shown in the student course catalog)	Students apply what they learn about various aspects of civil engineering to the design and development of a property. Working in teams, students explore hands-on activities and projects to learn the characteristics of Civil Engineering and Architecture. In addition, students use 3D design software to help them design solutions to solve major course projects. Students learn about documenting their project, solving problems, and communicating their solutions to their peers and members of the professional community of Civil Engineering and Architecture.
Instructional Topic Headings: (Separate each heading with a semi-colon.)	Overview of Civil Engineering and Architecture; Introduction to Projects; Project Planning; Site Planning; Architecture; Structural Engineering; Presentations and Reviews
POSTSECONDARY CREDENTIAL	
Recognized Postsecondary Credential (RPC): (Replaces Technical Skills Assessment (TSA) - not all TSAs will qualify as an RPC, and RPC is not required for all courses)	PLTW

STANDARDS	
This course addresses (enter yes/no):	
Alaska English Language Arts and Math Standards:	Yes
Alaska Cultural Standards:	Yes
All Aspects of Industry (AAI):	Yes
Core Technical Standards:	Yes
Employability Standards:	Yes
EMPLOYABILITY STANDARDS	
Employability Standards source:	Alaska
DUAL CREDIT AGREEMENT	
CTSO participation is included:	No
Current Dual Credit Agreement: (Agreements should be reviewed and updated annually)	<input type="checkbox"/> (If checked, complete the Dual Credit section below.)
Date of Current Agreement:	n/a
Postsecondary Institution Name:	n/a
Postsecondary Course Name:	n/a
Postsecondary Course Number:	n/a
Postsecondary Course Credits:	n/a
AUTHOR	
Course Developed By:	Chris Benshoof
Course Adapted From:	PLTW & FNSBSD Career & Technical Education Curriculum
Date of Previous Course Revision:	May 7, 2013
COURSE DELIVERY MODEL	
Is this course brokered through another institution or agency? (yes/no)	No

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will be able to compare and contrast civil engineering and architecture.	PLTW	ST.3, 5				B3, E4	A2, 5, B2, 4	Technology, Community	PLTW Assessments
Students will communicate ideas for designing a development project using various drawing methods, sketches, graphics or other media collected and documented.	PLTW	ST.2, ST-ET.1-2	RL.4b, 6			B3, E2	A1-2	Technology, Community	PLTW Assessments
Students will communicate understandings of the relationship of structures and land and the responsibility of designers to handle resources in an ethical manner.	PLTW	ST.2, ST-ET.1-2	RT.7-9			A6, B3, E2	A1-2	Technology, Community	PLTW Assessments
Students will mathematically compute utility needs of a project and size the utility supply lines correctly.	PLTW	ST-SM.1-4					A1-2	Technology, Community	PLTW Assessments
Students will analyze and determine the selection and placement of plantings to ensure the proper use of resources and determine if landscaping adds aesthetic appeal.	PLTW	ST-SM.1-4				E2	A1-2	Technology, Community	PLTW Assessments

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will research and design an appropriate energy system for the team's project.	PLTW	ST-ET.1-6	WT.8-9			B3-4	A1-2	Technology, Community	PLTW Assessments
Students will calculate and determine the heat loss or gain of the energy systems used in their team project.	PLTW	ST-SM.1-4		F-TF		B4	A1-2	Technology, Community	PLTW Assessments
Students will identify and create the necessary schedules for their team's project.	PLTW	ST-ET.1-6	RT.7-9, WT.8-9				A1-2	Technology, Community	PLTW Assessments
Students will determine the live and dead loads of a structure using load tables and appropriate mathematics.	PLTW	ST-ET.1-6		A-REI			A1-2	Technology, Community	PLTW Assessments
Students will size floor members according to loads and modify section details to show the sizing of supporting materials for their team's project.	PLTW	ST-ET.1-6, ST-SM.1-4		A-REI				Technology, Community	PLTW Assessments

