



Spokane Public Schools Engineering Design and Development

Course: Engineering Design and Development		Total Framework Hours up to: 180
CIP Code: 149994	<input type="checkbox"/> Exploratory <input checked="" type="checkbox"/> Preparatory	Date Last Modified: November 12, 2015
Career Cluster: Science, Technology, Engineering and Mathematics		Cluster Pathway: STEM - Engineering

Resources and Standard used in Framework Development:

Standards for this framework are taken from the Project Lead the Way Engineering Design and Development curriculum as outlined in the OSPI Model Framework for this course

Unit 1 COMPONENT 0-PROJECT MANAGEMENT	Hours: 5
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Performance Assessment(s):

1. The work of engineers has an impact on our society.
2. An open ended design process involves identifying a justifiable problem and developing an original solution that attempts to solve it.
3. The engineering design process is typically non-linear. Designers may need to re-visit steps in the process or take next steps based on feedback from previous steps.
4. The engineering design process is both a guide and a series of waypoints for effective problem solving. It is a tool for self-evaluation as an engineer moves through the process.
5. There are principles and practices related academic research. Topic selection and design decisions should be research driven and driven data whenever possible.
6. There are principles, practices, and techniques related to technical writing.
7. There are principles and practices related to documenting an engineering design process that allow teams to work effectively, preserve the work allowing continuation at a later date, and protect the designer's intellectual property.
8. Project management is the discipline of planning, organizing, motivating, utilizing resources to achieve specific goals.
9. Relevant principles and practices of Science, Technology, Engineering, and Mathematics (STEM) should be used to inform and justify design choices. They should be evident and well documented in an engineering design process.
10. Individuals and other entities put extraordinary effort into protecting their intellectual property so they can control who has access to and use of their work. Intellectual property protections allow individuals or companies to maintain rights to profit from their ideas.
11. There are many stakeholders involved in an open ended engineering design process.
12. The ability to communicate as a professional is a critical skill for engineers.
13. Measurable design requirements are developed from a problem statement. Design requirements guide engineers through the design process and help determine if the solution is successful at solving the identified problem.
14. Multiple design possibilities should be explored in an engineering design process.
15. Testing is a critical component to any engineering design process. A plan and process for testing the proposed solution both qualitatively and quantitatively against design requirements should be created and carried out.
16. Engineering design projects are typically peer reviewed. Stakeholder feedback and design reviews help guide engineers through the design process.
17. Presentation of this design process and project findings are critical to the engineering design process.

Leadership Alignment:

Communicate, participate and advocate effectively in pairs and small groups, teams, and large groups in order to plan, manage and carry out a team project.
 Students are required to carry out an in-class team leadership roles.
 Students have the opportunity to participate in TSA.

Aligned to Washington State Standards

Arts

Communication - Speaking and Listening CC: Collegeand

Career Speaking and Listening Anchor Standards Comprehension and Collaboration

- 1 - Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and
- 2 - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- 3 - Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Presentation of Knowledge and Ideas

- 4 - Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task,
- 5 - Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.
- 6 - Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

Health and Fitness

Language CC: CollegeandCareerLanguageAnchor

Standards Conventions of Standard English

- 1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- 2 - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Knowledge of Language

- 3 - Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when

Vocabulary Acquisition and Use

- 4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and
- 5 - Demonstrate understanding of word relationships and nuances in word meanings.
- 6 - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and

Mathematics CC: Number

- 1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale
- 2 - Define appropriate quantities for the purpose of descriptive modeling.*
- 3 - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.*

CC: Algebra (A) Seeing Structure in Expressions (A-SSE)

- 1 - Interpret expressions that represent a quantity in terms of its context.*

1a - Interpret parts of an expression, such as terms, factors, and coefficients.*

CC: Statistics and Probability (S) Interpreting

Categorical and Quantitative Data (S-ID)

1 - Represent data with plots on the real number line (dot plots, histograms, and box plots).*

2 - Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different

3 - Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).*

4 - Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a

5 - Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional

6 - Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.*

6a - Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context.

