MT. DIABLO UNIFIED SCHOOL DISTRICT
COURSE OF STUDY
DRAFT

COURSE TITLE:	**Introduction to Engineering Design**
COURSE NUMBER:	**007716**
CALPADS NUMBER:	**5573**
CST:	**None**
DEPARTMENT:	**Academies**
NCLB CREDENTIAL REQUIREMENTS:	**To be determined by the Credential Analyst in Personnel**
LENGTH OF COURSE:	**One Year**
CREDITS PER SEMESTER:	**5**
GRADE LEVEL(S):	**9^{th} – 12^{th}**
GRADUATION REQUIREMENT OR ELECTIVE:	**Elective**
PREREQUISITES:	**None**

BOARD OF EDUCATION ADOPTION:

COURSE DESCRIPTION:

Introduction to Engineering Design (IED) is a one year Project Lead the Way course in the Pathway to Engineering program. IED uses a design development process to enrich problem solving skills through a combination of activities-based, project-based, and problem-based (APPB) learning while creating and analyzing models using specialized computer software. APPB learning prepares students to: solve problems, participate as part of a team, lead teams, speak to a public audience, conduct research, understand real-world impacts, analyze data, and learn outside the classroom. High school students involved in PLTW strive to complete a minimum of the three foundation courses, one specialization course, and the capstone course. The Pathway To Engineering system works in any standard four-year sequence and prepares students for two- or four-year college studies in engineering and E/T by exposing them to the true scope of the field.

COURSE OUTLINE:

1. MAJOR GOALS

1.1 To develop the ability to reason logically and think spatially

1.2 To improve the skills necessary to be successful in multiple careers.

1.3 To use critical thinking skills to develop solutions to real life related situations.

1.4 To develop their knowledge base, stimulate creative ideas, and make informed decisions.

1.5 To communicate innovative solutions related to real life situations graphically, verbally, mathematically, and kinesthetically to targeted audiences.

1.6 To develop design processes and models using various techniques such as drawing, sketching, and computer modeling programs.

1.7 To gain an awareness of economics and resources and their impact on the global environment.

2. PERFORMANCE OBJECTIVES:

2.1 Engineering Design Pathway Standards

2.1.1 Recognize historical and current events related to engineering design and their effects on society (C1.0)

2.1.1.1 Know historical and current events that have relevance to engineering design. (C1.1):

2.1.1.2 Understand the development of graphic language in relation to engineering design. (C1.2)

2.1.2 Understand the effective use of engineering design equipment (C2.0):

2.1.2.1 Use the appropriate methods and techniques for employing all engineering design equipment. (C2.1)

2.1.2.2 Apply conventional engineering design process and procedures accurately, appropriately, and safely. (C2.2)

2.1.2.3 Apply the concepts of engineering design to the tools, equipment, projects, and procedures of the Engineering Design Pathway. (C2.3)

2.1.3 Understand measurement systems as they apply to engineering design (C3.0):

2.1.3.1 Know how the various measurement systems are used in engineering drawings. (C3.1)

2.1.3.2 Understand the degree of accuracy necessary for engineering design. (C3.2)

2.1.4 Use proper projection techniques to develop orthographic drawing (C4.0):

2.1.4.1 Understand the commands and concepts necessary for producing drawings through traditional or computer-aided means. (C4.1)

2.1.4.2 Understand the orthographic projection process for developing multiview drawings. (C4.2)

2.1.4.3 Understand the various techniques for viewing objects. (C4.3)

2.1.4.4 Use the concepts of geometric construction in the development of design drawings. (C4.4)

2.1.4.5 Apply pictorial drawings derived from orthographic multiview drawings and sketches and from a solid modeler. (C4.5)

2.1.5 Know various object-editing techniques and CADD programs (C5.0):
- **2.1.5.1** Understand the commands and concepts necessary for editing engineering drawings. (C5.1)
- **2.1.5.2** Know the various object-altering techniques. (C5.2)
- **2.1.5.3** Know the CADD components and the operational functions of the CADD systems. (C5.3)
- **2.1.5.4** Apply two-dimensional and three dimensional CADD operations in creating working and pictorial drawings, notes, and notations. (C5.4)
- **2.1.5.5** Understand how to determine properties of drawing objects. (C5.5)