INSTRUCTIONAL RESOURCES	
List the major instructional resources used for this course:	
Websites:	
Textbooks:	
Essential Equipment:	
Reference Materials:	
Supplies:	

Computer Programming

COURSE INFORMATION	
Course Name:	Computer Programming
Course Number:	TBD
Grade(s):	9-12
Length (# of semesters):	Two semesters
Credit:	1 (both semesters: math elective credit)
Foundational Course:	<input type="checkbox"/> This is a foundational CTE course (foundational courses are not technical)
Prerequisites:	<i>Algebra I</i> , concurrent enrollment in <i>Algebra I</i> , or teacher recommendation
Sequence or CTEPS:	STEM
Date of District Course Revision:	Spring 2024
CAREER & TECHNICAL STUDENT ORGANIZATION (CTSO)	
CTSO Embedded in this Sequence:	
TECHNICAL/OCCUPATIONAL STANDARDS	
Source(s) of Technical Standards:	
Names/Numbers of Technical Standards:	
REGISTRATION INFORMATION	
Course Description: (Brief paragraph - as will be shown in the student course catalog)	Computer Programming is a course designed to introduce basic programming concepts. Students will master concepts including integer arithmetic, basic sorts and searches, and use of data structures. Concepts of object-oriented programming and algorithm design within the syntax of a higher-level language will be introduced.
Instructional Topic Headings: (Separate each heading with a semi-colon.)	Overview of computing; data and expressions; using classes and objects; conditionals and loops; writing classes; building on conditional and loops; object oriented design; arrays
POSTSECONDARY CREDENTIAL	
Recognized Postsecondary Credential (RPC): <i>(Replaces Technical Skills Assessment (TSA) - not all TSAs will qualify as an RPC, and RPC is not required for all courses)</i>	

STANDARDS	
This course addresses (enter yes/no):	
Alaska English Language Arts and Math Standards:	Yes
Alaska Cultural Standards:	Yes
All Aspects of Industry (AAI):	Yes
Core Technical Standards:	Yes
Employability Standards:	Yes
EMPLOYABILITY STANDARDS	
Employability Standards source:	Alaska
DUAL CREDIT AGREEMENT	
CTSO participation is included:	No
Current Dual Credit Agreement: (Agreements should be reviewed and updated annually)	<input type="checkbox"/> (If checked, complete the Dual Credit section below.)
Date of Current Agreement:	n/a
Postsecondary Institution Name:	n/a
Postsecondary Course Name:	n/a
Postsecondary Course Number:	n/a
Postsecondary Course Credits:	n/a
AUTHOR	
Course Developed By:	
Course Adapted From:	FNSBSD Mathematics Curriculum
Date of Previous Course Revision:	June 7, 2022
COURSE DELIVERY MODEL	
Is this course brokered through another institution or agency? (yes/no)	No

Standards Alignment							
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Empl C Re Sta
Students will learn about and understand the following topics: <ul style="list-style-type: none"> Computer Processing Hardware Components Programming Language Program Development 				All mathematical practices are present in each unit.			
Students will learn will about and understand the following topics: <ul style="list-style-type: none"> Character Strings Variables and assignment Primitive data types Expressions Data conversion Interactive programs 				All mathematical practices are present in each unit.			
Students will learn about and understand the following topics: <ul style="list-style-type: none"> Creating objects The String Class Packages Enumerated types Wrapper classes 				All mathematical practices are present in each unit.			
Students will learn about and understand the following topics: <ul style="list-style-type: none"> Boolean expressions The if statement Comparing data The while statement 				All mathematical practices are present in each unit.			
Students will learn about and understand the following topics: <ul style="list-style-type: none"> Classes & objects revisited Anatomy of a class Encapsulation Anatomy of a method Constructors 				All mathematical practices are present in each unit.			
Students will learn about and understand the following topics: <ul style="list-style-type: none"> The switch statement The Conditional Operator The do statement The for statement 				All mathematical practices are present in each unit.			