6b - Informally assess the fit of a function by plotting and analyzing residuals.*

6c - Fit a linear function for a scatter plot that suggests a linear association.*

7 - Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.*

8 - Compute (using technology) and interpret the correlation coefficient of a linear fit.*

9 - Distinguish between correlation and causation.*

Making Inferences and Justifying Conclusions (S-IC)

1 - Understand statistics as a process for making inferences about population parameters based on a random sample from that population.*

2 - Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with

3 - Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.*

5 - Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.*

6 - Evaluate reports based on data.*

Reading CC: College and Career Reading Anchor

Standards Key Ideas and Details

1 - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions

2 - Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

4 - Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape

Range of Reading and Level of Text Complexity

10 - Read and comprehend complex literary and informational texts independently and proficiently.

Science

Social Studies

Writing

CC: College and Career Writing Anchor Standards

Text Types and Purposes

- 1 - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- 2 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of
- 3 - Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Production and Distribution of Writing

- 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- 5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
- 6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

- 7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
- 8 - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
- 9 - Draw evidence from literary or informational texts to support analysis, reflection, and research.

Range of Writing

- 10 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes,

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation

- Think Creatively
- Work Creatively with Other
- Implement Innovations

Creative Thinking and Problem Solving

- Reason Effectively
- Use Systems Thinking
- Make Judgements and Decisions
- Solve Problems

Communication & Collaboration

- Communicate Clearly
- Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy

- Access and Evaluate Information
- Use and Manage Information

Media Literacy

- Analyze Media
- Create Media Products

Information, Communications, and Technology (ICT Literacy)

- Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability

- Adapt to Change
- Be Flexible

Initiative and Self-Direction

- Manage Goals and Time
- Work Independently
- Be Self-Directed Learners

Social and Cross-Cultural

- Interact Effectively with Other
- Work Effectively in Diverse Teams

Productivity and Accountability

- Manage Projects
- Produce Results

Leadership and Responsibility

- Guide and Lead Others
- Be Responsible to Others

Unit 2 COMPONENT 1-RESEARCH A PROBLEM**Hours: 40****Performance Assessment(s):**

1. Project management is the discipline of planning, organizing, motivating, utilizing resources to achieve specific goals.
2. The work of engineers has an impact on our society.
3. An open ended design process involves identifying a justifiable problem and developing an original solution that attempts to solve it.
4. There are principles and practices related academic research. Topic selection and design decisions should be research driven and driven data whenever possible.
5. There are principles, practices, and techniques related to technical writing.
6. There are principles and practices related to documenting an engineering design process that protect the designer's intellectual property. This ensures that the designer has generated an original solution.
7. A well developed and accurately written problem statement identifies a need and guides an engineering design process.
8. A well developed and accurately written problem statement identifies a need and aims the engineer toward developing measureable and objective design requirements which guide the rest of the design process.
9. Individuals and other entities put extraordinary effort into protecting their intellectual property so they can control who has access to and use of their work. Intellectual property protections allow individuals or companies to maintain rights to profit from their ideas.
10. Experts are professionals that have specific knowledge in an area of interest and can guide the research needed for accurate justification and solutions to design problems.
11. The ability to communicate as a professional is a critical skill for engineers.
12. Effective market research focuses on potential users and buyers to gauge whether a problem is worth the investment required for a solution to be attempted.
13. Effective market research focuses on potential users and buyers to gauge whether a problem is worth the investment required for it to be solved.
14. Research and analysis of past solution attempts can help a designer identify critical design specifications or features in any viable solution designed.
15. Engineering design projects are typically peer reviewed. Stakeholder feedback and design reviews help guide engineers through the design process.
16. Design goals include specifications, constraints, parameters, desired features, and fundamental design considerations.
17. Presentation of a project proposal is a critical way-point in the design process

Leadership Alignment:

Research, organize, and communicate both verbally and in writing information on a given engineering problem.
 Students are required to carry out an in-class team leadership roles.
 Students have the opportunity to participate in TSA.
 Events:
 Biotechnology Design
 Engineering Design
 Technical Problem Solving
 Dragster Design
 Fashion Design