2.1.6 Understand and apply proper dimensioning to drawing (C6.0):
- **2.1.6.1** Know a variety of drafting applications and understand the proper dimensioning styles for each. (C6.1)
- **2.1.6.2** Apply dimensioning to various objects and features. (C6.2)
- **2.1.6.3** Edit a dimension by using various editing methods. (C6.3)

2.1.7 Understand sectional view applications and functions (C7.0):
- **2.1.7.1** Understand the function of sectional views. (C7.1)
- **2.1.7.2** Use a sectional view and appropriate cutting planes to clarify hidden features of an object. (C7.2)

2.1.8 Understand the tolerance relationships between mating parts (C8.0):
- **2.1.8.1** Understand what constitutes mating parts in engineering design. (C8.1)
- **2.1.8.2** Use tolerancing in an engineering drawing. (C8.2)
- **2.1.8.3** Interpret geometric tolerancing symbols in drawing. (C8.3)

2.1.9 Understand the methods of inserting text into a drawing (C9.0):
- **2.1.9.1** Understand the process of lettering and text editing. (C9.1)
- **2.1.9.2** Develop drawings using notes and specifications. (C9.2)
- **2.1.9.3** Understand the methods of title block creation. (C9.3)

2.1.10 Understand the sketching process used in concept development (C10.0):
- **2.1.10.1** Understand the process of producing proportional two- and three-dimensional sketches and designs. (C10.1)
- **2.1.10.2** Use sketching techniques as they apply to a variety of architectural and engineering models. (C10.2)
- **2.1.10.3** Use freehand graphic communication skills to represent conceptual ideas, analysis, and design concepts. (C10.3)

2.1.11 Understand the methods of creating both written and digital portfolios (C11.0):
- **2.1.11.1** Develop a binder of representative student work for presentation. (C11.1)
- **2.1.11.2** Produce a compact disc, Web site, or other digital-media portfolio. (C11.2)

2.1.11.3 Know how to given an effective oral presentation of a portfolio. (C11.3)

2.2 Foundation Standards

2.2.1 Mathematics -Specific applications of Mathematical Reasoning standards (grade seven):

2.1.1.1 Apply strategies and results from simpler problems to more complex problems. (2.2)

2.1.1.2 Make and test conjectures by using both inductive and deductive reasoning. (2.4)

2.1.1.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning. (2.5)

2.1.1.4 Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work. (2.6)

2.1.1.5 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy. (2.7)

2.1.1.6 Make precise calculations and check the validity of the results from the context of the problem. (2.8)

2.1.1.7 Evaluate the reasonableness of the solution in the context of the original situation. (3.1)

2.1.1.8 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems. (3.2)

2.1.1.9 Develop generalizations of the results obtained and the strategies used and apply them to new problem situations. (3.3)

Specific applications of Algebra I standards (grades eight through twelve):

2.1.1.10 Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents. (2.0)

2.1.1.11 Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step. (5.0)

2.1.1.12 Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems. (15.0)

Specific applications of Geometry standards (grades eight through twelve):

2.1.1.13 Students use the Pythagorean theorem to determine distance and find missing lengths of sides of right triangles. (15.0)

2.1.1.14 Students use trigonometric functions to solve for an unknown length of a side of a right triangle, given an angle and a length of a side. (19.0)

2.2.2 Science

Specific applications of Investigation and Experimentation standards (grades nine through twelve):

2.2.2.1 Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data. (1.a)

2.2.2.2 Formulate explanations by using logic and evidence. (1.d)

2.2.2.3 Analyze situations and solve problems that require combining and applying concepts from more than one area of science. (1.l)

2.2.3 History Social Science

Specific applications of World History, Culture, and Geography: The Modern World standards (grade ten):

2.2.3.1 Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States. (10.3)

2.2.3.2 Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy. (10.3.5)

2.3 Communications: Understand the principles of effective oral, written, and multimedia communication in a variety of formats and contexts.