Standards Alignment							
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Empl C Re Sta
Students will learn about and understand the following topics: <ul style="list-style-type: none"> Identifying classes and objects Static class members Class relationships Interfaces Enumerated types revisited Method design Method overloading				All mathematical practices are present in each unit.			
Students will learn about and understand the following topics: <ul style="list-style-type: none"> Array elements Declaring & using arrays Arrays of objects Command-line arguments Two-dimensional arrays				All mathematical practices are present in each unit.			

INSTRUCTIONAL RESOURCES	
List the major instructional resources used for this course:	
Websites:	
Textbooks:	<i>Introduction to Computer Science Using C++, 3rd edition, Knowl Technologies, 2001</i>
Essential Equipment:	
Reference Materials:	
Supplies:	

Digital Electronics

COURSE INFORMATION	
Course Name:	Digital Electronics
Course Number:	Semester 1: CTEO307 semester 2: CTEO308
Grade(s):	10-12
Length (# of semesters):	Two semesters
Credit:	1 (First semester: 0.5 Math elective credit second semester: 0.5 Science elective credit.)
Foundational Course:	<input type="checkbox"/> This is a foundational CTE course (foundational courses are not technical)
Prerequisites:	Completion of <i>Introduction to Engineering Design</i> or teacher recommendation; <i>Algebra 2</i> recommended (may be concurrently enrolled).
Sequence or CTEPS:	STEM, Engineering
Date of District Course Revision:	Spring 2024
CAREER & TECHNICAL STUDENT ORGANIZATION (CTSO)	
CTSO Embedded in this Sequence:	n/a
TECHNICAL/OCCUPATIONAL STANDARDS	
Source(s) of Technical Standards:	Project Lead the Way (PLTW)
Names/Numbers of Technical Standards:	PLTW, C1:1
REGISTRATION INFORMATION	
Course Description: (Brief paragraph - as will be shown in the student course catalog)	<i>Digital Electronics</i> is the study of electronic circuits that are used to process and control digital signals. <i>Digital Electronics</i> is the foundation of all modern electronic devices. The major focus of the course is to expose students to the design process of combinational and sequential logic design, teamwork, communication methods, engineering standards and technical documentation. Utilizing the activity-project-problem-based (APPB) teaching and learning pedagogy, students will analyze, design and build digital electronic circuits. While implementing those designs, students will continually hone their interpersonal skills, creative abilities and understanding of the design process.
Instructional Topic Headings: (Separate each heading with a semi-colon.)	Fundamentals of Analog and Digital Electronics, Combinational Logic, Sequential Logic, Microcontrollers
POSTSECONDARY CREDENTIAL	
Recognized Postsecondary Credential (RPC): (Replaces <i>Technical Skills Assessment (TSA)</i> - not all TSAs will qualify as an RPC, and RPC is not required for all courses)	PLTW Assessments

STANDARDS	
This course addresses (enter yes/no):	
Alaska English Language Arts and Math Standards:	Yes
Alaska Cultural Standards:	Yes
All Aspects of Industry (AAI):	Yes
Core Technical Standards:	Yes
Employability Standards:	Yes
EMPLOYABILITY STANDARDS	
Employability Standards source:	Alaska
DUAL CREDIT AGREEMENT	
CTSO participation is included:	No
Current Dual Credit Agreement: (Agreements should be reviewed and updated annually)	<input type="checkbox"/> (If checked, complete the Dual Credit section below.)
Date of Current Agreement:	n/a
Postsecondary Institution Name:	n/a
Postsecondary Course Name:	n/a
Postsecondary Course Number:	n/a
Postsecondary Course Credits:	n/a
AUTHOR	
Course Developed By:	Chris Benshoof and Andrew Slagle
Course Adapted From:	PLTW and FNSBSD Career and Technical Education Curriculum
Date of Previous Course Revision:	May 7, 2013
COURSE DELIVERY MODEL	
Is this course brokered through another institution or agency? (yes/no)	No

