

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title		Principles Of Engineering (POE)				Course Code		K0355-K0356	
Transcript Title:	Principles Of Engineering AB			Grades Levels:	9-12 (Pref. 10)		Board Adoption Date:		May 23, 2015
Content Area:	Interdisciplinary Elective			GPA Scale:	4.0		Date Course Submitted:		March 2015
Credential Req:	Single Subject Secondary Education Credential & CTE Credential		Graduation Subject Areas:		Electives				
UC/CSU “A-G” Area Approvals:		g		School Site that wrote and submitted the course:			Project Lead The Way – wrote the course; Estancia High School – submitting the course for NMUSD Board Approval		
Prerequisite(s):	None (although many of the students will have taken Introduction to Engineering Design in 9 th grade)								
Next course(s):	Aerospace Engineering, Biological Engineering, Civil Engineering and Architecture, Computer Integrated Manufacturing, Computer Science and Software Engineering, or Digital Electronics (all are 3 rd year PLTW courses in Engineering)								

COURSE DESCRIPTION (catalog summary):

Principles Of Engineering™ (POE) is a high school level course that is appropriate for 9th or 10th grade students who are interested in design and engineering. Through problems that engage and challenge, students explore a broad range of engineering topics, including mechanisms, the strength of structures and materials, and automation. Students develop skills in problem solving, research, and design while learning strategies for design process documentation, collaboration, and presentation.

Principles Of Engineering™ is one of two foundation courses in the Project Lead The Way® high school pre-engineering program. The course is about applying science, technology, engineering, and math through a project-based, hands-on approach to solve complex, open-ended problems in a real-world context. Students focus on the process of defining and solving a problem, not on getting the "right" answer. They learn how to apply STEM knowledge, skills, and habits of mind to make the world a better place through innovation. The course assumes no previous knowledge, but students should be concurrently enrolled in college preparatory mathematics and science. Students will employ engineering and scientific concepts in the solution of engineering design problems. In addition, students use a state of the 3D solid modeling design software package to help them design solutions to solve proposed problems. Students will develop problem-solving skills and apply their knowledge of research and design to create solutions to various challenges that increase in difficulty throughout the course. Students will also learn how to document their work, and communicate their solutions to their peers and members of the professional community.

The course of study includes:

- *Mechanisms*
- *Energy Sources*
- *Energy Applications*
- *Design Problem – Energy and Power*
- *Statics*

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- *Material Properties*
- *Material Testing*
- *Design Problem – Materials and Structures*
- *Machine Control*
- *Fluid Power*
- *Design Problem – Control Systems*
- *Statistics*
- *Kinematics*

GOALS (*expected performance outcomes for students*):

Students engage in open-ended problem solving, learn and apply the engineering design process, and develop vital teamwork, communication, and critical-thinking skills.

Unit 1: Energy and Power (49 days)

Lesson 1.1 Mechanisms (15 days)

1. Engineers and engineering technologists apply math, science, and discipline-specific skills to solve problems.
2. Engineering and engineering technology careers offer creative job opportunities for individuals with a wide variety of backgrounds and goals.
3. Technical communication can be accomplished in oral, written, and visual forms and must be organized in a clear and concise manner.
4. Most mechanisms are composed of gears, sprockets, pulley systems, and simple machines.
5. Mechanisms are used to redirect energy within a system by manipulating force, speed, and distance.
6. Mechanical advantage ratios mathematically evaluate input work versus output work of mechanisms.

Lesson 1.2 Energy Sources (11 days)

1. Energy source classifications include nonrenewable, renewable, and inexhaustible.
2. Energy source processes include harnessing, storing, transporting, and converting.
3. Energy often needs to be converted from one form to another to meet the needs of a given system.
4. An understanding of work, energy, and power is required to determine system efficiency.
5. An understanding of the basics of electricity requires the understanding of three fundamental Understandings of voltage, current, and resistance.
6. The atomic structure of a material determines whether it is a conductor, and insulator, or a semiconductor.

Lesson 1.3 Energy Applications (10 days)

1. Energy management is focused on efficient and accessible energy use.

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2. System energy requirements must be understood in order to select the proper energy source.
3. Energy systems can include multiple energy sources that can be combined to convert energy into useful forms.
4. Hydrogen fuel cells create electricity and heat through an electrochemical process that converts hydrogen and oxygen into water.
5. Solar cells convert light energy into electricity by using photons to create electron flow.
6. Thermodynamics is the study of the effects of work, thermo energy, and energy on a system.
7. Thermo energy can transfer via convection, conduction, or radiation.
8. Material conductivity, resistance, and energy transfer can be calculated.

Lesson 1.4 Design Problem – Energy and Power (13 days)

1. Design problems can be solved by individuals or in teams.
2. Engineers use a design process to create solutions to existing problems.
3. Design briefs are used to identify the problem specifications and to establish project constraints.
4. Teamwork requires constant communication to achieve the desired goal.
5. Design teams conduct research to develop their knowledge base, stimulate creative ideas, and make informed decisions.

Unit 2: Materials and Structures (40 days)

Lesson 2.1 Statics (14 days)

1. Laws of motion describe the interaction of forces acting on a body.
2. Structural member properties including centroid location, moment of inertia, and modulus of elasticity are important considerations for structure design.
3. Static equilibrium occurs when the sum of all forces acting on a body are equal to zero.
4. Applied forces are vector quantities with a defined magnitude, direction, and sense, and can be broken into vector components.
5. Forces acting at a distance from an axis or point attempt or cause an object to rotate.
6. In a statically determinate truss, translational and rotational equilibrium equations can be used to calculate external and internal forces.
7. Free body diagrams are used to illustrate and calculate forces acting upon a given body.

Lesson 2.2 Material Properties (11 days)

1. Materials are the substances with which all objects are made.
2. Materials are composed of elements and are categorized by physical and chemical properties.
3. Materials consist of pure elements. Compounds and mixtures and are typically classified as metallic, ceramic, organic, polymeric, and composite.
4. Material properties including recyclability and cost are important considerations for engineers when choosing appropriate materials for a design.
5. Material selection is based upon mechanical, thermal, electromagnetic, and chemical properties.