2.3.1 Reading

Specific applications of Reading Comprehension standards (grades nine and ten):

2.3.1.1 Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents. (2.2)

2.3.1.2 Demonstrate use of sophisticated learning tools by following technical directions (e.g., those found with graphic calculators and specialized software programs and in access guides to World Wide Web sites on the Internet). (2.6)

2.3.2 Writing

Specific applications of Writing Strategies and Applications standards (grades nine and ten):

2.3.2.1 Use clear research questions and suitable research methods (e.g., library, electronic media, personal interview) to elicit and present evidence from primary and secondary sources. (1.3)

2.3.2.2 Develop the main ideas within the body of the composition through supporting evidence (e.g., scenarios, commonly held beliefs, hypotheses, definitions). (1.4)

2.3.2.3 Use appropriate conventions for documentation in the text, notes, and bibliographies by adhering to those in style manuals (e.g., *Modern Language Association Handbook, The Chicago Manual of Style).* (1.7)

2.3.2.4 Design and publish documents by using advanced publishing software and graphic programs. (1.8)

2.3.2.5 Write technical documents (e.g., a manual on rules of behavior for conflict resolution, procedures for conducting a meeting, minutes of a meeting(2.6):

a. Report information and convey ideas logically and correctly.
b. Offer detailed and accurate specifications.
c. Include scenarios, definitions, and examples to aid comprehension
(e.g., troubleshooting guide).
d. Anticipate readers' problems, mistakes, and misunderstandings.

Specific applications of Writing Strategies and Applications standards (grades eleven and twelve):

2.3.2.6 Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources). (1.6)

2.3.2.7 Integrate databases, graphics, and spreadsheets into word-processed documents. (1.8)

2.3.2.8 Deliver multimedia presentations (2.6):

a. Combine text, images, and sound and draw information from many sources (e.g., television broadcasts, videos, films, newspapers, magazines, CD-ROMs, the Internet, electronic media-generated images).
b. Select an appropriate medium for each element of the presentation.
c. Use the selected media skillfully, editing appropriately and monitoring for quality.
d. Test the audience's response and revise the presentation accordingly.

2.3.3 Listening and Speaking

Specific applications of Listening and Speaking Strategies and Applications standards (grades nine and ten):

2.3.3.1 Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations. (1.7)

2.3.3.2 Produce concise notes for extemporaneous delivery. (1.8)

2.3.3.3 Evaluate the clarity, quality, effectiveness, and general coherence of a speaker's important points, arguments, evidence, organization of ideas, delivery, diction, and syntax. (1.12)

2.3.3.4 Deliver expository presentations(2.2):

a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives.
b. Convey information and ideas from primary and secondary sources accurately and coherently.
c. Make distinctions between the relative value and significance of specific data, facts, and ideas.
d. Include visual aids by employing appropriate technology to organize and display information on charts, maps, and graphs.
e. Anticipate and address the listener's potential misunderstandings, biases, and expectations.
f. Use technical terms and notations accurately.

Specific applications of Listening and Speaking Strategies and Applications standards (grades eleven and twelve):

2.3.3.5 Use effective and interesting language, including (1.8.):

a. Informal expressions for effect
b. Standard American English for clarity
c. Technical language for specificity

2.3.3.6 Evaluate when to use different kinds of effects (e.g., visual, music, sound, graphics) to create effective productions. (1.10)

2.3.3.7 Deliver multimedia presentations (2.4):

a. Combine text, images, and sound by incorporating information from a wide range of media, including films, newspapers, magazines, CD-ROMs, online information, television, videos, and electronic media-generated images.
b. Select an appropriate medium for each element of the presentation.
c. Use the selected media skillfully, editing appropriately and monitoring for quality.
d. Test the audience's response and revise the presentation accordingly.

2.3.3.8 Multimedia

Understand the importance of technical and computer-aided design and drawing technologies essential to the language of the engineering and design industry, including reading, writing, interpreting, and creating drawings, sketches, and schematics using

engineering and design industry conventions and standards; interpreting and understanding detailed information provided from available technical documents, both print and electronic, and from experienced people; and using computers, calculators, multimedia equipment, and other devices in a variety of applications.

