



# Goodheart-Willcox Publisher

18604 West Creek Drive • Tinley Park, IL 60477 • 800.323.0440 • www.g-w.com

## Goodheart-Willcox Publisher

### Correlation of *Engineering Fundamentals: Design, Principles, and Careers* ©2023

### to the Texas Essential Knowledge and Skills, Principles of Applied Engineering

**Standard 1A: demonstrate knowledge of how to dress, speak, and conduct oneself in a manner appropriate for the profession;**

Breakout	Narrative	Activity
(i) demonstrate knowledge of how to dress appropriately for the profession	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">160 (Paragraph 6)</a> , <a href="#">475 (Tools Feature, Personal Protective Equipment)</a> , <a href="#">13 (Tools Feature, Paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Know and Understand #14)</a>
(ii) demonstrate knowledge of how to speak politely for the profession	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">7-8 (Types of Skills and Traits)</a> , <a href="#">160 (Oral Presentation)</a> , <a href="#">309 (Paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Communicating about Engineering #1)</a> , <a href="#">43 (Communicating about Engineering#1)</a>
(iii) demonstrate knowledge of how to conduct oneself in a manner appropriate for the profession	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">50 (Ethics)</a> , <a href="#">33-35 (Ethics)</a> , <a href="#">309 (paragraph 3)</a> , <a href="#">7 (Final paragraph)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">42 (Know and Understand #5)</a>

**Standard 1B: cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;**

Breakout	Narrative	Activity
(i) cooperate as a member of a group in an effort to achieve a positive collective outcome	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">30 (Final paragraph)</a> , <a href="#">48-49 (Teamwork)</a> , <a href="#">309 (Paragraph 4)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">43 (Apply and Analyze #1)</a>
(ii) contribute as a member of a group in an effort to achieve a positive collective outcome	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">9 (Paragraph 2)</a> , <a href="#">30 (Final paragraph)</a> , <a href="#">7 (Final paragraph)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Communicating about Engineering #1)</a>
(iii) collaborate as a member of a group in an effort to achieve a positive collective outcome	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">76 (Final paragraph)</a> , <a href="#">269 (Paragraph 4)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">43 (Communicating about Engineering #1)</a>



# Goodheart-Willcox Publisher

18604 West Creek Drive • Tinley Park, IL 60477 • 800.323.0440 • www.g-w.com

Breakout	Narrative	Activity
		<a href="#">115 (Communicating about Engineering #1)</a>

**Standard 1C: present written and oral communication in a clear, concise, and effective manner;**

Breakout	Narrative	Activity
(i) present written communication in a clear manner	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">8 (Paragraph 1)</a> , <a href="#">62-63 (Engineering Notebooks)</a> , <a href="#">80-81 (Writing the Problem Statement)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Apply and Analyze #6)</a> , <a href="#">137 (Apply and Analyze #1)</a>
(ii) present written communication in a concise manner	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">8 (Paragraph 1)</a> , <a href="#">62-63 (Engineering Notebooks)</a> , <a href="#">80-81 (Writing the Problem Statement)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Apply and Analyze #6)</a> , <a href="#">137 (Apply and Analyze #1)</a>
(iii) present written communication in [an] effective manner	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">8 (Paragraph 1)</a> , <a href="#">62-63 (Engineering Notebooks)</a> , <a href="#">80-81 (Writing the Problem Statement)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Apply and Analyze #6)</a> , <a href="#">137 (Apply and Analyze #1)</a>
(iv) present oral communication in a clear manner	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">159 (Final Outputs)</a> , <a href="#">160 (Oral Presentation)</a> , <a href="#">8 (Paragraph 1)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">457 (Communicating about Engineering #2)</a> , <a href="#">91 (Communicating about Engineering #1)</a>
(v) present oral communication in a concise manner	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">159 (Final Outputs)</a> , <a href="#">160 (Oral Presentation)</a> , <a href="#">8 (Paragraph 1)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">457 (Communicating about Engineering #2)</a> , <a href="#">91 (Communicating about Engineering #1)</a>
(vi) present oral communication in [an] effective manner	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">159 (Final Outputs)</a> , <a href="#">160 (Oral Presentation)</a> , <a href="#">8 (Paragraph 1)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">457 (Communicating about Engineering #2)</a> , <a href="#">91 (Communicating about Engineering #1)</a>

**Standard 1D: demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and**

Breakout	Narrative	Activity
(i) demonstrate time-management skills in prioritizing tasks in a way that produces efficient results	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">8 (Paragraph 2)</a> , <a href="#">253-254</a> , <a href="#">85–86 (Free Association)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">262 (Critical Thinking #3)</a> , <a href="#">23 (Communicating about Engineering #3)</a>
(ii) demonstrate time-management skills in following schedules in a way that produces efficient results	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">8 (Paragraph 2)</a> , <a href="#">28 (Final Paragraph)</a> , <a href="#">252 (Tools feature, Production Charts and Schedules)</a> , <a href="#">246 (Paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">262 (Critical Thinking #2)</a>
(iii) demonstrate time-management skills in performing goal-relevant activities in a way that produces efficient results	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">8 (Paragraph 2)</a> , <a href="#">52 (Final paragraph)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Communicating about Engineering #1)</a> , <a href="#">230 (Communicating about Engineering #2)</a>

**Standard 1E: demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks.**

Breakout	Narrative	Activity
(i) demonstrate punctuality in performing assigned tasks	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">8 (Paragraph 1)</a> , <a href="#">30 (Final paragraph)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Communicating about Engineering #1)</a>
(ii) demonstrate dependability in performing assigned tasks	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">30 (Teamwork)</a> , <a href="#">48-49 (Teamwork)</a> , <a href="#">240 (Final paragraph)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">43 (Apply and Analyze #1)</a> , <a href="#">426 (Communicating about Engineering #1)</a>
(iii) demonstrate reliability in performing assigned tasks	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">30 (Teamwork)</a> , <a href="#">48-49 (Teamwork)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">329 (Communicating about Engineering #1)</a>
(iv) demonstrate responsibility in performing assigned tasks	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">30 (Teamwork)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">230 (Communicating about Engineering #2)</a> , <a href="#">329 (Communicating about Engineering #1)</a> , <a href="#">426 (Communicating about Engineering #1)</a>