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6. Raw materials undergo various manufacturing processes in the production of consumer goods.

Lesson 2.3 Material Testing (10 days)

1. Engineers utilize a design process and mathematical formulas to solve and document design problems.
2. Material testing aids in determining a product's reliability, safety, and predictability in function.
3. Engineers perform destructive and non-destructive tests on material specimens for the purpose of identifying and verifying the properties of various materials.
4. Material testing provides a reproducible evaluation of material properties.
5. Tensile testing data is used to create a test sample stress strain curve.
6. Stress strain data points are used to identify and calculate sample material properties including elastic range, proportional limit, modulus of elasticity, elastic limit, resilience, yield point, plastic deformation, ultimate strength, failure, and ductility.

Lesson 2.4 Design Problem – Materials and Structures (5 days)

1. Design problems can be solved by individuals or in teams.
2. Engineers use a design process to create solutions to existing problems.
3. Design briefs are used to identify the problem specifications and establish project constraints.
4. Teamwork requires constant communication to achieve the desired goal.
5. Design teams conduct research to develop their knowledge base, stimulate creative ideas, and make informed decisions.

Unit 3: Control Systems (46 days)

Lesson 3.1 Machine Control (16 days)

1. Flowcharts provide a step by step schematic representation of an algorithm or process.
2. Control systems are designed to provide consistent process control and reliability.
3. Control systems protocols are an established set of commands or functions typically created in a computer programming language.
4. Closed loop systems use digital and analog sensor feedback to make operational and process decisions.
5. Open loop systems use programming constants such as time to make operational and process decisions.

Lesson 3.2 Fluid Power (15 days)

1. Fluid power systems are categorized as either pneumatic, which utilizes gas, or hydraulic, which utilizes liquid.
2. Fluid power is possible because in a system of confined fluid, pressure acts equally in all directions.
3. The most basic components of all fluid power systems include a reservoir or receiver, a pump or compressor, a valve, and a cylinder.
4. Fluid power systems are designed to transmit force over great distances, multiply an input force, and increase the distance that an output will move.

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5. Laws about the behavior of fluid systems and standard conventions for calculating values within fluid systems aid in the design and understanding of such systems.
6. Standard schematic symbols and conventions are used to communicate fluid power designs.

Lesson 3.3 Design Problem – Control Systems (15 days)

1. Design problems can be solved by individuals or in teams.
2. Engineers use a design process to create solutions to existing problems.
3. Design briefs are used to identify the problem specifications and to establish project constraints.
4. Teamwork requires constant communication to achieve the desired goal.
5. Design teams conduct research to develop their knowledge base, stimulate creative ideas, and make informed decisions.

Unit 4: Statistics and Kinematics (30 days)

Lesson 4.1 Statistics (5 days)

1. Engineers use statistics to make informed decisions based upon established principles.
2. Visual representations of data analyses allow for easy distribution and understanding of data.
3. Statistics is based upon both theoretical and experimental data analysis.

Lesson 4.2 Kinematics (10 days)

1. When working with bodies in motion, engineers must be able to differentiate and calculate distance, displacement, speed, velocity, and acceleration.
2. When air resistance is not taken into account, released objects will experience acceleration due to gravity, also known as freefall.
3. Projectile motion can be predicted and controlled using kinematics equations.
4. When a projectile is launched, velocity in the x direction remains constant; whereas, with time, the velocity in the y direction in magnitude and direction changes due to gravity.

CALIFORNIA CONTENT STANDARDS *(how the course aligns with California and/or national curriculum standards):*

PLTW is the nation's leading STEM program which is aligned with the CCSS in the following areas: Next Generation Science Standards, CCSS for Mathematical Practice, CCSS for ELA, and Technological Literacy.

Next Generation Science Standards

Engineering Design

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Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. (HS.ETS1.1)

Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. (HS.ETS1.2)

Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. (HS.ETS1.3)

Energy

Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.* (HS.PS3.3)

Matter and Its Interactions

Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (HS.PS1.3)

Common Core State Standards for Mathematical Practice (HS)

Number and Quantity

Quantities

-Reason Quantitatively And Use Units To Solve Problems.

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 and the origin in graphs and data displays. (N.Q .1)

2. Define appropriate quantities for the purpose of descriptive modeling. (N.Q .2)

3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (N.Q .3)

The Real Number System

-Extend The Properties Of Exponents To Rational Exponents.

2. Rewrite expressions involving radicals and rational exponents using the properties of exponents. (N.RN.2)

Vector And Matrix Quantities

-Represent And Model With Vector Quantities.

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1. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v , $|v|$, $||v||$, v). (N.VM.1)
2. (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point. (N.VM.2)
3. (+) Solve problems involving velocity and other quantities that can be represented by vectors. (N.VM.3)

Algebra

Seeing Structure In Expressions

-Interpret The Structure Of Expressions

1. Interpret expressions that represent a quantity in terms of its context. (A.SSE.1)
 - 1.a. Interpret parts of an expression, such as terms, factors, and coefficients. (A.SSE.1.a)
 - 1.b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P .* (A.SSE.1.b)

Creating Equations

-Create Equations That Describe Numbers Or Relationships

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 exponential functions.* (A.CED.1)
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.* (A.CED.3)
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 .* (A.CED.4)

Reasoning With Equations And Inequalities

-Solve Equations And Inequalities In One Variable

3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. (A.REI.3)
4. Solve quadratic equations in one variable. (A.REI.4)

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Functions

Linear, Quadratic, And Exponential Models

-Construct And Compare Linear, Quadratic, And Exponential Models And Solve Problems

1.b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. (F.LE.1.b)

Trigonometric Functions

-Model Periodic Phenomena With Trigonometric Functions

7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.* (F.TF.7)

Geometry

Modeling With Geometry

-Apply Geometric Concepts In Modeling Situations

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).* (G.MG.1)

2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).* (G.MG.2)

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 based on ratios).* (G.MG.3)

Geometric Measurement And Dimension

-Explain Volume Formulas And Use Them To Solve Problems

3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.* (G.GMD.3)