Standards and Competencies**Aligned to Washington State Standards****Arts****Communication - Speaking and Listening** CC: College andCareer Speaking and Listening Anchor Standards Comprehension and Collaboration

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Health and Fitness

Language CC: College and Career Language Anchor

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- 2 - Define appropriate quantities for the purpose of descriptive modeling.*
- 3 - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.*

CC: Algebra(A) Seeing Structure in

Expressions(A-SSE)

- 1 - Interpret expressions that represent a quantity in terms of its context.*
 - 1a - Interpret parts of an expression, such as terms, factors, and coefficients.*

Reasoning with Equations and Inequalities(A-REI)

- 10 - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

CC: Functions(F)

Interpreting Functions(F-IF)

- 1 - Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a
- 4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and

5 - Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours

Linear, Quadratic, and Exponential Models (F-LE)

- 1 - Distinguish between situations that can be modeled with linear functions and with exponential functions.*
 - 1b - Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.*
 - 1c - Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.*
- 3 - Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial
- 5 - Interpret the parameters in a linear or exponential function in terms of a context.*

CC: Statistics and Probability (S)

Interpreting Categorical and Quantitative Data (S-ID)

- 1 - Represent data with plots on the real number line (dot plots, histograms, and box plots).*
- 2 - Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different
- 3 - Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).*
- 4 - Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a
- 6 - Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.*
 - 6a - Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context.
 - 6b - Informally assess the fit of a function by plotting and analyzing residuals.*
 - 6c - Fit a linear function for a scatter plot that suggests a linear association.*
- 7 - Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.*
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- 9 - Distinguish between correlation and causation.*

Making Inferences and Justifying Conclusions (S-IC)

- 1 - Understand statistics as a process for making inferences about population parameters based on a random sample from that population.*
- 3 - Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.*
- 4 - Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.*
- 6 - Evaluate reports based on data.* Using

Probability to Make Decisions (S-MD)

- 5 (+) - Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.*
 - 5a (+) - Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.*
- 6 (+) - Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).*
- 7 (+) - Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).*

Reading CC: College and Career Reading Anchor

Standards Key Ideas and Details

- 1 - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions
- 2 - Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
- 3 - Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Craft and Structure

4 - Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape

6 - Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

8 - Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

9 - Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Range of Reading and Level of Text Complexity

10 - Read and comprehend complex literary and informational texts independently and proficiently.

Science

Social Studies

Writing [CC College and Career Writing Anchor](#)

Standards Text Types and Purposes

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3 - Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Production and Distribution of Writing

4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

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LEARNING AND INNOVATION

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Information Literacy

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LIFE AND CAREER SKILLS

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Initiative and Self-Direction

- Manage Goals and Time
- Work Independently
- Be Self-Directed Learners

Social and Cross-Cultural

- Interact Effectively with Other
- Work Effectively in Diverse Teams

Productivity and Accountability

- Manage Projects
- Produce Results

Leadership and Responsibility

- Guide and Lead Others
- Be Responsible to Others

Unit 3 COMPONENT 2- DESIGN A SOLUTION**Hours: 30****Performance Assessment(s):**

Understandings Addressed in Component:

- 1.Relevant principles and practices of Science, Technology, Engineering, and Mathematics (STEM) should be used to inform and justify design choices. They should be evident and well documented in an engineering design process.
- 2.Engineers use a peer review process to evaluate design solutions, provide feedback, and implement necessary revisions.
- 3.Effective design teams typically have a diverse set of viewpoints.
- 4.Multiple design possibilities should be explored in an engineering design process.
- 5.Design goals include specifications, constraints, parameters, desired features, and fundamental design considerations.
- 6.Testing is a critical component to any engineering design process. A prototype should be created that can be tested qualitatively and quantitatively.
- 7.Assessing a product's lifecycle creates an opportunity for identifying potential improvements in the process and provides a method for evaluating the product's degree of success.
- 8.A decision matrix is one tool designers can use to compare preliminary design solutions. A solution path can be determined by assessing each alternate design based on the design requirements specified.
- 9.Drawings and sketches are used to organize, record, and communicate ideas.
- 10.An effective use of the design process includes the use of a variety of forms of technical visual communication. This may include, but not be limited to technical drawings, circuit diagrams, process or flow charts.
- 11.Virtual solutions for designs allow engineers to plan, test, and prepare for building a prototype.
- 12.Engineers and designers have ethical responsibilities to clients, peers, their profession, and the general public.
- 13.Product development will result in consequences, both good and bad, that must be considered when deciding whether or not to develop a product.
- 14.There are many stakeholders involved in an open ended engineering design process.
- 15.The ability to communicate as a professional is a critical skill for engineers.
- 16.A Preliminary Design Review is a peer review process to determine the viability of the final design proposed and if other modifications can be identified before the prototyping and testing phase.

Leadership Alignment:

Work collaboratively to design a solution for a given engineering problem.

Students are required to carry out an in-class team leadership roles.

Students have the opportunity to participate in TSA.

Events:

Computer Aided Design 3D

Biotechnology Design

Engineering Design

Technical Problem Solving

Dragster Design

Fashion Design

Standards and Competencies**Aligned to Washington State Standards****Arts**

Communication - Speaking and Listening [CC: Collegeand](#)

[CareerSpeakingandListeningAnchorStandards](#) [Comprehensionand](#)

[Collaboration](#)

- 1 - Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and
- 2 - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
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Presentation of Knowledge and Ideas

- 4 - Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task,
- 5 - Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

Health and Fitness

Language CC: College and Career Language Anchor

Standards Convention of Standard English

- 1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- 2 - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Knowledge of Language

- 3 - Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when

Vocabulary Acquisition and Use

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- 6 - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and

Mathematics CC: Number

- 1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale
- 2 - Define appropriate quantities for the purpose of descriptive modeling.*
- 3 - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.*

CC: Algebra(A) Seeing Structure in

Expressions(A-SSE)

- 1 - Interpret expressions that represent a quantity in terms of its context.*
 - 1a - Interpret parts of an expression, such as terms, factors, and coefficients.*
- 3 - Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*

Arithmetic with Polynomials and Rational Expressions(A-APR)

- 1 - Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract,

Creating Equations(A-CED)

- 1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and

- 2 - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.*
- 4 - Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance R .*
- Reasoning with Equations and Inequalities (A-REI)
- 4 - Solve quadratic equations in one variable.
- 10 - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
- 11 - Explain why the x -coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial,

CC: Functions (F)

Interpreting Functions (F-IF)

- 1 - Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a
- 7 - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
- 7a - Graph linear and quadratic functions and show intercepts, maxima, and minima.*
- 8 - Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

Building Functions (F-BF)

- 1 - Write a function that describes a relationship between two quantities.*
- 1b - Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function
- 1c (+) - Compose functions. For example, if $T(y)$ is the temperature in the atmosphere as a function of height, and $h(t)$ is the height of a weather balloon as a function of time,

Linear, Quadratic, and Exponential Models (F-LE)

- 1 - Distinguish between situations that can be modeled with linear functions and with exponential functions.*
- 1b - Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.*
- 1c - Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.*
- 3 - Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial
- 5 - Interpret the parameters in a linear or exponential function in terms of a context.*

CC: Geometry (G)

Congruence (G-CO)

- 1 - Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance
- 4 - Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
- 5 - Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence
- 12 - Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and

Modeling with Geometry (G-MG)

- 1 - Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).*
- 2 - Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).*
- 3 - Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems

CC: StatisticsandProbability(S) Interpreting

CategoricalandQuantitativeData(S-ID)

7 - Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.*

Reading CC: CollegeandCareerReadingAnchor

Standards KeyIdeasandDetails

1 - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions

2 - Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

CraftandStructure

4 - Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape

6 - Assess how point of view or purpose shapes the content and style of a text.

