PLTW Introduction to Engineering Design
Unit 1 Framework

PLTW Framework - Overview

PLTW Unit Frameworks provide an overview of the levels of understanding that each build upon the higher level: Knowledge and Skills, Objectives, Domains, and Competencies. The most fundamental level of learning is defined by course Knowledge and Skills statements. Each Knowledge and Skills statement reflects specifically what students will know and be able to do after they've had the opportunity to learn the course content. Students apply Knowledge and Skills to achieve learning Objectives, which are skills that directly relate to the workplace or applied academic settings. Objectives are organized by higher-level Domains.

Essential Questions

1.1 - 1 What are effective ways to generate potential solutions to a problem?

1.1 - 2 When solving an engineering problem, how can you reasonably ensure you have created the best solution possible?

1.1 - 3 How is technical drawing similar to and different from artistic drawing?

1.1 - 4 In what ways can technical drawings help or hinder communication in a global community?

1.2 - 1 Why are spatial visualization skills crucial to engineering success?

1.2 - 2 What advantages does Computer-Aided Design (CAD) provide over traditional paper and pencil design?

1.2 - 3 What advantages does paper and pencil design provide over CAD?

1.2 - 4 What would happen if engineers did not follow accepted dimensioning standards and guidelines, but instead, used their own individual dimensioning methods?

1.2 - 5 What limitations do models have?

1.3 - 1 Why is error unavoidable when making a measurement?

1.3 - 2 Can statistics be interpreted to justify conflicting viewpoints? Can this affect how you use statistics to inform, justify, and validate a problem solution?

1.3 - 3 Why do engineers use models? How reliable is a model?

1.4 - 1 Is it ever advantageous to create a design or solve a problem individually as opposed to using a team approach?

1.4 - 2 What does consensus mean, and how do teams use consensus to make decisions?

Competencies, Domains, Objectives, Knowledge and Skills

Transportable Knowledge and Skills

Core workplace skills that students and workers need to acquire, that can be used across all stages of a career, and that, because of their universal utility, are transportable from job to job, from employer to employer, across the economy.

Career Readiness (CAR):

STEM professionals use professional skills and knowledge to pursue opportunities and create sustainable solutions to improve and enhance the quality of life of individuals and society.

CAR-A. Demonstrate awareness of the education and skills required for professional practice in an engineering field.

CAR-A.1 Define engineering as the creation of solutions, such as new and improved products, technologies, systems and processes), to meet the needs of people and society.

APB:

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CAR-A.2 Identify technical and nontechnical skills common to all engineering disciplines that are gained from specialized and intense education, training, and experience, including problem-solving, the design process, data processing and interpretation, handling uncertainty, systems thinking, and modeling.

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Competencies, Domains, Objectives, Knowledge and Skills

CAR-B. Analyze the role of engineering professionals in society.

CAR-B.1 Describe the discipline of mechanical engineering and a variety of sub-disciplines and technical roles related to mechanical engineering

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CAR-B.2 Identify and describe contemporary engineering issues of local, global and cultural significance.

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Communication (COM):

Successful engineering professionals demonstrate effective communication with a variety of audiences using multiple modalities.

COM-A. Communicate effectively with an audience based on audience characteristics.

COM-A.1 According to best practices, effectively document engineering or scientific work in an organized notebook so someone unfamiliar with the work can follow and understand the process.

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COM-A.2 Use sketches, tables, charts, and graphs when appropriate to clearly communicate information and in making arguments and claims in oral, written, and visual presentations.

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COM-A.3 Initiate and participate in a range of open and effective interactions (one-on-one, in groups, and teacher-led) with diverse participants and across cultures, building on others' ideas and expressing one's own clearly and persuasively.

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COM-A.4 Present information, findings, and supporting evidence clearly, concisely, and logically in writing in which the development, organization, and style are appropriate to task, purpose, and audience.

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COM-A.5 Present information, findings, and supporting evidence clearly, concisely, and logically, such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

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Collaboration (COL):

Successful engineering professionals demonstrate an ability to function on multidisciplinary teams.

COL-A. Facilitate an effective team environment to promote successful goal attainment.

COL-A.3 Develop ideas and create products through positive interdependence among all teammates.

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COL-B. Contribute individually to overall collaborative efforts.