-Visualize Relationships Between Two-Dimensional And Three- Dimensional Objects

4. Identify the shapes of two-dimensional cross-sections of three- dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. (G.GMD.4)

Similarity, Right Triangles, And Trigonometry

-Define Trigonometric Ratios And Solve Problems Involving Right Triangles

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6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. (G.SRT.6)

8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.* (G.SRT.8)

Statistics and Probability

Interpreting Categorical And Quantitative Data

-Summarize, Represent, And Interpret Data On A Single Count Or Measurement Variable

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

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 sets. (S.ID.2)

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

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 procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. (S.ID.4)

Making Inferences And Justifying Conclusions

-Understand And Evaluate Random Processes Underlying Statistical Experiments

1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population. (S.IC.1)

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 probability 0.5. Would a result of 5 tails in a row cause you to question the model?* (S.IC.2)

-Make Inferences And Justify Conclusions From Sample Surveys, Experiments, And Observational Studies

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. (S.IC.4)

Conditional Probability And The Rules Of Probability

-Understand Independence And Conditional Probability And Use Them To Interpret Data

1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). (S.CP.1)

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2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. (S.CP.2)

3. Understand the conditional probability of A given B as $P(A \text{ and } B)/P(B)$, and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. (S.CP.3)

4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.* (S.CP.4)

5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* (S.CP.5)

-Use The Rules Of Probability To Compute Probabilities Of Compound Events In A Uniform Probability Model

6. Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model. (S.CP.6)

7. Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$, and interpret the answer in terms of the model. (S.CP.7)

8. (+) Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B|A) = P(B)P(A|B)$, and interpret the answer in terms of the model. (S.CP.8)

9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems. (S.CP.9)

Using Probability To Make Decisions

-Use Probability To Evaluate Outcomes Of Decisions

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

Common Core State Standards for English Language Arts

Reading

Key Ideas and Details

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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 drawn from the text. (AS.R.1)
2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. (AS.R.2)
7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. (AS.R.7)
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. (AS.R.9)
10. Read and comprehend complex literary and informational texts independently and proficiently. (AS.R.10)

Text Types and Purposes

2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. (AS.W.2)
4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4)
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. (AS.W.5)
6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. (AS.W.6)
7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. (AS.W.7)
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. (AS.W.8)
9. Draw evidence from literary or informational texts to support analysis, reflection, and research. (AS.W.9)
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, and audiences. (AS.W.10)

Comprehension and Collaboration

2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. (AS.SL.2)

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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, purpose, and audience. (AS.SL.4)

5. Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations. (AS.SL.5)

Conventions of Standard English

1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. (AS.L.1)

2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. (AS.L.2)

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 career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. (AS.L.6)

<http://www.corestandards.org/>

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EVALUATION *(how the effectiveness of the course will be monitored and assessed):*

Given this is our first year in implementing the course, we will be relying on PLTW to provide us with direction on the data they need to measure the effectiveness of the course. We anticipate that our students will be assessed based on the rubric grading provided on how effective individual and group assignments are completed. We also feel that students who successfully complete this course will be prepared to take the next course in the sequence as 11th graders going into the 2016-17 school year. PLTW is pleased to provide exclusive resources to the network that will help teachers, districts, and states develop customized assessments to meet district or state specific needs. These resources will provide guidance on planning, writing, and delivering high-quality assessments that will enable teachers and students to monitor student progress. Measuring student progress throughout the school year is crucial to promote academic growth and engage students as active participants in their own learning.

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Unit 1	Length of Unit: 49 days			
	Key Vocabulary	Standards (referenced)	Model Tasks	Tools / Texts
Energy and Power	- Atomic Structure - Circuit Resistance - Compound Machine Design - Conduction - Conductor - Convection - Converting - Current - Digital Multimeter - Distance - Drive Ratio - Efficiency - Electrical Input - Electricity - Electrochemical Process - Electron Flow - Energy - Energy Transfer - Energy Management - Energy Source - Energy System - Force - Gear - Harnessing - Heat - Hydrogen Fuel Cell - Input Work - Insulator - Light Energy	<u>Next Generation Science Standards</u> <u>Engineering Design</u> HS.ETS1.1 HS.ETS1.2 <u>Energy</u> HS.PS3.3 <u>CCSS for Math Practice</u> Number and Quantity <u>Quantities</u> N.Q.1 N.Q.2 N.Q.3 Algebra <u>Seeing Structures in Expressions</u> A.SSE.1 A.SSE.1.a A.SSE.1.b <u>Creating Equations</u> A.CED.1 A.CED.4 <u>Reasoning with Equations and Inequalities</u> A.REI.3 Functions <u>Linear, Quadratic, and Exponential Models</u> F.LE.1.b	Lesson 1.1 – Mechanisms HS.ETS1.2 N.Q.1 N.Q.2 N.Q.3 A.SSE.1 A.SSE.1.a A.SSE.1.b A.CED.1 A.CED.4 A.REI.3 F.LE.1.b G.MG.1 G.MG.3 Lesson 1.2 – Energy Sources HS.PS3.3 Lesson 1.3 – Energy Applications Lesson 1.4 – Design Problem – Energy and Power HS.ETS1.1 HS.PS3.3 N.Q.1 N.Q.2 N.Q.3	Principles of Engineering Handley, Coon, Marshall, ©2012 ISBN-13: 978-1-4354-2836-2 Principles of Engineering Handley, Coon, Marshall, ©2012 Workbook ISBN-13: 978-1-4354-2837-9 Instructor Resources ISBN-13: 978-1-4354-2838-6 CourseMate & eBook supplements available; please contact your Delmar representative for more information.