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will understand that the process of designing an electronic circuit takes into account many factors, including environment concerns and will be familiar with precautionary measures.	PLTW	ST.3, ST-SM.1			HS-PS4-2, HS-ETS1-1		A1-3	Finance, Technology, Community	PLTW Assessments
Students will understand numerical place value.	PLTW	ST-SM.1		N-RN.1			A2	Technology, Community	PLTW Assessments
Students will use schematics and symbolic algebra to represent digital gates in the creation of solutions to design problems.	PLTW	ST-SM.1-2, ST-ET.1, 3		A-CED.2-4, A-REI.5-9	HS-STS1-2		A1-2	Technology, Community	PLTW Assessments
Students will be able to create Boolean Expressions, logic circuit diagrams or truth tables from information provided in the solution of design problems.	PLTW	ST-SM.1-2, ST-ET.1, 3		MP.3, S-CP.1, 4	HS-ETS1-2		A2	Technology, Community	PLTW Assessments
Students will be able to design and implement combinational logic circuits using reprogrammable logic devices.	PLTW	ST-SM.1-2, ST-ET.1, 3		S-CP.4			A1-2	Technology, Community	PLTW Assessments
Students will demonstrate understanding of binary addition and subtraction by designing circuits to produce correct answers.	PLTW	ST-SM.1-2, ST-ET.1, 3					A1-2	Technology, Community	PLTW Assessments

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will be able to interpret waveform diagrams from circuits they construct and compare them with combinational waveforms.	PLTW	ST-SM.1-2, ST-ET.1, 3		F-TF.5	HS-PS4-1		A1-2	Technology, Community	PLTW Assessments
Students will conduct experiments to determine the basic principles of how shift registers work.	PLTW	ST-SM.1-2, ST-ET.1, 3					A1-2	Technology, Community	PLTW Assessments
Students will be able to correctly setup and use an oscilloscope to observe and measure propagation delay in a digital circuit.	PLTW	ST-SM.1-2			HS-PS4-1			Technology, Community	PLTW Assessments
Students will be able to design and create a program in correct syntax allowing a microprocessor to evaluate external data in order to operate motors and other devices to control the external environment.	PLTW	ST-SM.1-2			HS-ETS1-4			Technology, Community	PLTW Assessments

INSTRUCTIONAL RESOURCES	
List the major instructional resources used for this course:	
Websites:	
Textbooks:	
Essential Equipment:	
Reference Materials:	
Supplies:	

Engineering Design & Development

COURSE INFORMATION	
Course Name:	Engineering Design & Development
Course Number:	Semester 1: CTEO311 semester 2: CTEO312
Grade(s):	12
Length (# of semesters):	Two semesters
Credit:	1 (First semester: 0.5 CTE credit second semester: 0.5 Science elective credit)
Foundational Course:	<input type="checkbox"/> This is a foundational CTE course (foundational courses are not technical)
Prerequisites:	Completion of three other STEM courses or teacher recommendation
Sequence or CTEPS:	STEM, pre-engineering
Date of District Course Revision:	Spring 2024
CAREER & TECHNICAL STUDENT ORGANIZATION (CTSO)	
CTSO Embedded in this Sequence:	n/a
TECHNICAL/OCCUPATIONAL STANDARDS	
Source(s) of Technical Standards:	Project Lead the Way (PLTW)
Names/Numbers of Technical Standards:	PLTW
REGISTRATION INFORMATION	
Course Description: (Brief paragraph - as will be shown in the student course catalog)	<p><i>Engineering Design and Development</i> (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.</p> <p>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, as well as their creative and problem solving abilities and their understanding of the design process.</p> <p><i>Engineering Design and Development</i> is a high school level course that is appropriate for 12th grade students. Since the projects on which students work can vary with student interest and the curriculum focuses on problem solving, EDD is appropriate for students who are interested in any technical career path.</p>