**Standard 2A: investigate and report on the history of engineering disciplines, including chemical, civil, electrical, and mechanical engineering;**



## Goodheart-Willcox Publisher

18604 West Creek Drive • Tinley Park, IL 60477 • 800.323.0440 • [www.g-w.com](http://www.g-w.com)

Breakout	Narrative	Activity
(i) investigate the history of engineering disciplines, including chemical engineering	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">407 (History feature, Chemical Engineering in History).</a> <a href="#">17-21 (History of Engineering).</a> <a href="#">102 (Paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Apply and Analyze #4).</a> <a href="#">23 (Communicating about Engineering #2)</a>
(ii) investigate the history of engineering disciplines, including civil engineering	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">338 (Paragraph 2).</a> <a href="#">340 (History Feature, Municipal Water System Engineering).</a> <a href="#">17-21 (History of Engineering).</a> <a href="#">102 (Paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">360 (Know and Understand #1, 3).</a> <a href="#">23 (Apply and Analyze #4).</a> <a href="#">23 (Communicating about Engineering #2)</a>
(iii) investigate the history of engineering disciplines, including electrical engineering	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">283 (History Feature, Electrical Engineering in History).</a> <a href="#">17-21 (History of Engineering).</a> <a href="#">102 (Paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Apply and Analyze #4).</a> <a href="#">23 (Communicating about Engineering #2)</a>
(iv) investigate the history of engineering disciplines, including mechanical engineering	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">168 (Paragraph 2).</a> <a href="#">188 (History Feature, History of Power Sources).</a> <a href="#">17-21 (History of Engineering).</a> <a href="#">102 (Paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Apply and Analyze #4, 5).</a> <a href="#">23 (Communicating about Engineering #2)</a>
(v) report on the history of engineering disciplines, including chemical engineering	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">17-21 (History of Engineering).</a> <a href="#">102 (Paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Apply and Analyze #4).</a> <a href="#">23 (Communicating about Engineering #2)</a>
(vi) report on the history of engineering disciplines, including civil engineering	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">17-21 (History of Engineering).</a> <a href="#">102 (Paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Apply and Analyze #4).</a> <a href="#">23 (Communicating about Engineering #2)</a>
(vii) report on the history of engineering disciplines, including electrical engineering	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">17-21 (History of Engineering).</a> <a href="#">102 (Paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Apply and Analyze #4).</a> <a href="#">23 (Communicating about Engineering #2)</a>
(viii) report on the history of engineering disciplines, including mechanical engineering	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">17-21 (History of Engineering).</a> <a href="#">102 (Paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Apply and Analyze #4, 5).</a> <a href="#">23 (Communicating about Engineering #2)</a>



# Goodheart-Willcox Publisher

18604 West Creek Drive • Tinley Park, IL 60477 • 800.323.0440 • www.g-w.com

**Standard 2B: identify the inputs, processes, and outputs associated with technological systems;**

Breakout	Narrative	Activity
(i) identify the inputs associated with technological systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">179 (Power Sources).</a> <a href="#">278 (Conductors).</a> <a href="#">74-89 (Chapter 4)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">196 (Apply and Analyze #4).</a> <a href="#">294 (Know and Understand #2, 4)</a>
(ii) identify the processes associated with technological systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">180 (Transmission and Control Devices).</a> <a href="#">278-284 (Control Components).</a> <a href="#">94-113 (Chapter 5)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">196 (Apply and Analyze #1, 3)</a>
(iii) identify the outputs associated with technological systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">183-185 (Output Devices).</a> <a href="#">285-287 (Output Components).</a> <a href="#">140-160 (Chapter 7)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">196 (Apply and Analyze #5).</a> <a href="#">295 (Know and Understand #9)</a>

**Standard 2C: describe the difference between open and closed systems;**

Breakout	Narrative	Activity
(i) describe the difference between open and closed systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">285 (Control Systems)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">25 (Engineering Advancements Activity 1-2)</a>

**Standard 2D: describe how technological systems interact to achieve common goals;**

Breakout	Narrative	Activity
(i) describe how technological systems interact to achieve common goals	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">389 (Aerospace Engineering in Action).</a> <a href="#">193 (Automobiles).</a> <a href="#">290-291 (Electrical Engineering in Action).</a> <a href="#">319-324 (Computer Engineering Applications)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">391 (Apply and Analyze #4)</a>

**Standard 2E: compare engineering, science, and technology career paths, including entry-level employment, military service, apprenticeships, community and technical colleges, and universities;**

Breakout	Narrative	Activity
(i) compare engineering, science, and technology career paths, including entry-level employment	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">405 (Paragraph 2-4).</a> <a href="#">148-151 (Start with first paragraph).</a> <a href="#">9 (Science Feature, Science in Engineering).</a> <a href="#">169 (Professional Aspects)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">42 (Know and Understand #2).</a> <a href="#">425 (Apply and Analyze #2)</a>
(ii) compare engineering, science, and technology career paths, including military service	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">359 (Paragraph 2-4).</a> <a href="#">368 (Final paragraph)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">361 (Know and Understand #17)</a>
(iii) compare engineering, science, and technology career paths, including apprenticeships	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">9 (Paragraph 4).</a> <a href="#">30 (Paragraph 1)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">42 (Know and Understand #3, 4)</a>
(iv) compare engineering, science, and technology career paths, including technical colleges	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">405 (Paragraph 2).</a> <a href="#">31 (Paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">42 (Know and Understand #3, 4)</a>
(v) compare engineering, science, and technology career paths, including community colleges	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">405 (Paragraph 2).</a> <a href="#">31 (Paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">42 (Know and Understand #3, 4)</a>
(vi) compare engineering, science, and technology career paths, including universities	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">405 (Paragraph 2).</a> <a href="#">31-32 (Professional Knowledge)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">42 (Know and Understand #3, 4)</a>