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	• Mechanical Advantage Ratio • Mechanical Output • Mechanical Power • Mechanical System • Mechanism • Nonrenewable • Ohm's Law • Output Work • Parallel Circuit • Photon • Photovoltaic Cell • Power • Power Conversion • Pulley Systems • R-value • Radiation • Recyclable Insulation • Renewable • Resistance • Semiconductor • Series Circuit • Simple Machines • Solar Cell • Solar Hydrogen System • Speed • Sprockets • Storing • Thermo Energy • Thermodynamics • Transporting • Voltage	Geometry <u>Modeling with Geometry</u> G.MG.1 G.MG.3		

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	• Work			
Differentiation	Support -- for students who are struggling with the content	Note: Lessons for support will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015 Content: Engineering Design, Energy, Number and Quantity (Quantities),Algebra (Seeing Structures in Expressions, Creating Equations, Reasoning with Equations and Inequalities), Functions (Linear, Quadratic, and Exponential), Geometry (Modeling with Geometry) Process: Re-teaching, balanced group configurations, differentiated instruction, teacher's extra assistance, guided practice Product: Checking for Understanding tasks (i.e., exit slips, quick writes, feedback quizzes), re-testing, alternate assignments addressing the base-level standard mastery		
	Extension – for high achieving students.	Note: Lessons for extension will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015 Content: Engineering Design, Energy, Number and Quantity (Quantities),Algebra (Seeing Structures in Expressions, Creating Equations, Reasoning with Equations and Inequalities), Functions (Linear, Quadratic, and Exponential), Geometry (Modeling with Geometry) Process: Project-based learning in applying content to real-world type assignments Product: Enriched interdisciplinary projects tied to content standards and assessment outcomes for the unit		
Evaluation	Assessments play an important role in providing meaningful feedback to students, teachers, administrators, and PLTW. Through assessments, students identify what they are doing well and what they need help with, and teachers are able to provide individualized direction and guidance to each student. PLTW supports a balanced approach to assessment for all programs, integrating both formative and summative assessments. Through a balanced approach, assessment is an ongoing activity. Students demonstrate their knowledge throughout the course by completing activities, projects, and problems using a variety of assessment tools, such as performance rubrics and reflective questioning, to deepen and expand their knowledge and skills. PLTW's assessment experts apply industry best practices and methods to design, test, and implement End of Course (EoC) assessments for our network of schools. We report valid and reliable scores on overall student performance within the course. The End of Course assessment gives students an objective evaluation of their achievement, and stakeholders obtain data to make informed decisions. Formative Assessments (ongoing & mid-lesson): Note: Formative Assessments will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015. Students demonstrate their knowledge throughout the course by completing activities, projects, and problems using a variety of assessment tools, such as performance rubrics and reflective questioning, to deepen and expand their knowledge			

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	<i>and skills. In the future PLTW will provide teachers access to classroom assessments that can be used both for formative and summative purposes. Further details will be released to the network at the appropriate time. PLTW supports a balanced approach to assessment for all programs, integrating both formative and summative assessments. Through a balanced approach, assessment is an ongoing activity. Students demonstrate their knowledge throughout the course by completing activities, projects, and problems using a variety of assessment tools, such as performance rubrics and reflective questioning, to deepen and expand their knowledge and skills.</i> <i>Assessment FOR Learning- Formative assessment. Growth assessments are a system of assessments designed to help teachers realize each student's strengths and needs relative to the content being assessed. There are two different areas teachers can measure growth in (math and science). Armed with growth assessment data, teachers can adjust their instruction to increase their responsiveness to individual student differences and needs. Over time, repeated administration of growth assessments can create growth data which further informs teachers and students as to the gains that are being achieved.</i> Summative Assessments (unit final evaluation): <i>Note: Summative Assessments will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015. In the future PLTW will provide teachers access to classroom assessments that can be used both for formative and summative purposes. Further details will be released to the network at the appropriate time. PLTW supports a balanced approach to assessment for all programs, integrating both formative and summative assessments. Through a balanced approach, assessment is an ongoing activity. Students demonstrate their knowledge throughout the course by completing activities, projects, and problems using a variety of assessment tools, such as performance rubrics and reflective questioning, to deepen and expand their knowledge and skills.</i> • Assessment OF Learning- Summative assessment • Students are allowed 80 minutes total to complete an assessment. The test can be given in one 80 minute testing session or can be administered in two 40 minute testing periods. You should refer to the testing guidelines on the processes for delivering the assessments in one or two sessions. Lesson 1.1 Mechanisms (15 days) Knowledge and Skills <i>It is expected that students will:</i> • Differentiate between engineering and engineering technology. • Conduct a professional interview and reflect on it in writing. • Identify and differentiate among different engineering disciplines. • Measure forces and distances related to mechanisms. • Distinguish between the six simple machines, their attributes, and components. • Calculate mechanical advantage and drive ratios of mechanisms. • Design, create, and test gear, pulley, and sprocket systems. • Calculate work and power in mechanical systems. • Determine efficiency in a mechanical system.		

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	• Design, create, test, and evaluate a compound machine design. Lesson 1.2 Energy Sources (11 days) Knowledge and Skills <i>It is expected that students will:</i> • Identify and categorize energy sources as nonrenewable, renewable, or inexhaustible. • Create and deliver a presentation to explain a specific energy source. • Summarize and reflect upon information collected during a visit to a local utility company. • Define the possible types of power conversion. • Calculate work and power. • Demonstrate the correct use of a digital multimeter. • Calculate power in a system that converts energy from electrical to mechanical. • Determine efficiency of a system the converts an electrical input to a mechanical output. • Calculate circuit resistance, current, and voltage using Ohm's law. • Understand the advantages and disadvantages of parallel and series circuit design in an application. Lesson 1.3 Energy Applications (10 days) Knowledge and Skills <i>It is expected that students will:</i> • Test and apply the relationship between voltage, current, and resistance relating to a photovoltaic cell and a hydrogen fuel cell. • Experiment with a solar hydrogen system to produce mechanical power. • Design, construct, and test recyclable insulation materials. • Test and apply the relationship between R-values and recyclable insulation. • Complete calculations for conduction, R-values, and radiation. Lesson 1.4 Design Problem – Energy and Power (13 days) Knowledge and Skills <i>It is expected that students will:</i> • Brainstorm and sketch possible solutions to an existing design problem. • Create a decision-making matrix for a design problem. • Select an approach that meets or satisfies the constraints provided in a design brief. • Create a detailed pictorial sketch of use 3D modeling software to document the best choice, based upon the design team's decision matrix. • Present a workable solution to the design problem.		