COL-B.4 Critically and realistically self-evaluate personal contributions and collaboration effectiveness within a team. [ongoing]

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Competencies, Domains, Objectives, Knowledge and Skills

Ethical Reasoning and Mindset (ERM):

Successful engineering professionals exhibit personal and professional characteristics and behaviors that involve considerations of the impact of their work on individuals, society, and the natural world.

ERM-B. Consider the impact of potential engineering solutions on future generations to inform the development of sustainable solutions.

ERM-B.1 Explain that different engineering solutions can have significantly different impacts on individuals, society, and the natural world.

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Critical and Creative Problem-Solving (CCP):

The skills necessary for students to generate ideas and solutions to problems.

CCP-A. Demonstrate independent thinking and self-direction in pursuit of accomplishing a goal.

CCP-A.2 Plan and use time effectively in pursuit of accomplishing a goal without direct oversight.

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Competencies, Domains, Objectives, Knowledge and Skills

CCP-B. Demonstrate curiosity, creativity, flexibility, and adaptability to change.

CCP-B.2 Seek out and use feedback to improve work and positively influence one's personal and professional development.

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CCP-B.3 Reflect critically on past experiences to inform future progress.

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CCP-B.4 Successfully adjust to changes that impact work. Adapt to varied roles, job responsibilities, and schedules.

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Competencies, Domains, Objectives, Knowledge and Skills

CCP-C. Persevere to solve a problem or achieve a goal.

CCP-C.1 Demonstrate risk taking in engineering, scientific, or computational processes.

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CCP-C.2 Demonstrate persistence in accomplishing a difficult challenge.

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CCP-D. Make judgments and decisions based on evidence.

CCP-D.2 Collect, analyze, and interpret information relevant to the problem or opportunity at hand to support engineering decisions.

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Competencies, Domains, Objectives, Knowledge and Skills

CCP-E. Apply an iterative design process to creatively address a need or solve a problem.

CCP-E.2 Define measurable visual, functional, and structural design requirements (criteria) and realistic constraints against which solution alternatives can be evaluated and optimized. [Note that criteria and constraints should include considerations of cost, safety, reliability, manufacturability, and aesthetics, as well as possible social, cultural, and environmental impacts.]

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CCP-E.3 Apply effective techniques and appropriate guidelines to generate multiple creative ideas and potential solutions to a problem.

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CCP-E.4 Carry out a plan to compare competing solution ideas and justify the selection of a solution path with respect to design requirements and constraints.

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Competencies, Domains, Objectives, Knowledge and Skills

CCP-E.5 Develop a potential solution and implement a plan to test and evaluate the solution with respect to design criteria and constraints.

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CCP-E.6 Identify design flaws of and potential enhancements to a proposed design solution.

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CCP-E.7 Strategically iterate steps of the design process to improve and optimize a solution.

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Competencies, Domains, Objectives, Knowledge and Skills

CCP-F. Design and perform an experimental protocol to investigate a phenomenon and/or gain knowledge.

CCP-F.1 Develop a testable hypothesis, experimental controls and important variables (independent and dependent) address a problem or answer a question.

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CCP-F.2 Identify best strategies and appropriate tools for data collection, documentation, and analysis.

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CCP-G. Use appropriate statistical methods and visualization techniques to justify claims based on evidence.

CCP-G.1 Graphically represent experimental data for a single count or measurement with charts and/or plots on the real number line, such as dot plots, box plots and histograms.

APB:

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Competencies, Domains, Objectives, Knowledge and Skills

CCP-G.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range) of two or more different data sets. Interpret differences in shape, center, and spread in the context of the data sets.

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CCP-G.3 Apply inferential reasoning to make and/or support claims about populations based on data.

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CCP-G.4 Draw conclusions related to the hypothesis and support conclusions using experimental data.

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Competencies, Domains, Objectives, Knowledge and Skills

CCP-H. Apply project management tools when designing and developing a solution to successfully deliver a product using available resources.

CCP-H.1 Define the project deliverables and constraints, such as scope, time, cost, quality, resources, and risk.

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CCP-H.2 Develop a project schedule (with the critical path identified when appropriate), allocate tasks among team members, and track progress for successful completion of the project.

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☐	☐	☐	☐	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☐	☐	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☐	☐	☐	☐

1.4.1
☑

CCP-K. Analyze and evaluate the work of others to provide helpful feedback.