IntegrationofKnowledgeandIdeas

7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

8 - Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

9 - Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

RangeofReadingandLevelofTextComplexity

10 - Read and comprehend complex literary and informational texts independently and proficiently.

Science

Social Studies

Writing CC: CollegeandCareerWritingAnchor

Standards TextTypesandPurposes

1 - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

2 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of

3 - Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Production and Distribution of Writing

4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

ResearchtoBuildandPresentKnowledge

7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

8 - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

9 - Draw evidence from literary or informational texts to support analysis, reflection, and research.

RangeofWriting

10 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes,

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation

- Think Creatively
- Work Creatively with Other
- Implement Innovations

Creative Thinking and Problem Solving

- Reason Effectively
- Use Systems Thinking
- Make Judgements and Decisions
- Solve Problems

Communication & Collaboration

- Communicate Clearly
- Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy

- Access and Evaluate Information
- Use and Manage Information

Media Literacy

- Analyze Media
- Create Media Products

Information, Communications, and Technology (ICT Literacy)

- Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability

- Adapt to Change
- Be Flexible

Initiative and Self-Direction

- Mange Goals and Time
- Work Independently
- Be Self-Directed Learners

Social and Cross-Cultural

- Interact Effectively with Other
- Work Effectively in Diverse Teams

Productivity and Accountability

- Manage Projects
- Produce Results

Leadership and Responsibility

- Guide and Lead Others
- Be Responsible to Others

Unit 4 COMPONENT 3-CEARTING A PROTOTYPE AND TEASTING PLAN**Hours: 45****Performance Assessment(s):**

Understandings Addressed in Component:

- 1.Relevant principles and practices of Science, Technology, Engineering, and Mathematics (STEM) should be used to inform and justify design choices. They should be evident and well documented in an engineering design process.
- 2.Project management is the discipline of planning, organizing, motivating, utilizing resources to achieve specific goals.
- 3.During the construction of a prototype, safety in the workplace is a critical component. All safety guidelines and procedures should be followed.
- 4.Material, tools, and equipment requirements are defined by creating a materials and cost analysis before the construction of a prototype.
- 5.A prototyping provides the engineer with a scaled working model of the design solution that can be tested.
- 6.Engineers write step-by-step instructions for the prototype assembly to guide the fabrication of the design solution.
- 7.Designers must consider characteristics such as strength and weight of materials and fastening procedures to be sure that the final design meets design specifications.
- 8.Testing is a critical component to any engineering design process. A plan and process for testing the proposed solution both qualitatively and quantitatively against design requirements should be created and carried out.
- 9.Prototypes can generally be broken down into subsystems in order to isolate problems and conduct incremental testing.
- 10.Prototype testing is a controlled procedure that is used to evaluate a specific aspect of a design solution.
- 11.In order to gather useful data, specific criteria for success or failure of a test must be determined before testing begins.
- 12.A detailed description of the testing procedure helps to ensure that the results of the design solution testing are valid.
- 13.Data can be classified as either quantitative because it can be measured or qualitative because it describes a quality or categorization.
- 14.The results of prototype testing are used to refine the design and to improve the design solution.
- 15.A Critical Design Review is used to determine the quality and functionality of the final prototype. Designers should seek feedback from key stakeholders to determine if any modifications or improvements can be made before finalizing the testing process.

Leadership Alignment:

Work collaboratively to build a testable prototype.
 Students are required to carry out an in-class team leadership roles.
 Students have the opportunity to participate in TSA.
 Event:
 Manufacturing Prototype

Standards and Competencies**Aligned to Washington State Standards****Arts****Communication - Speaking and Listening**CC: CollegeandCareerSpeakingandListeningAnchorStandardsComprehensionandCollaboration

- 1 - Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and
- 2 - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- 3 - Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

PresentationofKnowledgeandIdeas

- 4 - Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task,
- 5 - Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

6 - Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

Health and Fitness

Language

CC: College and Career Language Anchor Standards

Conventions of Standard English

- 1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- 2 - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Knowledge of Language