## Standard 2F: conduct and present research on emerging and innovative technology; and

Breakout	Narrative	Activity
(i) conduct research on emerging technology	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">21 (Engineering in the Twenty-First Century).</a> <a href="#">108 (Tools feature, Three-Dimensional Scanning).</a> <a href="#">325 (Paragraph 2).</a> <a href="#">324 (Paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Communicating about Engineering #1)</a>
(ii) conduct research on innovative technology	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">21 (Engineering in the Twenty-First Century).</a> <a href="#">224-227 (Nanotechnology).</a> <a href="#">454 (Biological Engineering in Action)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">229 (Know and Understand #14, 15)</a>
(iii) present research on emerging technology	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">21 (Engineering in the Twenty-First Century).</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Communicating about Engineering #1)</a>



# Goodheart-Willcox Publisher

18604 West Creek Drive • Tinley Park, IL 60477 • 800.323.0440 • www.g-w.com

Breakout	Narrative	Activity
	<a href="#">88 (Going Green Feature, Floating Cities)</a> , <a href="#">442 (Going Green Feature, Vertical Farms)</a>	
(iv) present research on innovative technology	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">21 (Engineering in the Twenty-First Century)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Communicating about Engineering #2)</a> , <a href="#">230 (Communicating about Engineering #2)</a> , <a href="#">481 (Communicating about Engineering #10)</a>

## Standard 2G: demonstrate proficiency of the engineering design process.

Breakout	Narrative	Activity
(i) demonstrate proficiency of the engineering design process	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">46-63 (Chapter 3)</a> , <a href="#">74-89 (chapter 4)</a> , <a href="#">94-113 (chapter 5)</a> , <a href="#">120-135 (chapter 6)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Communicating about Engineering #1)</a>

## Standard 3A: use clear and concise written, verbal, and visual communication techniques;

Breakout	Narrative	Activity
(i) use clear written communication techniques	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">159-160 (Final Project Report)</a> , <a href="#">80-81 (Writing the Problem Statement)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Apply and Analyze #3)</a> , <a href="#">91 (Know and Understand #10-18)</a>
(ii) use clear verbal communication techniques	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">160 (Oral Presentation)</a> , <a href="#">84-88 (Brainstorming)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Apply and Analyze #3)</a> , <a href="#">23 (Communicating about Engineering #2)</a> , <a href="#">137 (Communicating about Engineering #2)</a>
(iii) use clear visual communication techniques	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">120-135 (Chapter 6)</a> , <a href="#">353 (Design feature, Civil Engineering Software)</a> , <a href="#">59-60 (Start at paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">137 (Apply and Analyze #1-5)</a> , <a href="#">137 (Communicating about Engineering #1, 2)</a>



Breakout	Narrative	Activity
(iv) use concise written communication techniques	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">120-135 (Chapter 6).</a> <a href="#">131 (Design Feature, Drafting Drawings).</a> <a href="#">177 (Design Feature, Fluid Power System Schematics)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">136-137 (Know and Understand #1-13).</a> <a href="#">196 (Communicating about Engineering #1)</a>
(v) use concise verbal communication techniques	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">160 (Oral Presentation).</a> <a href="#">7 (Final paragraph).</a> <a href="#">30 (Final paragraph)</a>	<a href="#">23 (Communicating about Engineering #1, 2).</a> <a href="#">43 (Communicating about Engineering #1)</a>
(vi) use concise visual communication techniques	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">215 (Design Feature, Materials Symbols).</a> <a href="#">325 (Final paragraph).</a> <a href="#">326 (Medical Imaging).</a> <a href="#">146-151 (Computer Modeling)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Communicating about Engineering #2).</a>

## Standard 3B: maintain a design and computation engineering notebook;

Breakout	Narrative	Activity
(i) maintain a design and computation engineering notebook	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">62-63 (Engineering Notebooks).</a> <a href="#">78 (Final paragraph).</a> <a href="#">112 (Paragraph 6).</a> <a href="#">106 (Paragraph 1)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Apply and Analyze #6)</a>

## Standard 3C: develop and present ideas using sketching and computer-aided design and drafting (CADD);

Breakout	Narrative	Activity
(i) develop ideas using sketching	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">96-101 (Sketches).</a> <a href="#">120-135 (Chapter 6).</a> <a href="#">131 (Design Feature, Drafting Drawings)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">115 (Apply and Analyze #5).</a> <a href="#">114 (Know and Understand #1-3)</a>
(ii) develop ideas using computer-aided design and drafting (CADD)	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">146-151 (Computer Modeling).</a> <a href="#">252 (Tools Feature, Manufacturing Engineering Tools).</a> <a href="#">7 (Technical Knowledge)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Apply and Analyze #1)</a>



Breakout	Narrative	Activity
(iii) present ideas using sketching	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">112 (Paragraph 7-8).</a> <a href="#">122-124 (Working Drawings).</a> <a href="#">124-131 (Drawing Classifications).</a> <a href="#">160 (Production Documents)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">115 (Apply and Analyze #5)</a>
(iv) present ideas using computer-aided design and drafting (CADD)	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">146-151 (Computer Modeling).</a> <a href="#">148 (Paragraph 1).</a> <a href="#">320 (Computer-Integrated Manufacturing (CIM))</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Apply and Analyze #2)</a>