Instructional Topic Headings: (Separate each heading with a semi-colon.)	
POSTSECONDARY CREDENTIAL	
Recognized Postsecondary Credential (RPC): <i>(Replaces Technical Skills Assessment (TSA) - not all TSAs will qualify as an RPC, and RPC is not required for all courses)</i>	Yes
STANDARDS	
This course addresses (enter yes/no):	
Alaska English Language Arts and Math Standards:	Yes
Alaska Cultural Standards:	Yes
All Aspects of Industry (AAI):	Yes
Core Technical Standards:	Yes
Employability Standards:	Yes
EMPLOYABILITY STANDARDS	
Employability Standards source:	Alaska
DUAL CREDIT AGREEMENT	
CTSO participation is included:	No
Current Dual Credit Agreement: <i>(Agreements should be reviewed and updated annually)</i>	<input type="checkbox"/> <i>(If checked, complete the Dual Credit section below.)</i>
Date of Current Agreement:	n/a
Postsecondary Institution Name:	n/a
Postsecondary Course Name:	n/a
Postsecondary Course Number:	n/a
Postsecondary Course Credits:	n/a
AUTHOR	
Course Developed By:	Andrew Slagle
Course Adapted From:	PLTW & FNSBSD Career and Technical Education Curriculum
Date of Previous Course Revision:	May 13, 2014
COURSE DELIVERY MODEL	
Is this course brokered through another institution or agency? (yes/no)	No

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will justify why some discoveries are inventions and others are innovations.	PLTW	ST-SM.3-4	AS.SL.1				2, 4, 8	Tech/ Prod	PLTW Assessments
Students will conduct patent searches and judge which patents are most relevant to a given topic.	PLTW	ST-SM.3-4	AS.R.10				6	Tech/ Prod	PLTW Assessments
Students will detail ecological and sustainable design attributes of a specific product.	PLTW	ST-ET.1, 4			HS-PS3-3	A1, B3		Tech/ Prod	PLTW Assessments
Students will summarize research findings in visual and verbal form.	PLTW	ST-ET.1-2	AS.SL.1				2, 4	Tech/ Prod	PLTW Assessments
Students will create a solution to a problem using a design process.	PLTW	ST-ET.1, 4-5	AS.W.1	N.Q.1	HS-PS3-2			Business Plan	PLTW Assessments
Students will design and implement a prototype testing procedure and interpret test results.	PLTW	ST-ET.1, 4-5			HS-PS2-3		6	Business Plan	PLTW Assessments
Students will develop and use a decision matrix to choose a problem statement.	PLTW	ST-SM.1-2					8	Tech/ Prod	PLTW Assessments
Students will identify math and science concepts that will be or could be utilized in the process of solving an identified problem.	PLTW	ST-SM.1-2		N.Q.1	HS-PS2-3, HS-PS2-5			Tech/ Prod	PLTW Assessments

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will identify and describe specific criteria and constraints to the design of a product.	PLTW	ST-SM.1-2, ST-ET.1, 4-5	AL.SL.1	N.Q.2			2, 4	Tech/ Prod	PLTW Assessments
Students will assess their product design based on a variety of design factors and implement design changes to improve their product.	PLTW	ST-SM.1-2, ST-ET.1, 4-5			HS-PS3-3			Tech/ Prod	PLTW Assessments
Students will communicate professionally with experts and mentors to obtain feedback on the technical feasibility of their product design, document the interactions, and implement recommended changes to their product design.	PLTW	ST-ET.2	AS.SL.4			A1, B3	2, 4		PLTW Assessments
Students will create a document to present their proposed design and provide justification for further development of a product.	PLTW	ST-ET.2	AS.W.1, AS.SL.4				2, 4	Business Plan	PLTW Assessments

INSTRUCTIONAL RESOURCES	
List the major instructional resources used for this course:	
Websites:	
Textbooks:	
Essential Equipment:	
Reference Materials:	
Supplies:	