- 3 - Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when

Vocabulary Acquisition and Use

- 4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and
- 5 - Demonstrate understanding of word relationships and nuances in word meanings.
- 6 - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and

Mathematics

- 1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale
- 2 - Define appropriate quantities for the purpose of descriptive modeling.*
- 3 - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.*

CC: Algebra (A) Seeing Structure in

Expressions (A-SSE)

- 1 - Interpret expressions that represent a quantity in terms of its context.*
 - 1a - Interpret parts of an expression, such as terms, factors, and coefficients.*
- 3 - Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*

Creating Equations (A-CED)

- 1 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and
- 2 - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.*
- 4 - Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance R .*

Reasoning with Equations and Inequalities (A-REI)

- 6 - Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
- 10 - Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
- 12 - Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of

CC: Functions (F)

Interpreting Functions(F-IF)

- 1 - Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function, the graph consists of all ordered pairs $(x, f(x))$.
- 2 - Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
- 4 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; and symmetry.
- 5 - Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours required to assemble n engines, the graph must pass through the point $(1, h(1))$.
- 6 - Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*
 - 7a - Graph linear and quadratic functions and show intercepts, maxima, and minima.*

Building Functions(F-BF)

- 1 - Write a function that describes a relationship between two quantities.*
- 2 - Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*

Linear, Quadratic, and Exponential Models(F-LE)

- 1 - Distinguish between situations that can be modeled with linear functions and with exponential functions.*
 - 1b - Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.*
 - 1c - Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.*
- 2 - Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include descriptions of the inputs and outputs).
- 3 - Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial of any fixed degree.

CC: Statistics and Probability(S) Interpreting

Categorical and Quantitative Data(S-ID)

- 1 - Represent data with plots on the real number line (dot plots, histograms, and box plots).*
- 2 - Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data distributions.*
- 3 - Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).*
- 4 - Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a normal distribution is inappropriate.*
- 5 - Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies).
- 6 - Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.*
 - 6a - Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context.
 - 6b - Informally assess the fit of a function by plotting and analyzing residuals.*
 - 6c - Fit a linear function for a scatter plot that suggests a linear association.*
- 7 - Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.*
- 8 - Compute (using technology) and interpret the correlation coefficient of a linear fit.*
- 9 - Distinguish between correlation and causation.*

Making Inferences and Justifying Conclusions(S-IC)

- 1 - Understand statistics as a process for making inferences about population parameters based on a random sample from that population.*
- 3 - Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.*
- 4 - Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.*
- 5 - Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.*

6 - Evaluate reports based on data.* Using Probability to Make Decisions (S-MD)

5 (+) - Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.*

5a (+) - Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.*

5b (+) - Evaluate and compare strategies on the basis of expected values. For example, compare a high-deductible versus a low-deductible automobile insurance policy using

6 (+) - Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).*

7 (+) - Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).*

Reading CC: College and Career Reading Anchor

Standards Key Ideas and Details

1 - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions

Craft and Structure

4 - Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape

Integration of Knowledge and Ideas

7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

Range of Reading and Level of Text Complexity

10 - Read and comprehend complex literary and informational texts independently and proficiently.

Science

Social Studies

Writing CC: College and Career Writing Anchor

Standards Text Types and Purposes

1 - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

2 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of

3 - Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Production and Distribution of Writing

4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

8 - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

9 - Draw evidence from literary or informational texts to support analysis, reflection, and research.

Range of Writing

10 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes,

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation

- Think Creatively
- Work Creatively with Other
- Implement Innovations

Creative Thinking and Problem Solving

- Reason Effectively
- Use Systems Thinking
- Make Judgements and Decisions
- Solve Problems

Communication & Collaboration

- Communicate Clearly
- Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy

- Access and Evaluate Information
- Use and Manage Information

Media Literacy

- Analyze Media
- Create Media Products

Information, Communications, and Technology (ICT Literacy)

- Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability

- Adapt to Change
- Be Flexible

Initiative and Self-Direction

- Manage Goals and Time
- Work Independently
- Be Self-Directed Learners

Social and Cross-Cultural

- Interact Effectively with Other
- Work Effectively in Diverse Teams

Productivity and Accountability

- Manage Projects
- Produce Results

Leadership and Responsibility

- Guide and Lead Others
- Be Responsible to Others

Performance Assessment(s):