## Standard 3D: draw conclusions using industry-standard visualization techniques and media;

Breakout	Narrative	Activity
(i) draw conclusions using industry-standard visualization techniques	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">120-135 (Chapter 6).</a> <a href="#">177 (Design Feature, Fluid Power System Schematics)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">136-137 (Know and Understand #1-13).</a> <a href="#">137 (Apply and Analyze #1-5)</a>
(ii) draw conclusions using industry-standard visualization media	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">146-151 (Computer Modeling).</a> <a href="#">104 (Paragraph 1).</a> <a href="#">108 (Tools Feature, Three-Dimensional Scanning).</a> <a href="#">145-146 (Physical Modeling)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Apply and Analyze #1, 2).</a> <a href="#">161 (Know and Understand #3, 4)</a>

## Standard 3E: maintain a paper or digital portfolio using the engineering documentation process; and

Breakout	Narrative	Activity
(i) maintain a paper or digital portfolio using the engineering documentation process	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">62-63 (Engineering Notebooks).</a> <a href="#">78 (Final paragraph).</a> <a href="#">80 (Paragraph 4)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Apply and Analyze #6)</a>

## Standard 3F: use collaborative tools such as desktop or web-based applications to share and develop information.

Breakout	Narrative	Activity
(i) use collaborative tools to share information	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">80 (Writing the Problem Statement).</a> <a href="#">96 (Sketches).</a> <a href="#">104 (Final paragraph)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #11-18)</a>



## Goodheart-Willcox Publisher

18604 West Creek Drive • Tinley Park, IL 60477 • 800.323.0440 • www.g-w.com

Breakout	Narrative	Activity
(ii) use collaborative tools to develop information	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">80 (Writing the Problem Statement).</a> <a href="#">96 (Sketches).</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #11-18)</a>

### Standard 4A: master relevant safety tests;

Breakout	Narrative	Activity
(i) master relevant safety tests	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">155 (Safety).</a> <a href="#">259 (Safety).</a> <a href="#">185 (Safety Devices)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Apply and Analyze #4).</a> <a href="#">91 (Know and Understand #5)</a>

### Standard 4B: follow lab safety guidelines as prescribed by instructor in compliance with local, state, and federal regulations;

Breakout	Narrative	Activity
(i) follow lab safety guidelines as prescribed by instructor in compliance with local regulations	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">421 (Protection).</a> <a href="#">155 (Safety).</a> <a href="#">259 (Safety)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">425 (Know and Understand #20, 21)</a>
(ii) follow lab safety guidelines as prescribed by instructor in compliance with state regulations	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">421 (Protection).</a> <a href="#">155 (Safety).</a> <a href="#">259 (Safety)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">425 (Know and Understand #20, 21)</a>
(iii) follow lab safety guidelines as prescribed by instructor in compliance with federal regulations	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">421 (Protection).</a> <a href="#">155 (Safety).</a> <a href="#">259 (Safety)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">425 (Know and Understand #20, 21)</a>

### Standard 4C: identify industry safety terminology related to the personal work environment such as Occupational Safety and Health Administration (OSHA), American Society of Mechanical Engineers (ASME), and personal protective equipment (PPE);

Breakout	Narrative	Activity
(i) identify industry safety terminology related to the personal work environment	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">421 (Protection).</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">262 (Know and Understand #13).</a> <a href="#">425 (Know and Understand #20, 21)</a>

### Standard 4D: recognize the classification of hazardous materials and wastes;

Breakout	Narrative	Activity
(i) recognize the classification of hazardous materials	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">420-421 (Waste).</a> <a href="#">228 (Paragraph 1).</a> <a href="#">421 (Paragraph 5).</a> <a href="#">251 (Going Green Feature, Environmentally Conscious Manufacturing).</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">425 (Apply and Analyze #7)</a>
(ii) recognize the classification of hazardous wastes	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">420-421 (Waste).</a> <a href="#">251 (Going Green Feature, Environmentally Conscious Manufacturing).</a> <a href="#">35 (Going Green Feature, Making Green Decisions).</a> <a href="#">40 (Paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">425 (Apply and Analyze #7)</a>

**Standard 4E: describe appropriate ways to dispose of hazardous materials and wastes;**

Breakout	Narrative	Activity
(i) describe appropriate ways to dispose of hazardous materials	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">421 (Paragraph 2).</a> <a href="#">228 (Paragraph 1).</a> <a href="#">322 (Going Green Feature, Green Computer Tips, paragraph 5).</a> <a href="#">251 (Going Green Feature, Environmentally Conscious Manufacturing).</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">425 (Apply and Analyze #7)</a>
(ii) describe appropriate ways to dispose of hazardous wastes	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">421 (Paragraph 2).</a> <a href="#">251 (Going Green Feature, Environmentally Conscious Manufacturing).</a> <a href="#">35 (Going Green Feature, Making Green Decisions).</a> <a href="#">40 (Paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">425 (Apply and Analyze #7)</a>

**Standard 4F: maintain, safely handle, and properly store laboratory equipment;**

Breakout	Narrative	Activity
(i) maintain laboratory equipment	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">422 (Laboratory Equipment)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">426 (Communicating about Engineering #1)</a>
(ii) safely handle laboratory equipment	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">422 (Laboratory Equipment)</a>	<b>Engineering Fundamentals 2023 OLS</b>



## Goodheart-Willcox Publisher

18604 West Creek Drive • Tinley Park, IL 60477 • 800.323.0440 • www.g-w.com

Breakout	Narrative	Activity
		<a href="#">426 (Communicating about Engineering #1)</a>
(iii) properly store laboratory equipment	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">422 (Laboratory Equipment)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">426 (Communicating about Engineering #1)</a>

**Standard 4G: describe the implications of negligent or improper maintenance; and**

Breakout	Narrative	Activity
(i) describe the implications of negligent or improper maintenance	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">474-476 (Bioremediation)</a> , <a href="#">418 (Going Green Feature, Bioplastics)</a> , <a href="#">212 (Going Green Feature, Recycling Plastics)</a> , <a href="#">471 (Paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">480 (Apply and Analyze #4)</a>