CCP-K.1 Describe the purpose and positive outcomes of a peer review process.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☑	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☐	☐	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☐	☐	☐	☐

1.4.1
☐

CCP-K.2 Provide effective feedback to peers.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☑	☐	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☑	☐	☑	☑	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☑	☐	☐	☐

1.4.1
☑

CCP-M. Optimize performance of a mechanical part or assembly.

CCP-M.2 Define basic fabrication processes and analyze if a product can be built as designed.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☐	☐	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☐	☐	☐	☑

1.4.1
☐

Competencies, Domains, Objectives, Knowledge and Skills

Technical Knowledge and Skills

Every career field requires technical literacy and career-specific knowledge and skills to support professional pratice.

Algorithms and Programming (AAP):

Computational thinking is a critical part of a problem-solving process that supports the ability to interpret complex, open-ended problems across all disciplines.

AAP-B. Use algorithms to create a solution with or without the use of a computer program.

AAP-B.1 Use existing correct algorithms as building blocks for constructing a new algorithm to help ensure the new algorithm is correct.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☑	☐	☑	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☐	☐	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☐	☐	☐	☐

1.4.1
☐

AAP-D. Collect, organize, and analyze data to help define and/or solve a problem.

AAP-D.1 Populate a spreadsheet application with data and organize the data to be useful in accomplishing a specific goal.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☑	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☐	☐	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☐	☐	☐	☐

1.4.1
☑

AAP-D.2 Use the functions and tools within a spreadsheet application to manipulate, analyze, and present data in a useful way, including graphs, regression analyses, and descriptive statistical analyses.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☑	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☐	☐	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☐	☐	☐	☐

1.4.1
☐

AAP-E. Apply abstraction to generalize problems and solutions.

AAP-E.1 Identify what has been made more general by an abstraction and what details have been hidden or removed.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5		
☐	☐	☐	☐	☐		
1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	
☐	☐	☐	☐	☐	☑	
1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☐	☐	☐	☐
1.4.1						
☐						

Engineering Tools and Technology (ETT):

The practice of engineering requires the application of mathematical principles and common engineering tools, techniques, and technologies.

ETT-A. Using a variety of measuring devices, measure and report quantities accurately and to a precision appropriate for the purpose.

ETT-A.1 Explain that all measurements are an approximation of the true value of a quantity.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5		
☐	☐	☐	☑	☐		
1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	
☐	☐	☐	☐	☐	☐	
1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☑	☐	☐	☐	☐	☐	☐
1.4.1						
☐						

ETT-A.2 Describe the accuracy and precision of a measurement or measuring device and differentiate between the two.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5		
☐	☐	☐	☑	☑		
1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	
☐	☐	☐	☐	☐	☐	
1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☑	☐	☐	☐	☐	☐	☐
1.4.1						
☐						

ETT-A.3 Use dimensional analysis and unit conversions to transform data to consistent units or to units appropriate for a particular purpose or model.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☑	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☐	☐	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☑	☐	☐	☐	☐	☐	☐

1.4.1
☐

ETT-A.4 Choose a measurement device based on the level of precision and accuracy needed.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☐	☐	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☑	☑	☐	☐	☐	☐	☐

1.4.1
☐

Competencies, Domains, Objectives, Knowledge and Skills

Modeling (MOD):

Modeling is used to represent ideas and simulate objects, processes, or systems to help us understand, evaluate, and predict the behavior of real phenomena.

MOD-A. Develop models and simulations to represent information, processes, and/or objects to an appropriate level of abstraction for the intended purpose.

MOD-A.1 Recognize that models use abstraction to represent a simplified version of a complex phenomenon and there is no guarantee that the Recognize that models use abstraction to represent a simplified version of a complex phenomenon and there is no guarantee that the model accurately represents the real object or phenomenon. List differences (potential or real) between model behavior and the behavior of the real object, system, or process that it represents, and identify limitations of the model. (Limitations may include specific characteristics being studied, accuracy, precision, range of conditions, and so on.)

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☐	☐	☑	☑

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☐	☐	☐	☑

1.4.1
☐

MOD-A.2 Develop a model to accurately represent information or important characteristics of an object, data, process, or design idea for an intended purpose. [Notes on scope: the intended purpose may vary and could include organizing information to show relationships; providing a visual representation of the object/design to demonstrate how the object might “look”; a functional model to demonstrate the operation; a prototype of a specific component to test fit, performance, durability, or compatibility with other components in a system; and so on. The model could be a conceptual model, a mathematical model, a computer/virtual model, or a physical model, as appropriate for the testing scenario.]