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Unit 2	Length of Unit: 40 days			
	Key Vocabulary	Standards (referenced)	Model Tasks	Tools / Texts
Materials and Structures	• <i>Applied Force</i> • <i>Axis</i> • <i>Centroid</i> • <i>Centroid Location</i> • <i>Ceramic</i> • <i>Chemical Property</i> • <i>Composite</i> • <i>Compound</i> • <i>Consumer Good</i> • <i>Continuity</i> • <i>Cost</i> • <i>Density</i> • <i>Destructive Test</i> • <i>Direction</i> • <i>Ductility</i> • <i>Elastic Limit</i> • <i>Elastic Range</i> • <i>Electromagnetic Property</i> • <i>Equation of Equilibrium</i> • <i>Equilibrium</i> • <i>External Force</i> • <i>Failure</i> • <i>Ferrous Metal</i> • <i>Flexure</i> • <i>Force</i> • <i>Free Body Diagram</i> • <i>Hardness</i> • <i>Internal Force</i>	<u>Next Generation Science Standards</u> <u>Engineering Design</u> HS.ETS1.3 <u>Matter and Its Interaction</u> HS.PS1.3 <u>CCSS for Math Practice</u> Number and Quantity <u>Quantities</u> N.Q.1 N.Q.2 N.Q.3 Algebra <u>Seeing Structures in Expressions</u> A.SSE.1 A.SSE.1.a A.SSE.1.b Geometry <u>Geometric Measurement And Dimension</u> G.GMD.3 G.GMD.4 <u>Modeling With Geometry</u> G.MG.1 G.MG.2 <u>CCSS for English Language Arts</u>	Lesson 2.1 – Statics Lesson 2.2 – Material Properties N.Q.1 N.Q.3 G.GMD.3 G.GMD.4 G.MG.1 G.MG.2 AS.R.1 AS.R.2 AS.R.7 AS.R.9 AS.R.10 AS.W.2 AS.W.4 AS.W.7 AS.W.8 AS.W.9 AS.W.10 AS.SL.2 AS.SL.4 AS.SL.5 AS.L.1 AS.L.2 AS.L.6 Lesson 2.3 – Material Testing HS.PS1.3 N.Q.1 N.Q.2 N.Q.3 A.SSE.1 A.SSE.1.a A.SSE.1.b	Principles of Engineering Handley, Coon, Marshall, ©2012 ISBN-13: 978-1-4354-2836-2 Principles of Engineering Handley, Coon, Marshall, ©2012 Workbook ISBN-13: 978-1-4354-2837-9 Instructor Resources ISBN-13: 978-1-4354-2838-6 CourseMate & eBook supplements available; please contact your Delmar representative for more information.

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	• <i>Laws of Motion</i> • <i>Magnitude</i> • <i>Mass</i> • <i>Mechanical Property</i> • <i>Metallic</i> • <i>Method of Joints Strategy</i> • <i>Mixture</i> • <i>Modulus of Elasticity</i> • <i>Moment Force</i> • <i>Moment of Inertia</i> • <i>Non-destructive Test</i> • <i>Organic</i> • <i>Physical Property</i> • <i>Plastic Deformation</i> • <i>Polymeric</i> • <i>Predictability</i> • <i>Proportional Limit</i> • <i>Pure Element</i> • <i>Raw Material</i> • <i>Recyclability</i> • <i>Recycling Code</i> • <i>Reliability</i> • <i>Reproducible Evaluation</i> • <i>Resilience</i> • <i>Rotational Equilibrium Equation</i> • <i>Safety</i> • <i>Scalar Quantity</i> Reading <u>Key Ideas and Details</u> AS.R.1 AS.R.2 AS.R.7 AS.R.9 AS.R.10 <u>Text Types and Purposes</u> AS.W.2 AS.W.4 AS.W.7 AS.W.8 AS.W.9 AS.W.10 <u>Comprehension and Collaboration</u> AS.SL.2 AS.SL.4 AS.SL.5 <u>Conventions of Standard English</u> AS.L.1 AS.L.2 AS.L.6	Lesson 2.4 – Design Problem – Materials and Structures HS.ETS1.3 N.Q.1 N.Q.2	

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	• Sense • Static Equilibrium • Statically Determinate Truss • Stress Strain Curve • Surface Area • Tensile Testing Data • Test Sample Stress Strain Curve • Thermal Property • Translational Equilibrium Equation • Ultimate Strength • Vector Component • Vector Quantity • Volume • Weight • X Component • Y Component • Yield Point		
Differentiation	Support -- for students who are struggling with the content	<i>Note: Lessons for support will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015</i> <i>Content: Engineering Design, Matter and Its Interaction, Number and Quantity (Quantities), Algebra (Seeing Structures in Expressions), Geometry (Geometric Measurement and Dimension, Modeling with Geometry), Reading (Key Ideas and Details, Text Types and Purposes, Comprehension and Collaboration, and Conventions of Standard English)</i>	