**Standard 4H: demonstrate the use of precision measuring instruments.**

Breakout	Narrative	Activity
(i) demonstrate the use of precision measuring instruments	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">174 (Tools Feature, Micrometers)</a> , <a href="#">414 (Fluid Flow Rate Measurement)</a> , <a href="#">252 (Tools Feature, Manufacturing Engineering Tools, Measuring Tools)</a> , <a href="#">288-289 (Tools Feature, Meters in Electrical Engineering)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">361 (Know and Understand #16)</a>

**Standard 5A: describe how technology has affected individuals, societies, cultures, economies, and environments;**

Breakout	Narrative	Activity
(i) describe how technology has affected individuals	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">17-21 (History of Engineering)</a> , <a href="#">36 (Paragraph 3)</a> , <a href="#">454 (Ethics)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Critical Thinking #1)</a>
(ii) describe how technology has affected societies	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">36 (Paragraph 4)</a> , <a href="#">338-339 (Begins at paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">42 (Know and Understand #6)</a>

Breakout	Narrative	Activity
(iii) describe how technology has affected cultures	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">36 (Paragraph 4).</a> <a href="#">423 (Chemical Engineering in Action).</a> <a href="#">34 (Paragraph 1).</a> <a href="#">38 (Paragraph 1)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">42 (Know and Understand #6)</a>
(iv) describe how technology has affected economies	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">37 (Paragraph 1-2).</a> <a href="#">156-157 (Engineering Economics).</a> <a href="#">454 (Ethics)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">161 (Know and Understand #10)</a>
(v) describe how technology has affected environments	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">36-40 (Engineering Impacts).</a> <a href="#">40 (Paragraph 1-2).</a> <a href="#">156 (Environmental Impact).</a> <a href="#">212 (Going Green Feature, Recycling Plastics)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">425 (Communicating about Engineering #2)</a>

**Standard 5B: describe how the development and use of technology influenced past events;**

Breakout	Narrative	Activity
(i) describe how the development of technology influenced past events	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">17-21 (History of Engineering).</a> <a href="#">56 (History Feature, Engineering Design in History).</a> <a href="#">188 (History Feature, History of Power Sources)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Apply and Analyze # 4, 5).</a> <a href="#">22 (Know and Understand #13)</a>
(ii) describe how the use of technology influenced past events	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">17-21 (History of Engineering).</a> <a href="#">56 (History Feature, Engineering Design in History).</a> <a href="#">188 (History Feature, History of Power Sources)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Apply and Analyze # 4, 5).</a> <a href="#">22 (Know and Understand #13)</a>

**Standard 5C: describe how and why technology progresses; and**

Breakout	Narrative	Activity
(i) describe how technology progresses	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">17-21 (History of Engineering).</a> <a href="#">204 (Paragraph 1).</a> <a href="#">356 (Final paragraph).</a> <a href="#">86 (The Future Process)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">23 (Communicating about Engineering #2)</a>

Breakout	Narrative	Activity
(ii) describe why technology progresses	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">17-21 (History of Engineering)</a> , <a href="#">355 (Going Green Feature, Alternative Energy)</a> , <a href="#">436 (Paragraph 1)</a> , <a href="#">86 (The Future Process)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Apply and Analyze #6)</a>

**Standard 5D: predict possible changes caused by the advances of technology.**

Breakout	Narrative	Activity
(i) predict possible changes caused by the advances of technology	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">40-41 (Future of Engineering)</a> , <a href="#">21 (Engineering in the Twenty-First Century)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">329 (Apply and Analyze #7)</a> , <a href="#">457 (Apply and Analyze #2)</a>

**Standard 6A: identify and describe an engineering design process needed for a project, including the design process and prototype development and initiating, planning, executing, monitoring and controlling, and closing a project;**

Breakout	Narrative	Activity
(i) identify an engineering design process needed for a project, including the design process	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">46-63 (chapter 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">64-65 (Know and Understand, all questions)</a> , <a href="#">65 (Apply and Analyze, all questions)</a> , <a href="#">65 (Critical Thinking, all questions)</a> , <a href="#">65 (Communicating about Engineering, all questions)</a>
(ii) identify an engineering design process needed for a project, including prototype development	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">56-57 (Start at paragraph 1)</a> , <a href="#">145 (Physical Modeling)</a> , <a href="#">151 (Paragraph 2)</a> , <a href="#">153-154 (Start at paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Apply and Analyze #1)</a>
(iii) identify an engineering design process needed for a project, including initiating a project	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">51-52 (Problem Definition)</a> , <a href="#">77-83 (Defining the Problem)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Apply and Analyze #1, 2, 3)</a> , <a href="#">64 (Know and Understand #5)</a> , <a href="#">91 (Apply and Analyze #1, 2)</a>



## Goodheart-Willcox Publisher

18604 West Creek Drive • Tinley Park, IL 60477 • 800.323.0440 • www.g-w.com

Breakout	Narrative	Activity
		<a href="#">91 (Communicating about Engineering #1)</a>
(iv) identify an engineering design process needed for a project, including planning a project	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">52-57 (starting with Idea Generation)</a> , <a href="#">84-87 (Brainstorming)</a> , <a href="#">94-113 (Chapter 5)</a> , <a href="#">120-135 (Chapter 6)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">64-65 (Know and Understand #5, 8-12)</a> , <a href="#">65 (Apply and Analyze #1)</a>
(v) identify an engineering design process needed for a project, including executing a project	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">140-160 (Chapter 7)</a> , <a href="#">55-57 (Testing/Analysis)</a> , <a href="#">108 (Material Testing)</a> , <a href="#">59 (Final Solution or Output)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Know and Understand #8-12)</a>
(vi) identify an engineering design process needed for a project, including monitoring and controlling a project	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">140-160 (Chapter 7)</a> , <a href="#">55-57 (Testing/Analysis)</a> , <a href="#">108 (Material Testing)</a> , <a href="#">59 (Final Solution or Output)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Know and Understand #8-12)</a>
(vii) identify an engineering design process needed for a project, including closing a project	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">61 (Design Improvement)</a> , <a href="#">160 (Design Improvement)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Apply and Analyze # 5)</a>
(viii) describe an engineering design process needed for a project, including the design process	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">46-63 (chapter 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">64-65 (Know and Understand, all questions)</a> , <a href="#">65 (Apply and Analyze, all questions)</a> , <a href="#">65 (Critical Thinking, all questions)</a> , <a href="#">65 (Communicating about Engineering, #1, 2)</a>
(ix) describe an engineering design process needed for a project, including prototype development	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">56-57 (Start at first paragraph)</a> , <a href="#">145 (Physical Modeling)</a> , <a href="#">151 (Paragraph 2)</a> , <a href="#">153-154 (Start at paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Apply and Analyze #1)</a>
(x) describe an engineering design process needed for a project, including initiating a project	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">51-52 (Problem Definition)</a> , <a href="#">77-83 (Defining the Problem)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Apply and Analyze #1, 2, 3)</a> , <a href="#">91 (Apply and Analyze #1-7)</a>