2.4 **Career Planning and Management:** Understand how to make effective decisions, use career information, and manage personal career plans:

- **2.4.1** Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in a career. (3.1)
- **2.4.2** Understand the past, present, and future trends that affect careers, such as technological developments and societal trends, and the resulting need for lifelong learning. *(3.5)*

2.5 **Technology:** Know how to use contemporary and emerging technological resources in diverse and changing personal, community, and workplace environments:

- **2.5.1** Understand past, present, and future technological advances as they relate to a chosen pathway. (4.1)
- **2.5.2** Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services. (4.2)

2.6 **Problem Solving and Critical Thinking:** Understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques:

- **2.6.1** Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks. (5.1)
- **2.6.2** Understand the systematic problem-solving models that incorporate input, process, outcome, and feedback components. (5.2)
- **2.6.3** Use critical thinking skills to make informed decisions and solve problems. (5.3)

2.7 **Responsibility and Flexibility:** Know the behaviors associated with the demonstration of responsibility and flexibility in personal, workplace, and community settings:

- **2.7.1** Understand the qualities and behaviors that constitute a positive and professional work demeanor. (7.1)
- **2.7.2** Understand the importance of accountability and responsibility in fulfilling personal, community, and workplace roles. (7.2)
- **2.7.3** Understand the need to adapt to varied roles and responsibilities. (7.3)
- **2.7.4** Understand that individual actions can affect the larger community. (7.4)

2.8 **Ethics and Legal Responsibilities:** Understand professional, ethical, and legal behavior consistent with applicable laws, regulations, and organizational norms:

2.8.1 Understand the concept and application of ethical and legal behavior consistent with workplace standards. (8.2)

2.8.2 Understand the role of personal integrity and ethical behavior in the workplace. (8.3)

2.9 **Leadership and Teamwork**: Understand effective leadership styles, key concepts of group dynamics, team and individual decision making, the benefits of workforce diversity, and conflict resolution:

2.9.1 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace settings. (9.1)

2.9.2 Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals. (9.3)

2.9.3 Know multiple approaches to conflict resolution and their appropriateness for a variety of situations in the workplace. (9.4)

2.9.4 Understand how to interact with others in ways that demonstrate respect for individual and cultural differences and for the attitudes and feelings of others. (9.5)

2.9.5 *Understand how to organize, conduct, lead, and participate in student-centered activities and events through student-based organizations. (9.6)*

2.10 **Technical Knowledge and Skills:** Understand the essential knowledge and skills common to all pathways in the Engineering and Design sector:

2.10.1 Use and maintain industrial and technological products and systems. (10.1)

2.10.2 Understand the importance of technical and computer-aided technologies essential to the language of the engineering and design industry. (10.2)

2.10.3 Acquire, store, allocate, and use materials and space efficiently. (10.4)

2.10.4 Understand the role of the engineering and design industry in the California economy. (10.5)

2.10.5 Understand and apply the appropriate use of quality control systems and procedures. (10.6)

2.11 **Demonstration and Application**: Demonstrate and apply the concepts contained in the foundation and pathway standards

3 CONTENT OUTLINE:

3.1 Introduction to a Design Process

3.1.1 There are many design processes that guide professionals in developing solutions to problems.

3.1.2 A design process most used by engineers includes defining a problem, brainstorming, researching, identifying requirements, exploring possibilities, selecting an approach, developing a design

proposal, making a model or prototype, testing, refining, making, and communicating results.

3.1.3 Design teams use brainstorming techniques to generate large numbers of ideas in short time periods.

3.1.4 Engineers conduct research to develop their knowledge base, stimulate creative ideas, and make informed decisions.

3.1.5 A designer uses an engineer's notebook to chronologically document all aspects of a design project.

3.2 Introduction to Technical Sketching and Drawing

3.2.1 Engineers create sketches to quickly record, communicate, and investigate ideas.

3.2.2 Pictorials and tonal shading techniques are used in combination to give sketched objects a realistic look.

3.2.3 Designers use isometric, oblique, perspective, and multiview sketching to maintain an object's visual proportions.

3.2.4 A multiview projection is the most common method of communicating the shape and size of an object that is intended for manufacture.

3.3 Measurement and Statistics

3.3.1 Measurement systems were developed out of the need for standardization.

3.3.2 Engineers apply dimensions to drawings to communicate size information.

3.3.3 Manufactured parts are often created in different countries, where dimensional values are often converted from one standard unit to another.

3.3.4 The amount of variation that can be measured depends on the precision of the measuring tool.

3.3.5 Statistical analysis of measurements can help to verify the quality of a design or process.

3.3.6 Engineers use graphics to communicate patterns in recorded data.

3.4 Puzzle Cube

3.4.1 Three- dimensional forms are derived from two-dimensional shapes.

3.4.2 The results of the design process are commonly displayed as a physical model.

3.4.3 Engineers develop models to communicate and evaluate possible solutions.

3.4.4 Geometric and numeric constraints are used to define the shape and size of objects in Computer Aided Design (CAD) modeling systems.