Introduction to Engineering Design

COURSE INFORMATION	
Course Name:	Introduction to Engineering Design
Course Number:	Semester 1: CTEO303 semester 2: CTEO304
Grade(s):	12
Length (# of semesters):	Two semesters
Credit:	1 (First semester: 0.5 CTE credit second semester: 0.5 math elective credit)
Foundational Course:	<input type="checkbox"/> This is a foundational CTE course (foundational courses are not technical)
Prerequisites:	None
Sequence or CTEPS:	
Date of District Course Revision:	Spring 2024
CAREER & TECHNICAL STUDENT ORGANIZATION (CTSO)	
CTSO Embedded in this Sequence:	n/a
TECHNICAL/OCCUPATIONAL STANDARDS	
Source(s) of Technical Standards:	Project Lead the Way (PLTW)
Names/Numbers of Technical Standards:	PLTW
REGISTRATION INFORMATION	
Course Description: (Brief paragraph - as will be shown in the student course catalog)	<p><i>Introduction to Engineering Design (IED)</i> is a high school engineering course in the PLTW Engineering Program. In IED, students explore engineering tools and apply a common approach to the solution of engineering problems, an engineering design process. Utilizing the activity-project-problem-based (APB) teaching and learning pedagogy, students progress from completing structured activities to solving open-ended projects and problems that require them to plan, document, communicate, and develop other professional skills.</p> <p>Through both individual and collaborative team activities, projects, and problems, students apply systems thinking and consider various aspects of engineering design including material selection, human-centered design, manufacturability, assemblability and sustainability. Students develop skills in technical representation and documentation, especially through 3D computer modeling using a Computer Aided Design (CAD) application. As part of the design process, students produce precise 3D-printed engineering prototypes using an additive manufacturing process. Student-developed testing protocols drive decision-making and iterative design improvements. To inform design and problem solutions addressed in IED, students apply computational methods by developing</p>

	algorithms, performing statistical analyses, and developing mathematical models. Students build competency in professional engineering practices, including project management, peer review, and environmental impact analysis as part of a collaborative design team. Ethical issues related to professional practice and product development are also presented.
Instructional Topic Headings: (Separate each heading with a semi-colon.)	Design Process, Design Exercises, Reverse Engineering, Open-Ended Design Problems
POSTSECONDARY CREDENTIAL	
Recognized Postsecondary Credential (RPC): <i>(Replaces Technical Skills Assessment (TSA) - not all TSAs will qualify as an RPC, and RPC is not required for all courses)</i>	PLTW Assessments
STANDARDS	
This course addresses (enter yes/no):	
Alaska English Language Arts and Math Standards:	Yes
Alaska Cultural Standards:	Yes
All Aspects of Industry (AAI):	Yes
Core Technical Standards:	Yes
Employability Standards:	Yes
EMPLOYABILITY STANDARDS	
Employability Standards source:	Alaska
DUAL CREDIT AGREEMENT	
CTSO participation is included:	No
Current Dual Credit Agreement: <i>(Agreements should be reviewed and updated annually)</i>	<input type="checkbox"/> <i>(If checked, complete the Dual Credit section below.)</i>
Date of Current Agreement:	n/a
Postsecondary Institution Name:	n/a
Postsecondary Course Name:	n/a
Postsecondary Course Number:	n/a
Postsecondary Course Credits:	n/a
AUTHOR	
Course Developed By:	Chris Benshoof and Andrew Slagle
Course Adapted From:	PLTW and FNSBSD Career and Technical Education Curriculum
Date of Previous Course Revision:	May 7, 2013
COURSE DELIVERY MODEL	
Is this course brokered through another institution or agency?(yes/no)	No