Breakout	Narrative	Activity
		<a href="#">91 (Communicating about Engineering #1)</a>
(xi) describe an engineering design process needed for a project, including planning a project	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">52-57 (starting with Idea Generation)</a> , <a href="#">84-87 (Brainstorming)</a> , <a href="#">94-113 (Chapter 5)</a> , <a href="#">120-135 (Chapter 6)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">64-65 (Know and Understand #5, 8-12)</a> , <a href="#">65 (Apply and Analyze #1)</a>
(xii) describe an engineering design process needed for a project, including executing a project	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">140-160 (Chapter 7)</a> , <a href="#">55-57 (Testing/Analysis)</a> , <a href="#">108 (Material Testing)</a> , <a href="#">59 (Final Solution or Output)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Know and Understand #8-12)</a>
(xiii) describe an engineering design process needed for a project, including monitoring and controlling a project	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">140-160 (Chapter 7)</a> , <a href="#">55-57 (Testing/Analysis)</a> , <a href="#">108 (Material Testing)</a> , <a href="#">59 (Final Solution or Output)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Know and Understand #8-12)</a>
(xiv) describe an engineering design process needed for a project, including closing a project	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">61 (Design Improvement)</a> , <a href="#">160 (Design Improvement)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Apply and Analyze #5)</a>

**Standard 6B: identify the chemical, mechanical, and physical properties of engineering materials and identify testing methods associated with the materials;**

Breakout	Narrative	Activity
(i) identify the chemical properties of engineering materials	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">220 (Chemical Properties)</a> , <a href="#">223 (Destructive Tests)</a> , <a href="#">411 (Mass Balance)</a> , <a href="#">416-417 (Temperature Measurement)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">229 (Know and Understand #11)</a>
(ii) identify the mechanical properties of engineering materials	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">216-218 (Mechanical Properties)</a> , <a href="#">342-343 (Structural Forces)</a> , <a href="#">223 (Destructive Tests)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">230 (Apply and Analyze #1)</a>
(iii) identify the physical properties of engineering materials	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">215-216 (Physical Properties)</a> , <a href="#">409-410 (Zeroth Law)</a> , <a href="#">471 (Paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">229 (Know and Understand #8)</a> , <a href="#">479-480 (Know and Understand #2)</a>

Breakout	Narrative	Activity
(iv) identify testing methods associated with the [engineering] materials	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">222-224 (Materials Testing)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">230 (Apply and Analyze #2)</a> , <a href="#">236 (Activity 9-4, Material Testing Device)</a>

**Standard 6C: use problem-solving techniques to develop technological solutions such as product, process, or system;**

Breakout	Narrative	Activity
(i) use problem-solving techniques to develop technological solutions	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">74-89 (Chapter 4)</a> , <a href="#">5 (Problem Solving)</a> , <a href="#">106 (Reverse Engineering)</a> , <a href="#">290 (Reverse Engineering)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Communicating about Engineering #2)</a>

**Standard 6D: use consistent units for all measurements and computations; and**

Breakout	Narrative	Activity
(i) use consistent units for all measurements	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">143 (Units of Measurement)</a> , <a href="#">288-289 (Tools Feature, Meters in Electricity)</a> , <a href="#">413-417 (Characteristics and Measurements)</a> , <a href="#">11 (Math Feature, Applying Math (Units of Measure))</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">161 (Know and Understand #1)</a>
(ii) use consistent units for all computations	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">144-145 (Formulas)</a> , <a href="#">217 (Math Feature, Equations)</a> , <a href="#">276-278 (Start with Series Circuits)</a> , <a href="#">186-190 (Mechanical Power Principles and Formulas)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">196 (Apply and Analyze #5-10)</a>

**Standard 6E: assess the risks and benefits of a design solution.**

Breakout	Narrative	Activity
(i) assess the risks of a design solution	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">40 (Risk Analysis)</a> , <a href="#">152-156 (Start with Predictive Analysis)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Apply and Analyze #2, 5)</a>
(ii) assess the benefits of a design solution	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">39 (Positive Impacts (Benefits))</a> , <a href="#">30 (Tools Feature, Cost-Benefit)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">42-43 (Know and Understand #8, 9)</a>



## Goodheart-Willcox Publisher

18604 West Creek Drive • Tinley Park, IL 60477 • 800.323.0440 • www.g-w.com

Breakout	Narrative	Activity
	<a href="#">Analysis</a> , <a href="#">40 (Risk Analysis)</a>	

**Standard 7A: describe applications of robotics, process control, and automation systems;**

Breakout	Narrative	Activity
(i) describe applications of robotics	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">322-324 (Robotics)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">328 (Know and Understand #22)</a>
(ii) describe applications of process control	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">324-326 (Computer Engineering in Action)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">328 (Know and Understand #19)</a> , <a href="#">329 (Communicating about Engineering #2)</a>
(iii) describe applications of automation systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">320 (Computer-Integrated Manufacturing (CIM))</a> , <a href="#">320-321 (Computer Numerical Control (CNC))</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">328 (Know and Understand #20, 21)</a>