3.4.5 Engineers use CAD modeling systems to quickly generate and annotate working drawings.

3.4.6 Packaging not only protects a product, but contributes to that product's commercial success.

3.5 Geometric Shapes and Solids

3.5.1 Geometric shapes describe the two or three dimensional contours that characterize an object.

3.5.2 The properties of volume and surface area are common to all designed objects and provide useful information to the engineer.

3.5.3 CAD systems are used to increase productivity and reduce design costs.

3.5.4 Solid CAD models are the result of both additive and subtractive processes.

3.6 Dimensions and Tolerances

3.6.1 Working drawings should contain only the dimensions that are necessary to build and inspect an object.

3.6.2 Object features require specialized dimensions and symbols to communicate technical information, such as size.

3.6.3 There is always a degree of variation between the actual manufactured object and its dimensioned drawing.

3.6.4 Engineers specify tolerances to indicate the amount of dimensional variation that may occur without adversely affecting an object's function.

3.6.5 Tolerances for mating part features are determined by the type of fit.

3.7 Advances Modeling Skills

3.7.1 Solid modeling programs allow the designer to create quality designs for production in far less time than traditional design methods.

3.7.2 Engineers use CAD models, assemblies, and animations to check for design problems, verify the functional qualities of a design, and communicate information to other professionals and clients.

3.7.3 Auxiliary views allow the engineer to communicate information about an object's inclined surfaces that appear foreshortened in basic multiview drawings.

3.7.4 Designers use sectional views to communicate an object's interior features that may be difficult to visualize from the outside.

3.7.5 As individual objects are assembled together, their degrees of freedom are systematically removed.

3.7.6 Engineers create mathematical formulas to establish geometric and functional relationships within their designs.

3.7.7 A title block provides the engineer and manufacturer with important information about an object and its creator.

3.7.8 A parts list and balloons are used to identify individual components in an assembly drawing.

3.8 Advanced Designs

3.8.1 Design solutions can be created as an individual or in teams.

3.8.2 Engineers use design briefs to explain the problem, identify solution expectations, and establish project constraints.

3.8.3 Teamwork requires constant communication to achieve the goal at hand.

3.8.4 Engineers conduct research to develop their knowledge base, stimulate creative ideas, and make informed decisions.

3.8.5 Engineers use a design process to create solutions to existing problems.

3.8.6 Engineers use CAD modeling systems to quickly generate and annotate working drawings.

3.8.7 Fluid Power Concepts could be used to enhance design solutions.

3.9 Visual Analysis

3.9.1 Visual design principles and elements constitute an aesthetic vocabulary that is used to describe any object independent of its formal title, structural, and functional qualities.

3.9.2 Tangible design elements are manipulated according to conceptual design principles

3.9.3 Aesthetic appeal results from the interplay between design principles and elements.

3.9.4 Though distinctly different, a design's visual characteristics are influenced by its structural and functional requirements.

3.9.5 Visual appeal influences a design's commercial success.

3.9.6 Graphic designers are concerned with developing visual messages that make people in a target audience respond in a predictable and favorable manner.

3.10 Functional Analysis

3.10.1 Mechanisms use simple machines to move loads through the input of applied effort forces.

3.10.2 Engineers perform reverse engineering on products to study their visual, functional, and structural qualities.

3.10.3 Through observation and analysis, a product's function can be divided into a sequence of operations.

3.10.4 Products operate as systems, with identifiable inputs and outputs.

3.11 Structural Analysis

3.11.1 Objects are held together by means of joinery, fasteners, or adhesives.

3.11.2 Precision measurement tools and techniques are used to accurately record an object's geometry.

3.11.3 Operational conditions, material properties, and manufacturing methods help engineers determine the material makeup of a design.

3.11.4 Engineers use reference sources and computer-aided design (CAD) systems to calculate the mass properties of designed objects.

3.12 Product Improvement By Design

3.12.1 Engineers analyze designs to identify shortcomings and opportunities for innovation.

3.12.2 Design teams use brainstorming techniques to generate large numbers of ideas in short time periods.

3.12.3 Engineers use decision matrices to help make design decisions that are based on analysis and logic.

3.12.4 Engineers spend a great deal of time writing technical reports to explain project information to various audiences.