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		Process: <i>Re-teaching, balanced group configurations, differentiated instruction, teacher's extra assistance, guided practice</i> Product: <i>Checking for Understanding tasks (i.e., exit slips, quick writes, feedback quizzes), re-testing, alternate assignments addressing the base-level standard mastery</i> Note: Lessons for extension will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015 Content: <i>Engineering Design, Matter and Its Interaction, Number and Quantity (Quantities), Algebra (Seeing Structures in Expressions), Geometry (Geometric Measurement and Dimension, Modeling with Geometry), Reading (Key Ideas and Details, Text Types and Purposes, Comprehension and Collaboration, and Conventions of Standard English)</i> Process: <i>Project-based learning in applying content to real-world type assignments</i> Product: <i>Enriched interdisciplinary projects tied to content standards and assessment outcomes for the unit</i>	
Evaluation	Extension – for high achieving students.	Formative Assessments (ongoing & mid-lesson): <i>Note: Formative Assessments will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015. Students demonstrate their knowledge throughout the course by completing activities, projects, and problems using a variety of assessment tools, such as performance rubrics and reflective questioning, to deepen and expand their knowledge and skills. In the future PLTW will provide teachers access to classroom assessments that can be used both for formative and summative purposes. Further details will be released to the network at the appropriate time. PLTW supports a balanced approach to assessment for all programs, integrating both formative and summative assessments. Through a balanced approach, assessment is an ongoing activity. Students demonstrate their knowledge throughout the course by completing activities, projects, and problems using a variety of assessment tools, such as performance rubrics and reflective questioning, to deepen and expand their knowledge and skills.</i> <i>Assessment FOR Learning- Formative assessment. Growth assessments are a system of assessments designed to help teachers realize each student's strengths and needs relative to the content being assessed. There are two different areas teachers can measure growth in (math and science). Armed with growth assessment data, teachers can adjust their instruction to increase their responsiveness to individual student differences and needs. Over time, repeated administration of growth assessments can create growth data which further informs teachers and students as to the gains that are being achieved.</i> Summative Assessments (unit final evaluation): <i>Note: Summative Assessments will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015. In the future PLTW will provide teachers access to classroom assessments that can be used both for formative and summative purposes. Further details will be released to the network at the appropriate time. PLTW supports a balanced approach to assessment for all programs, integrating both formative and summative assessments. Through a balanced</i>	

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	<i>approach, assessment is an ongoing activity. Students demonstrate their knowledge throughout the course by completing activities, projects, and problems using a variety of assessment tools, such as performance rubrics and reflective questioning, to deepen and expand their knowledge and skills.</i> • Assessment OF Learning- Summative assessment • Students are allowed 80 minutes total to complete an assessment. The test can be given in one 80 minute testing session or can be administered in two 40 minute testing periods. You should refer to the testing guidelines on the processes for delivering the assessments in one or two sessions. Lesson 2.1 Statics (14 days) Knowledge and Skills <i>It is expected that students will:</i> • Create free body diagrams of objects, identifying all forces acting on the object. • Mathematically locate the centroid of structural members. • Calculate moment of inertia of structural members. • Differentiate between scalar and vector quantities. • Identify magnitude, direction, and sense of a vector. • Calculate the X and Y components given a vector. • Calculate moment forces given a specified axis. • Use equations of equilibrium to calculate unknown forces. • Use the method of joints strategy to determine forces in the members of a statically determinate truss. Lesson 2.2 Material Properties (11 days) Knowledge and Skills <i>It is expected that students will:</i> • Investigate specific material properties related to a common household product. • Conduct investigative non-destructive material property tests on selected common household products. Property testing conducted to identify continuity, ferrous metal, hardness, and flexure. • Calculate weight, volume, mass, density, and surface area of selected common household products. • Identify the manufacturing processes used to create the selected common household product. • Identify the recycling codes. • Promote recycling using current media trends. Lesson 2.3 Material Testing (10 days) Knowledge and Skills		

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	<i>It is expected that students will:</i> • Utilize a five-step technique to solve word problems. • Obtain measurements of material samples. • Tensile test a material test sample. • Identify and calculate test sample material properties using a stress strain curve. Lesson 2.4 Design Problem – Materials and Structures (5 days) Knowledge and Skills <i>It is expected that students will:</i> • Brainstorm and sketch possible solutions to an existing design problem. • Create a decision making matrix for the design problem. • Select an approach that meets or satisfies the constraints given in a design brief. • Create a detailed pictorial sketch of use 3D modeling software to document the best choice, based upon your team's decision matrix. • Present a workable design solution.		

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Unit 3	Length of Unit: 46 days			
	Key Vocabulary	Standards (referenced)	Model Tasks	Tools / Texts
Control Systems	• Absolute Pressure • Absolute Temperature • Algorithm • Closed Loop System • Compressor • Control System • Cylinder • Flow Rate • Flow Velocity • Fluid Power System • Hydraulic • Hydraulic Device • Hydraulic System • Hydrodynamic System • Hydrostatic System • Mechanical Advantage • Open Loop System • Pascal's Law • Perfect Gas Laws • Pneumatic • Pneumatic Device	<u>Next Generation Science Standards</u> <u>Engineering Design</u> HS.ETS1.2 HS.ETS1.3 <u>Energy</u> HS.PS3.3 <u>CCSS for Math Practice</u> Number and Quantity <u>Quantities</u> N.Q.3	Lesson 3.1 – Machine Control Lesson 3.2 – Fluid Power HS.PS3.3 HS.ETS1.3 Lesson 3.3 – Design Problem – Control Systems HS.ETS1.2 HS.ETS1.3 N.Q.3	Principles of Engineering Handley, Coon, Marshall, ©2012 ISBN-13: 978-1-4354-2836-2 Principles of Engineering Handley, Coon, Marshall, ©2012 Workbook ISBN-13: 978-1-4354-2837-9 Instructor Resources ISBN-13: 978-1-4354-2838-6 CourseMate & eBook supplements available; please contact your Delmar representative for more information.

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	• Pneumatic System • Pressure • Pump • Receiver • Reservoir • Temperature • Valve			
Differentiation	Support -- for students who are struggling with the content	Note: Lessons for support will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015 Content: Engineering Design, Energy, Number and Quantity (Quantities) Process: Re-teaching, balanced group configurations, differentiated instruction, teacher's extra assistance, guided practice Product: Checking for Understanding tasks (i.e., exit slips, quick writes, feedback quizzes), re-testing, alternate assignments addressing the base-level standard mastery		
	Extension – for high achieving students.	Note: Lessons for extension will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015 Content: Engineering Design, Energy, Number and Quantity (Quantities) Process: Project-based learning in applying content to real-world type assignments Product: Enriched interdisciplinary projects tied to content standards and assessment outcomes for the unit		
Evaluation	Formative Assessments (ongoing & mid-lesson): Note: Formative Assessments will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015. Students demonstrate their knowledge throughout the course by completing activities, projects, and problems using a variety of assessment tools, such as performance rubrics and reflective questioning, to deepen and expand their knowledge and skills. In the future PLTW will provide teachers access to classroom assessments that can be used both for formative and summative purposes. Further details will be released to the network at the appropriate time. PLTW supports a balanced approach to assessment for all programs, integrating both formative and summative assessments. Through a balanced approach, assessment is an ongoing activity. Students demonstrate their knowledge throughout the course by completing activities, projects, and problems using a variety of assessment tools, such as performance rubrics and reflective questioning, to deepen and expand their knowledge and skills. Assessment FOR Learning- Formative assessment. Growth assessments are a system of assessments designed to help teachers realize each student's strengths and needs relative to the content being assessed. There are two different areas			