**Standard 7B: apply design concepts to problems in robotics, process control, and automation systems;**

Breakout	Narrative	Activity
(i) apply design concepts to problems in robotics	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">322-324 (Robotics)</a> , <a href="#">124 (Schematic Drawings)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">329 (Communicating about Engineering #2)</a>
(ii) apply design concepts to problems in process control	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">320 (Computer-Integrated Manufacturing (CIM))</a> , <a href="#">124 (Schematic Drawings)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">328 (Know and Understand #19)</a>
(iii) apply design concepts to problems in automation systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">320-321 (Computer Numerical Control (CNC))</a> , <a href="#">124 (Schematic Drawings)</a> , <a href="#">324 (Paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">328 (Know and Understand #20, 21)</a>

**Standard 7C: identify fields and career opportunities related to robotics, process control, and automation systems; and**

Breakout	Narrative	Activity
(i) identify fields related to robotics	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">322-324 (Robotics)</a> , <a href="#">308 (Paragraph 2-5)</a> , <a href="#">240 (Paragraph 4-5)</a> , <a href="#">453-454 (Start at paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">328 (Apply and Analyze #1, 2)</a>
(ii) identify fields related to process control	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">308 (Paragraph 2-5)</a> , <a href="#">322 (Robotics, paragraph 1, 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">328 (Apply and Analyze #1, 2)</a>
(iii) identify fields related to automation systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">320-324 (Start with Computer-Integrated Manufacturing (CIM))</a> , <a href="#">453-454 (Start at paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">328 (Know and Understand (#19, 22))</a>
(iv) identify career opportunities related to robotics	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">322 (Robotics, paragraph 1, 2)</a> , <a href="#">308 (Paragraph 2-5)</a> , <a href="#">240 (Paragraph 4-5)</a> , <a href="#">453-454 (Start at paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">328 (Apply and Analyze #1, 2)</a>
(v) identify career opportunities related to process control	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">308 (Paragraph 2-5)</a> , <a href="#">322 (Robotics, paragraph 1, 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">328 (Apply and Analyze #1, 2)</a>
(vi) identify career opportunities related to automation systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">320-324 (Start with Computer-Integrated Manufacturing (CIM))</a> , <a href="#">453-454 (Start at paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">328 (Know and Understand (#19, 22))</a>

**Standard 7D: identify emerging trends in robotics, process control, and automation systems.**

Breakout	Narrative	Activity
(i) identify emerging trends in robotics	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">324 (Start at paragraph 2)</a> , <a href="#">453-454 (Start at paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">328 (Know and Understand #22)</a>
(ii) identify emerging trends in process control	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">325 (Paragraph 2)</a> , <a href="#">453-454 (Start at paragraph 2)</a> <a href="#">325 (Design Feature, Integrated Circuit Design)</a> , <a href="#">448 (Tools Feature, 3-D Printing)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">329 (Apply and Analyze #7)</a>
(iii) identify emerging trends in automation systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">320 (Computer-Integrated Manufacturing (CIM))</a> , <a href="#">251 (Going Green Feature)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">328 (Know and Understand (#19, 22))</a>



# Goodheart-Willcox Publisher

18604 West Creek Drive • Tinley Park, IL 60477 • 800.323.0440 • www.g-w.com

Breakout	Narrative	Activity
	<a href="#">Environmentally Conscious Manufacturing</a>	

## Standard 8A: describe the applications of electrical and mechanical systems;

Breakout	Narrative	Activity
(i) describe the applications of electrical systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">268-269 (Start at paragraph 1).</a> <a href="#">290-291 (Electrical Engineering in Action)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">295 (Apply and Analyze #1)</a>
(ii) describe the applications of mechanical systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">168-169 (Start at paragraph 1).</a> <a href="#">191-193 (Mechanical Engineering Applications)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">196 (Apply and Analyze #1).</a> <a href="#">196 (Critical Thinking #1)</a>

## Standard 8B: describe career opportunities in electrical and mechanical systems;

Breakout	Narrative	Activity
(i) describe career opportunities in electrical systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">268-269 (Start at paragraph 1).</a> <a href="#">290-291 (Electrical Engineering in Action)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">295 (Know and Understand #7)</a>
(ii) describe career opportunities in mechanical systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">168-169 (Start at paragraph 1).</a> <a href="#">191-193 (Mechanical Engineering Applications)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">196 (Apply and Analyze #1).</a> <a href="#">196 (Critical Thinking #1)</a>

## Standard 8C: identify emerging trends in electrical and mechanical systems; and

Breakout	Narrative	Activity
(i) identify emerging trends in electrical systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">290-291 (Electrical Engineering in Action)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">295 (Know and Understand #9)</a>
(ii) identify emerging trends in mechanical systems	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">193-194 (Mechanical Engineering in Action)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">196 (Communicating about Engineering #1)</a>

## Standard 8D: describe and apply basic electronic theory.

Breakout	Narrative	Activity
(i) describe basic electronic theory	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">271 (Sources of Electricity)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">294 (Know and Understand #2, 3)</a>



## Goodheart-Willcox Publisher

18604 West Creek Drive • Tinley Park, IL 60477 • 800.323.0440 • www.g-w.com

Breakout	Narrative	Activity
(ii) apply basic electronic theory	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">271 (Sources of Electricity)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">294 (Know and Understand #2, 3)</a>

**Standard 9A: apply the design process, including decision matrices, as a team participant;**

Breakout	Narrative	Activity
(i) apply the design process, including decision matrices, as a team participant	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">48-49 (Teamwork)</a> , <a href="#">52 (Final paragraph)</a> , <a href="#">76 (Paragraph 3)</a> , <a href="#">79 (Final paragraph)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">43 (Apply and Analyze #1)</a>

**Standard 9B: perform different roles within the project as a team member;**

Breakout	Narrative	Activity
(i) perform different roles within the project as a team member	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">84 (Final paragraph)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #8)</a>