3.13 Engineering Design Ethics

3.13.1 The material of a product, how the material is prepared for use, its durability, and ease of recycling all impact a product's design, marketability, and life expectancy.

3.13.2 All products made, regardless of material type, may have both positive and negative impacts.

3.13.3 In addition to economics and resources, manufacturers must consider human and global impacts of various manufacturing process options.

3.13.4 Laws and guidelines have been established to protect humans and the global environment.

3.13.5 A conscious effort by product designers and engineers to investigate the recyclable uses of materials will play a vital role in the future of landfills and the environment.

3.14 Design Teams

3.14.1 Teams of people can accomplish more than one individual working alone.

3.14.2 Design teams establish group norms through brainstorming and consensus to regulate proper and acceptable behavior by and between team members.

3.14.3 Engineers develop Gantt charts to plan, manage, and control a design team's actions on projects that have definite beginning and end dates.

3.14.4 Virtual teams rely on communications other than face-to-face contact to work effectively to solve problems.

3.14.5 Each team member's strengths are a support mechanism for the other team members' weaknesses.

3.14.6 Conflict between team members is a normal occurrence, and can be addressed using formal conflict resolution strategies.

4. INSTRUCTIONAL METHODS AND /OR STRATEGIES:

4.1 Lecture and demonstration
4.2 Bloom's Taxonomy and Maslow's Hierarchy of Needs
4.3 Modeling
4.4 Sketching for planning and presentation
4.5 Engineering journal, notes, drawings and plans
4.6 Opportunity to build reading and writing skills
4.7 Vocabulary building skills
4.8 Use research based student engagement strategies such as SDAIE
4.9 Portfolio
4.10 Computer Technology and instruction
4.11 Group and individual activities
4.12 Guest speakers

4.13 Fieldtrips

5. TIME ESTIMATES:

5.1 Instructional sequences vary in length from a few days to several weeks.

6. INSTRUCTIONAL MATERIALS:

6.1 District adopted textbooks
6.2 Supplementary and teacher-created materials that may include a career focus
6.3 Technology materials
6.4 Project Lead the Way materials

Sample Lesson Plan (using backward planning model)
Sample Lesson: Design Process (lesson 3.1)
Standard to be taught:

Mathematics (seventh grade standards): 2.5, 2.6, 2.7, 2.8, 3.1
Science: 1.1 1.1d
History: 10.3
Communication: Writing: 1.3, 1.7, 2.6
Listening: 1.7, 1.8, 2.4
Reading:
Technology: 4.1, 4.2
Problem-Solving and Critical Solving: 5.1, 5.2, 5.3

Assessment:

1. Students will be assessed on the accuracy and completeness of term definitions and notes on design process recorded in their lab notebooks.
2. Students will be evaluated on their responses to essential and key questions
- What is the most efficient way to solve a problem?
- You have been asked to design a new sneaker. What are some of the questions you would ask in order to refine your task?

3. Students will be evaluated on the completion and thoroughness of Invention Card.
4. Students will be evaluated on their PowerPoint presentation on the application of product development lifecycle.

Teaching strategies:

1. Introductory PowerPoint lesson on the design process and the concept of the Product
Development Lifecycle chart.
2. Introduction of the key questions and assigns a due date for the unit
3. Student centered problem based learning with teacher intervention through question
and answer exchanges

Student activities:

1. Students will begin researching the essential questions regarding the design process
2. Students create a PowerPoint Presentation from their research and present their findings to their peers and instructor.
3. Students define important definitions and concepts related to anticipatory set and keep detailed notes of their research.

Resources:

1. Project Lead The Way Curriculum
2. PowerPoints
3. Word Documents

7. EVALUATION OF STUDENT PROGRESS:

Students communicate mathematically and demonstrate content knowledge in a variety of ways that lead to mathematical competence in their chosen careers.

7.1 Teacher observation
7.2 Written assignments and projects
7.3 Quizzes and tests
7.4 Rubrics
7.5 Peer Review
7.6 Panel Review

Committee Members:

1.	Melinda Hall	Director of Curriculum & Instruction	Curriculum & Instruction
2.	Spoogmai Habibi	Curriculum Specialist	Curriculum & Instruction
3.	Danielle McReynolds Dell	Math Teacher	Clayton Valley High School
4.	Ryan Leuschen	Math Teacher	Mt. Diablo High School