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	<i>teachers can measure growth in (math and science). Armed with growth assessment data, teachers can adjust their instruction to increase their responsiveness to individual student differences and needs. Over time, repeated administration of growth assessments can create growth data which further informs teachers and students as to the gains that are being achieved.</i> Summative Assessments (unit final evaluation): <i>Note: Summative Assessments will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015. In the future PLTW will provide teachers access to classroom assessments that can be used both for formative and summative purposes. Further details will be released to the network at the appropriate time. PLTW supports a balanced approach to assessment for all programs, integrating both formative and summative assessments. Through a balanced approach, assessment is an ongoing activity. Students demonstrate their knowledge throughout the course by completing activities, projects, and problems using a variety of assessment tools, such as performance rubrics and reflective questioning, to deepen and expand their knowledge and skills.</i> • Assessment OF Learning- Summative assessment • Students are allowed 80 minutes total to complete an assessment. The test can be given in one 80 minute testing session or can be administered in two 40 minute testing periods. You should refer to the testing guidelines on the processes for delivering the assessments in one or two sessions. Lesson 3.1 Machine Control (16 days) Knowledge and Skills <i>It is expected that students will:</i> • Create detailed flow charts utilizing a computer software application. • Create control system operating programs utilizing computer software. • Create system control programs that utilize flowchart logic. • Choose appropriate inputs and output devices based on the need of a technological system. • Differentiate between the characteristics of digital and analog devices. • Judge between open and closed loop systems in order to choose the most appropriate system for a given technological problem. • Design and create a control system based on given needs and constraints. Lesson 3.2 Fluid Power (15 days) Knowledge and Skills <i>It is expected that students will:</i> • Identify devices that utilize fluid power. • Identify and explain basic components and functions of fluid power devices. • Differentiate between the characteristics of pneumatic and hydraulic systems. • Distinguish between hydrodynamic and hydrostatic systems.		

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	• Design, create, and test a hydraulic device. • Design, create, and test a pneumatic device. • Calculate values in a fluid power system utilizing Pascal's Law. • Distinguish between pressure and absolute pressure. • Distinguish between temperature and absolute temperature. • Calculate values in a pneumatic system, utilizing the perfect gas laws. • Calculate flow rate, flow velocity, and mechanical advantage in a hydraulic system. Lesson 3.3 Design Problem – Control Systems (15 days) Knowledge and Skills <i>It is expected that students will:</i> • Brainstorm and sketch possible solutions to an existing design problem. • Create a decision-making matrix for a design problem. • Select an approach that meets or satisfies the constraints provided in a design brief. • Create a detailed pictorial sketch of use 3D modeling software to document the best choice, based upon the design team's decision matrix. • Present a workable solution to the design problem.		

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Unit 4	Length of Unit: 30 days			
	Key Vocabulary	Standards (referenced)	Model Tasks	Tools / Texts
Statistics and Kinematics	• Acceleration • Bayes' Theorem • Bernoulli Process • Central Tendency • Data Variation • Displacement • Distance • Experimental Data Analysis • Experimental Frequency Distribution • Frequency Distribution • Gravity • Histogram • Initial Velocity • Kinematic Equation • Logic • Mean • Median • Mode • Potential Energy • Probability • Projectile Motion • Propulsion • Range • Speed	<u>Next Generation Science Standards</u> <u>Energy</u> HS.PS3.3 <u>CCSS for Math Practice</u> Statistics and Probability <u>Interpreting Categorical And Quantitative Data</u> S.ID.1 S.ID.2 S.ID.3 S.ID.4 <u>Making Inferences And Justifying Conclusions</u> S.IC.1 S.IC.2 S.IC.4 <u>Conditional Probability And The Rules Of Probability</u> S.CP.1 S.CP.2 S.CP.3 S.CP.4 S.CP.5 S.CP.6 S.CP.7 S.CP.8 S.CP.9 <u>Using Probability To Make Decisions</u> S.MD.7	Lesson 4.1 – Statistics S.ID.1 S.ID.2 S.ID.3 S.ID.4 S.IC.1 S.IC.2 S.IC.4 S.CP.1 S.CP.2 S.CP.3 S.CP.4 S.CP.5 S.CP.6 S.CP.7 S.CP.8 S.CP.9 S.MD.7 Lesson 4.2 – Kinematics N.RN.2 N.Q.1 N.Q.2 N.Q.3 N.VM.1 N.VM.2 N.VM.3 A.SSE.1 A.SSE.1.a A.SSE.1.b A.CED.3 A.CED.4 A.REI.3 A.REI.4 F.TF.7	Principles of Engineering Handley, Coon, Marshall, ©2012 ISBN-13: 978-1-4354-2836-2 Principles of Engineering Handley, Coon, Marshall, ©2012 Workbook ISBN-13: 978-1-4354-2837-9 Instructor Resources ISBN-13: 978-1-4354-2838-6 CourseMate & eBook supplements available; please contact your Delmar representative for more information.