Understandings Addressed in Component:

- 1.The engineering design process is typically non-linear. Designers may need to re-visit steps in the process or take next steps based on feedback from previous steps.
- 2.The engineering design process is both a guide and a series of waypoints for effective problem solving. It is a tool for self-evaluation as an engineer moves through the process.
- 3.There are many stakeholders involved in an open ended engineering design process.
- 4.The ability to communicate as a professional is a critical skill for engineers.
- 5.Engineering design projects are typically peer reviewed. Stakeholder feedback and design reviews help guide engineers through the design process.
- 6.Presentation of this design process and project findings are critical to the engineering design process.

Leadership Alignment:

Think critically about a solution to an engineering problem.
 Students are required to carry out an in-class team leadership roles.
 Students have the opportunity to participate in TSA.

- Event:
- Biotechnology Design
 - Engineering Design
 - Dragster Design
 - Fashion Design
 - Manufacturing Prototype

Standards and Competencies

Aligned to Washington State Standards

Arts

Communication - Speaking and Listening CC: Collegeand

CareerSpeakingandListeningAnchorStandards Comprehensionand
Collaboration

- 1 - Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and
- 2 - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- 3 - Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

PresentationofKnowledgeandIdeas

- 4 - Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task,
- 5 - Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.
- 6 - Adapt speech to a variety of contexts and communicative tasks, demonstration command of formal English when indicated or appropriate.

Health and Fitness

Language CC: CollegeandCareerLanguageAnchor

Standards ConventionsofStandardEnglish

- 1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- 2 - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Knowledge of Language

- 3 - Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when

Vocabulary Acquisition and Use

- 4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and
- 5 - Demonstrate understanding of word relationships and nuances in word meanings.
- 6 - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and

Mathematics CC: Number

- 1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale
- 2 - Define appropriate quantities for the purpose of descriptive modeling.*
- 3 - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.*

CC: Statistics and Probability (S) Interpreting

Categorical and Quantitative Data (S-ID)

- 1 - Represent data with plots on the real number line (dot plots, histograms, and box plots).*
- 2 - Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different
- 3 - Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).*
- 4 - Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a
- 5 - Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional
 - 6b - Informally assess the fit of a function by plotting and analyzing residuals.*
 - 6c - Fit a linear function for a scatter plot that suggests a linear association.*
- 7 - Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.*
- 9 - Distinguish between correlation and causation.*

Making Inferences and Justifying Conclusions (S-IC)

- 1 - Understand statistics as a process for making inferences about population parameters based on a random sample from that population.*
- 2 - Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with
- 3 - Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.*
- 4 - Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.*
- 5 - Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.*

6 - Evaluate reports based on data.* Using

Probability to Make Decisions (S-MD)

- 5 (+) - Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.*
 - 5a (+) - Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.*

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6 (+) - Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).*

7 (+) - Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).*

Reading CC: CollegeandCareerReadingAnchor

Standards KeyIdeasandDetails

1 - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions

2 - Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

CraftandStructure

4 - Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape

6 - Assess how point of view or purpose shapes the content and style of a text.

IntegrationofKnowledgeandIdeas

7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

8 - Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

9 - Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

RangeofReadingandLevelofTextComplexity

10 - Read and comprehend complex literary and informational texts independently and proficiently.