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will explore the concepts of form and function and explain its use in product design.	PLTW	ST-ET.1-2				E3	A1-2	Technology , Community	PLTW Assessments
Students will apply the steps of the design process to solve a variety of design problems.	PLTW	ST-ET.1, 4		Modeling		E6	A1-2	Technology , Community	PLTW Assessments
Students will develop a portfolio to organize and display evidence of their work.	PLTW	ST.5, 6				A1	A3	Technology , Community	PLTW Assessments
Students will evaluate and select the necessary views to graphically communicate design solutions.	PLTW	ST-ET.1, 4		Modeling			A1-2	Technology , Community	PLTW Assessments
Students will identify major geometric shapes.	PLTW	ST-ET.1 4		G.MG.1-3, Modeling			A1-2	Technology , Community	PLTW Assessments
Students will draw a two-dimensional sketch using a CAD package.	PLTW	ST-ET.1, 4		G-CO.12-13, Modeling			A1-2	Technology , Community	PLTW Assessments
Students will explore and demonstrate assembly-modeling skills to solve a variety of design problems.	PLTW	ST-ET.1 4		G-MG.1-3, Modeling			A1-2	Technology , Community	PLTW Assessments
Students will translate a three-dimensional drawing or model into corresponding orthographic drawing views.	PLTW	ST-ET.1 4		G-CO.12-13, Modeling			A1-2	Technology , Community	PLTW Assessments

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will interpret data, which have been statically analyzed to ensure product quality.	PLTW			S-CP, S-MD			A1-2	Technology , Community	PLTW Assessments
Students will use laws of electricity to build functional circuits.	PLTW			A-CED.1, N-Q.1			A2	Technology , Community	PLTW Assessments
Students will write computer programs to control circuits they construct.	PLTW			F-IF.2			A2	Technology , Community	PLTW Assessments
Students will understand numerical place value.	PLTW			N-RN.1			A2	Technology , Community	PLTW Assessments

INSTRUCTIONAL RESOURCES	
List the major instructional resources used for this course:	
Websites:	
Textbooks:	
Essential Equipment:	
Reference Materials:	
Supplies:	

Principles of Engineering

COURSE INFORMATION	
Course Name:	Principles of Engineering
Course Number:	Semester 1: CTEO301 semester 2: CTEO302
Grade(s):	9-12
Length (# of semesters):	Two semesters
Credit:	1 (both semesters earn Science elective credit)
Foundational Course:	<input type="checkbox"/> This is a foundational CTE course (foundational courses are not technical)
Prerequisites:	<i>Geometry</i> or instructor approval
Sequence or CTEPS:	STEM, Engineering
Date of District Course Revision:	Spring 2024
CAREER & TECHNICAL STUDENT ORGANIZATION (CTSO)	
CTSO Embedded in this Sequence:	n/a
TECHNICAL/OCCUPATIONAL STANDARDS	
Source(s) of Technical Standards:	Project Lead the Way (PLTW)
Names/Numbers of Technical Standards:	PLTW
REGISTRATION INFORMATION	
Course Description: (Brief paragraph - as will be shown in the student course catalog)	<i>Principles of Engineering</i> (POE) is a high school-level, survey course of engineering with a focus on the physical science nature of engineering. The course exposes students to some of the major concepts that they will encounter in a postsecondary engineering course of study. Students have an opportunity to investigate different engineering and high-tech career options. POE gives students the opportunity to develop skills and understanding of course concepts through activities, projects, and problem-based learning. There are a variety of different team and individual projects that students work to complete by applying the engineering principles learned in this course.
Instructional Topic Headings: (Separate each heading with a semi-colon.)	Mechanisms, Energy Sources, Energy Applications, Machine Control, Fluid Power, Statics, Material Properties, Material Testing, Statistics, Kinematics
POSTSECONDARY CREDENTIAL	
Recognized Postsecondary Credential (RPC): (Replaces Technical Skills Assessment (TSA) - not all TSAs will qualify as an RPC, and RPC is not required for all courses)	PLTW Assessments