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	• <i>Standard Deviation</i> • <i>Statistics</i> • <i>Theoretical Data Analysis</i> • <i>Theoretical Probability</i> • <i>Variance</i> • <i>Velocity</i> Number and Quantity <u>The Real Number System</u> N.RN.2 <u>Quantities</u> N.Q.1 N.Q.2 N.Q.3 <u>Vector And Matrix Quantities</u> N.VM.1 N.VM.2 N.VM.3 Algebra <u>Seeing Structures in Expressions</u> A.SSE.1 A.SSE.1.a A.SSE.1.b <u>Creating Equations</u> A.CED.3 A.CED.4 <u>Reasoning with Equations and Inequalities</u> A.REI.3 A.REI.4 Functions <u>Trigonometric Functions</u> F.TF.7 Geometry <u>Similarity, Right Triangles, And Trigonometry</u> G.SRT.6 G.SRT.8	G.SRT.6 G.SRT.8 G.MG.3 S.ID.2 AS.W.5 AS.W.6 AS.W.7 AS.W.8 AS.W.9 AS.W.10 AS.SL.2 AS.L.1 AS.L.2 AS.L.6	

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		<u>Modeling with Geometry</u> G.MG.3 <u>CCSS for English Language Arts</u> Reading <u>Text Types and Purposes</u> AS.W.5 AS.W.6 AS.W.7 AS.W.8 AS.W.9 AS.W.10 <u>Comprehension and Collaboration</u> AS.SL.2 <u>Conventions of Standard English</u> AS.L.1 AS.L.2 AS.L.6	
Differentiation	Support -- for students who are struggling with the content	<i>Note: Lessons for support will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015</i> <i>Content: Energy, Statistics and Probability (Interpreting Categorical and Quantitative Data, Making Inferences and Justifying Conclusions, Conditional Probability and the Rules of Probability, Using Probability to Make Decisions), Number and Quantity (The Real Number System, Quantities, Vector and Matrix Quantities), Algebra (Seeing Structures in Equations, Creating Equations, Reasoning with Equations and Inequalities), Functions (Trigonometric Functions), Geometry (Similarity, Right Triangles, Trigonometry, Modeling with Geometry), Reading (Text Types and Purposes, Comprehension and Collaboration, Conventions of Standard English)</i> <i>Process: Re-teaching, balanced group configurations, differentiated instruction, teacher's extra assistance, guided practice</i> <i>Product: Checking for Understanding tasks (i.e., exit slips, quick writes, feedback quizzes), re-testing, alternate assignments addressing the base-level standard mastery</i>	
		<i>Note: Lessons for extension will be furnished to our teacher during intensive 2-week training at San</i>	

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Course Title	Principles Of Engineering (POE)		Course Code	K0355-K0356
	Extension – for high achieving students.	Diego State in Summer 2015 Content: <i>Energy, Statistics and Probability (Interpreting Categorical and Quantitative Data, Making Inferences and Justifying Conclusions, Conditional Probability and the Rules of Probability, Using Probability to Make Decisions), Number and Quantity (The Real Number System, Quantities, Vector and Matrix Quantities), Algebra (Seeing Structures in Equations, Creating Equations, Reasoning with Equations and Inequalities), Functions (Trigonometric Functions), Geometry (Similarity, Right Triangles, Trigonometry, Modeling with Geometry), Reading (Text Types and Purposes, Comprehension and Collaboration, Conventions of Standard English)</i> Process: <i>Project-based learning in applying content to real-world type assignments</i> Product: <i>Enriched interdisciplinary projects tied to content standards and assessment outcomes for the unit</i>		
Evaluation	Formative Assessments (ongoing & mid-lesson): <i>Note: Formative Assessments will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015. Students demonstrate their knowledge throughout the course by completing activities, projects, and problems using a variety of assessment tools, such as performance rubrics and reflective questioning, to deepen and expand their knowledge and skills. In the future PLTW will provide teachers access to classroom assessments that can be used both for formative and summative purposes. Further details will be released to the network at the appropriate time. PLTW supports a balanced approach to assessment for all programs, integrating both formative and summative assessments. Through a balanced approach, assessment is an ongoing activity. Students demonstrate their knowledge throughout the course by completing activities, projects, and problems using a variety of assessment tools, such as performance rubrics and reflective questioning, to deepen and expand their knowledge and skills.</i> <i>Assessment FOR Learning- Formative assessment. Growth assessments are a system of assessments designed to help teachers realize each student's strengths and needs relative to the content being assessed. There are two different areas teachers can measure growth in (math and science). Armed with growth assessment data, teachers can adjust their instruction to increase their responsiveness to individual student differences and needs. Over time, repeated administration of growth assessments can create growth data which further informs teachers and students as to the gains that are being achieved.</i> Summative Assessments (unit final evaluation): <i>Note: Summative Assessments will be furnished to our teacher during intensive 2-week training at San Diego State in Summer 2015. In the future PLTW will provide teachers access to classroom assessments that can be used both for formative and summative purposes. Further details will be released to the network at the appropriate time. PLTW supports a balanced approach to assessment for all programs, integrating both formative and summative assessments. Through a balanced approach, assessment is an ongoing activity. Students demonstrate their knowledge throughout the course by completing activities, projects, and problems using a variety of assessment tools, such as performance rubrics and reflective questioning, to deepen and expand their knowledge and skills.</i> Assessment OF Learning- Summative assessment			

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

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	- Students are allowed 80 minutes total to complete an assessment. The test can be given in one 80 minute testing session or can be administered in two 40 minute testing periods. You should refer to the testing guidelines on the processes for delivering the assessments in one or two sessions. Lesson 4.1 Statistics (5 days) Knowledge and Skills <i>It is expected that students will:</i> - Calculate the theoretical probability that an event will occur. - Calculate the experimental frequency distribution of an event occurring. - Apply the Bernoulli process to events that only have two distinct possible outcomes. - Apply AND, OR, and NOT logic to probability. - Apply Bayes' theorem to calculate the probability of multiple events occurring. - Create a histogram to illustrate frequency distribution. - Calculate the central tendency of a data array, including mean, median, and mode. - Calculate data variation, including range, standard deviation, and variance. Lesson 4.2 Kinematics (10 days) Knowledge and Skills <i>It is expected that students will:</i> - Calculate distance, displacement, speed, velocity, and acceleration from data. - Design, build, and test a vehicle that stores and releases potential energy for propulsion. - Calculate acceleration due to gravity given data from a free fall device. - Calculate the X and Y components of a projectile motion. - Determine the angle needed to launch a projectile a specific range given the projectile's initial velocity.		