Science

Social Studies

Writing CC: CollegeandCareerWritingAnchor

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1 - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

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6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

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7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

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10 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes,

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- Reason Effectively
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- Interact Effectively with Other
- Work Effectively in Diverse Teams

Productivity and Accountability

- Manage Projects
- Produce Results

Leadership and Responsibility

- Guide and Lead Others
- Be Responsible to Others

Unit 6 COMPONENT 5-PRESENTATION OF THE DESIGN PROCESS**Hours: 30****Performance Assessment(s):**

1. Presentation of this design process and project findings are critical to the engineering design process.
2. Presentations and displays of work provide the means to effectively promote and justify the implementation of a project.
3. There are principles and practices related to documenting an engineering design process that protect the designer's intellectual property. This ensures that the designer has generated an original solution.
4. A well-done presentation can enhance the perception of the quality of work completed for a team project.
5. The use of presentation software allows designers to present visual aids and project information in a professional manner.
6. The media format used for a presentation is chosen in order to effectively communicate the design solution process to a target audience

Leadership Alignment:

Give an oral presentation to the community and professionals
 Students are required to carry out an in-class team leadership roles.
 Students have the opportunity to participate in TSA.
 Event:
 Prepared presentations

Standards and Competencies**Aligned to Washington State Standards****Arts****Communication - Speaking and Listening** CC: College and Career Speaking and Listening Anchor Standards

Comprehension and Collaboration

- 1 - Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and
- 2 - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- 3 - Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Presentation of Knowledge and Ideas

- 4 - Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task,
- 5 - Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.
- 6 - Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

Health and Fitness**Language** CC: College and Career Language Anchor

Standards of Convention of Standard English

- 1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- 2 - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Knowledge of Language

3 - Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when

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5 - Demonstrate understanding of word relationships and nuances in word meanings.

6 - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and

Mathematics CC: Algebra(A) Seeing

StructureinExpressions(A-SSE)

1 - Interpret expressions that represent a quantity in terms of its context.*

ReasoningwithEquationsandInequalities(A-REI)

1 - Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation

2 - Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

CC: Functions(F)

InterpretingFunctions(F-IF)

5 - Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours

CC: StatisticsandProbability(S) Interpreting

CategoricalandQuantitativeData(S-ID)

1 - Represent data with plots on the real number line (dot plots, histograms, and box plots).*

2 - Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different

3 - Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).*

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5 - Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional

6 - Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.*

6a - Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context.

6b - Informally assess the fit of a function by plotting and analyzing residuals.*

6c - Fit a linear function for a scatter plot that suggests a linear association.*

MakingInferencesandJustifyingConclusions(S-IC)

3 - Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.*

4 - Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.*

5 - Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.*

6 - Evaluate reports based on data.* Using

ProbabilitytoMakeDecisions(S-MD)

5 (+) - Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.*

5b (+) - Evaluate and compare strategies on the basis of expected values. For example, compare a high-deductible versus a low-deductible automobile insurance policy using

6 (+) - Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).*

Reading

CC: CollegeandCareerReadingAnchorStandards Key

IdeasandDetails

1 - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions

2 - Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

CraftandStructure

4 - Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape

6 - Assess how point of view or purpose shapes the content and style of a text.

IntegrationofKnowledgeandIdeas

7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

8 - Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

9 - Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

RangeofReadingandLevelofTextComplexity

10 - Read and comprehend complex literary and informational texts independently and proficiently.

Science

Social Studies

Writing CC: CollegeandCareerWritingAnchor

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1 - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

2 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of

3 - Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Production and Distribution of Writing

4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

ResearchtoBuildandPresentKnowledge

7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

8 - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

9 - Draw evidence from literary or informational texts to support analysis, reflection, and research.

RangeofWriting

10 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes,

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation

- Think Creatively
- Work Creatively with Other
- Implement Innovations

Creative Thinking and Problem Solving

- Reason Effectively
- Use Systems Thinking
- Make Judgements and Decisions
- Solve Problems

Communication & Collaboration

- Communicate Clearly
- Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy

- Access and Evaluate Information
- Use and Manage Information

Media Literacy

- Analyze Media
- Create Media Products

Information, Communications, and Technology (ICT Literacy)

- Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability

- Adapt to Change
- Be Flexible

Initiative and Self-Direction

- Mange Goals and Time
- Work Independently
- Be Self-Directed Learners

Social and Cross-Cultural

- Interact Effectively with Other
- Work Effectively in Diverse Teams

Productivity and Accountability

- Manage Projects
- Produce Results

Leadership and Responsibility

- Guide and Lead Others
- Be Responsible to Others