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☑	☐	☑	☑	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☑	☐	☐	☐	☑	☑

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☑	☑	☐	☐	☑	☑

1.4.1
☑

Competencies, Domains, Objectives, Knowledge and Skills

MOD-B. Apply mathematical (including graphical) models and interpret the output of models to test ideas or make predictions.

MOD-B.1 Build and/or use a mathematical model (algorithm, table of values, equation, graph) to represent data, describe relationships, describe processes, and to make predictions in the context of the problem. For example: create displacement/time graphs (Cartesian); create polar graphs to describe displacement caused by a cam (and cam shape).

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☑	☑

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☐	☐	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☐	☐	☐	☐

1.4.1
☐

MOD-C. Use engineering graphics to represent physical objects.

MOD-C.1 Identify three-dimensional objects generated by rotation of a two-dimensional object.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☐	☐	☑	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☐	☐	☐	☐

1.4.1
☐

MOD-C.2 Build a physical representation of an object or system based on graphical representations of the object or system. (Includes building solid objects, electrical circuits, mechanical devices, and complex systems according to technical drawings.)

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☑	☐	☐	☑

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☐	☐	☐	☐

1.4.1
☑

MOD-C.3 Hand sketch isometric views of a simple object or part at a given scale using the actual object, a detailed verbal description of the object, pictorial view of the object, or set of orthographic projections.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☑	☐	☑	☐	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☐	☐	☐	☑

1.4.1
☐

MOD-C.4 Identify errors and omissions in orthographic projections and multiview drawings (including errors in line locations, line types, Identify errors and ommissions in orthographic projections and multiview drawings (including errors in line locations, line types, number of views, scale, dimensioning, and view orientation) to fully detail an object or part using the actual object, a detailed verbal description of the object, or a pictorial and isometric view of the object.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☑	☑	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☐	☐	☐	☐

1.4.1
☐

MOD-C.5 Identify errors and omissions in a full- or half-section view (including errors in line locations, line types, location of cutting plane line, scale, dimensioning, and view orientation) to fully detail an object or part.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☐	☐	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☐	☐	☐	☑	☐

1.4.1
☐

Competencies, Domains, Objectives, Knowledge and Skills

MOD-C.6 Identify necessary/appropriate views to fully detail a part or assembly.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☑	☐	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☑	☑	☑	☑	☐

1.4.1
☑

MOD-C.7 Read and interpret a hole note to identify the size and type of hole specified.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☐	☐	☐	☐	☐

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☑	☐	☐	☐	☐	☐

1.4.1
☐

MOD-E. Create and interpret a computer model or simulation of simple objects, assemblies, or systems to inform engineering decisions and solve problems.

MOD-E.1 Create a computer model to represent an object or conceptual idea and inform design decisions.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
☐	☐	☐	☐	☐

1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
☐	☑	☐	☐	☐	☑

1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☑	☐	☐	☐	☑

1.4.1
☑

MOD-E.2 Correctly build and constrain a three-dimensional solid computer model to accurately represent the physical characteristics and behaviors of a design idea or real object. Scope: This could include the appropriate application of geometric (horizontal, vertical, parallel, perpendicular, tangent, concentric) and dimensional constraints, as well as modeling other physical properties (density, color, texture, and so on).

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5		
☐	☐	☐	☐	☐		
1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	
☐	☑	☐	☐	☑	☐	
1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☑	☑	☐	☐	☐	☑
1.4.1						
☑						

MOD-F. Create technical drawings using 3D computer-aided design (CAD) software to document a design according to standard engineering practices.

MOD-F.1 Generate an annotated multiview technical drawing using CAD software to fully describe a simple part.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5		
☐	☐	☐	☐	☐		
1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	
☐	☐	☑	☑	☐	☑	
1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☑	☑	☑	☑	☑
1.4.1						
☑						

MOD-F.2 Apply appropriate and sufficient annotation (including dimensioning) methods to a drawing to fully describe an object or system using accepted technical drawing techniques.

APB:

1.1.1	1.1.2	1.1.3	1.1.4	1.1.5		
☐	☐	☐	☐	☐		
1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	
☐	☐	☐	☑	☐	☐	
1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7
☐	☐	☑	☑	☑	☑	☑
1.4.1						
☑						