STANDARDS	
This course addresses (enter yes/no):	
Alaska English Language Arts and Math Standards:	Yes
Alaska Cultural Standards:	Yes
All Aspects of Industry (AAI):	Yes
Core Technical Standards:	Yes
Employability Standards:	Yes
EMPLOYABILITY STANDARDS	
Employability Standards source:	Alaska
DUAL CREDIT AGREEMENT	
CTSO participation is included:	No
Current Dual Credit Agreement: (Agreements should be reviewed and updated annually)	<input type="checkbox"/> (If checked, complete the Dual Credit section below.)
Date of Current Agreement:	n/a
Postsecondary Institution Name:	n/a
Postsecondary Course Name:	n/a
Postsecondary Course Number:	n/a
Postsecondary Course Credits:	n/a
AUTHOR	
Course Developed By:	Chris Benshoof
Course Adapted From:	PLTW & FNSBSD Career & Technical Education Curriculum
Date of Previous Course Revision:	May 7, 2013
COURSE DELIVERY MODEL	
Is this course brokered through another institution or agency? (yes/no)	No

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will differentiate between engineering and engineering technology while exploring careers and various engineering disciplines.	PLTW	ST.4-5			HS-ETS1-3	B3, E8	B2-5	Labor	PLTW Assessments
Students will understand, design and evaluate simple and compound machines, machine systems and machine designs.	PLTW	ST-ET.1-4	RT.3	S-CP, S-MD	HS-PS3-3		A1-2, 5, B1	Technology, Tech/ Prod	PLTW Assessments
Students will identify and categorize energy sources as nonrenewable, renewable or inexhaustible while researching specific energy sources.	PLTW	ST.3, ST-ET.6	RT.7-9		HS-STS1-1		A1-2, 5, B1	Technology, Tech/ Prod	PLTW Assessments
Students will demonstrate understanding of energy and power by testing and applying the relationship between voltage, current and resistance relating to a photovoltaic cell and a hydrogen fuel cell, as well as the relationship between R-values and recyclable insulation.	PLTW	ST-ET.5	RT.7-9	S-CP, S-MD	HS-PS3-3		A1-2, 5, B1	Technology, Tech/ Prod	PLTW Assessments
Students will apply the steps of the design process to solve a variety of design problems.	PLTW	ST-ET.1, 4		G-MG.1-3, Modeling	HS-ETS1-2		A1-2, 5 B1	Technology, Tech/ Prod	PLTW Assessments

Standards Alignment									
Student Performance Standards (Instructional Topic Headings)	Specific Occupational Skill Standards	Common Technical Core Standards	Alaska English/ Language Arts Standards	Alaska Math Standards	Alaska Science Standards	Alaska Cultural Standards	Employability/ Career Readiness Standards	All Aspects of Industry/ Systems	Assessment
Students will create free body diagrams of objects, identifying, testing and evaluating all forces acting on the object.	PLTW	ST-ET.1-5		Modeling	HS-PS3-2, HS-PS2-1		A1-2, 5, B1	Technology, Tech/ Prod	PLTW Assessments
Students will investigate specific material properties related to common household products and manufacturing processes associated with those products.	PLTW	ST-ET.1-5		F-TF	HS-PS1-3		A1-2, 5, B1	Technology, Tech/ Prod	PLTW Assessments
Students will utilize computer software to create and demonstrate flowchart logic.	PLTW	ST-TM.1, 4		A-REI	HS-ETS1-4		A1-2, 5, B1	Technology, Tech/ Prod	PLTW Assessments
Students will demonstrate understanding of concepts and functions related to fluid power.	PLTW	ST-TM.1, 4			HS-HS3-3		A1-2, 5, B1	Technology, Tech/ Prod	PLTW Assessments

INSTRUCTIONAL RESOURCES	
List the major instructional resources used for this course:	
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Reference Materials:	
Supplies:	



The Fairbanks North Star Borough School District is an equal employment and educational opportunity institution, as well as a tobacco and nicotine-free learning and work environment.

Fairbanks North Star Borough School District

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