**Standard 9C: formulate decisions using collaborative strategies such as decision and design matrices and conflict resolution;**

Breakout	Narrative	Activity
(i) formulate decisions using collaborative strategies	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">78 (Final paragraph)</a> , <a href="#">159-160 (Final Outputs)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">43 (Communicating about Engineering #1)</a>

**Standard 9D: maintain an engineering notebook for the project;**

Breakout	Narrative	Activity
(i) maintain an engineering notebook for the project	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">62-63 (Engineering Notebooks)</a> , <a href="#">78 (Final paragraph)</a> , <a href="#">80 (Paragraph 4)</a> , <a href="#">112 (Paragraph 6)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Apply and Analyze #6)</a>

**Standard 9E: develop and test the model for the project; and**

Breakout	Narrative	Activity
(i) develop the model for the project	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">142-151 (Modeling).</a> <a href="#">55 (Start at paragraph 1).</a> <a href="#">420 (Paragraph 1)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">161 (Know and Understand #3, 5).</a> <a href="#">162 (Apply and Analyze #1).</a> <a href="#">162 (Communicating about Engineering #1)</a>
(ii) test the model for the project	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">152-156 (Testing).</a> <a href="#">56 (Paragraph 3).</a> <a href="#">345 (Paragraph 1)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Apply and Analyze #4).</a> <a href="#">162 (Communicating about Engineering #1)</a>

**Standard 9F: demonstrate communication skills by preparing and presenting the project, including building consensus setback resolution and decision matrices**

Breakout	Narrative	Activity
(i) demonstrate communication skills by preparing the project, including building consensus setback resolution matrices	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">50-57 (Engineering Design Process).</a> <a href="#">74-89 (Chapter 4).</a> <a href="#">94-113 (Chapter 5).</a> <a href="#">120-135 (Chapter 6)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Apply and Analyze #1, 2, 3, 4).</a> <a href="#">64 (Know and understand #5, 7)</a>
(ii) demonstrate communication skills by preparing the project, including decision matrices	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">50-57 (Engineering Design Process).</a> <a href="#">74-89 (Chapter 4).</a> <a href="#">94-113 (Chapter 5).</a> <a href="#">120-135 (Chapter 6)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Apply and Analyze #1, 2, 3, 4).</a> <a href="#">64 (Know and understand #5, 7)</a>
(iii) demonstrate communication skills by presenting the project, including building consensus setback resolution matrices	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">159-160 (Final Outputs).</a> <a href="#">59 (Final Solution or Output).</a> <a href="#">112 (Analyze Data-First paragraph)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Know and Understand #14).</a> <a href="#">(Apply and Analyze #3).</a> <a href="#">137 (Communicating about Engineering #1)</a>
(iv) demonstrate communication skills by presenting the project, including decision matrices	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">159-160 (Final Outputs).</a> <a href="#">59 (Final Solution or Output).</a> <a href="#">112 (Analyze Data-First paragraph)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Know and Understand #14).</a> <a href="#">(Apply and Analyze #3).</a> <a href="#">137 (Communicating about Engineering #1)</a>

**Standard 10A: set up, create, and modify drawings;**





# Goodheart-Willcox Publisher

18604 West Creek Drive • Tinley Park, IL 60477 • 800.323.0440 • www.g-w.com

Breakout	Narrative	Activity
(i) set up drawings	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">96-98 (Sketches)</a> , <a href="#">54 (Paragraph 3)</a> , <a href="#">53 (Paragraph 1)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">114 (Know and Understand #1)</a>
(ii) create drawings	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">120-135 (Chapter 6)</a> , <a href="#">98-100 (Sketching Process)</a> , <a href="#">131 (Design Feature, Drafting Drawings)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">114 (Know and Understand #2, 3)</a> , <a href="#">65 (Communicating about Engineering #2)</a>
(iii) modify drawings	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">112 (Paragraph 7-8)</a> , <a href="#">252 (Tools Feature, Manufacturing Engineering Tools)</a> , <a href="#">131 (Design Feature, Drafting Drawings)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">115 (Apply and Analyze #5)</a>

## Standard 10B: store and retrieve geometry;

Breakout	Narrative	Activity
(i) store geometry	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">142-151 (Modeling)</a> , <a href="#">100 (Detail the Solution)</a> , <a href="#">55 (Paragraph 1)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Communicating about Engineering #1)</a>
(ii) retrieve geometry	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">320-324 (Start with Computer-Integrated Manufacturing (CIM))</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">161 (Know and Understand #5)</a>

## Standard 10C: demonstrate and use appropriate line types in engineering drawings;

Breakout	Narrative	Activity
(i) demonstrate appropriate line types in engineering drawings	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">132 (Line Types)</a> , <a href="#">133-134 (Dimensions)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">137 (Know and Understand #10, 12)</a> , <a href="#">137 (Communicating About Engineering #1)</a>
(ii) use appropriate line types in engineering drawings	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">132 (Line Types)</a> , <a href="#">133-134 (Dimensions)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">137 (Know and Understand #10, 12)</a> , <a href="#">137 (Communicating About Engineering #1)</a>

## Standard 10D: draw two-dimensional, single-view objects;



# Goodheart-Willcox Publisher

18604 West Creek Drive • Tinley Park, IL 60477 • 800.323.0440 • www.g-w.com

Breakout	Narrative	Activity
(i) draw two-dimensional, single-view objects	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">127 (Start with One-View Drawings)</a> , <a href="#">131 (Design Feature, Drafting Drawings)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">137 (Apply and Analyze #3)</a>

**Standard 10E: create multi-view working drawings using orthographic projection;**

Breakout	Narrative	Activity
(i) create multi-view working drawings using orthographic projection	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">124-127 (Orthographic Drawings)</a> , <a href="#">59 (Final paragraph)</a> , <a href="#">131 (Design Feature, Drafting Drawings)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">137 (Apply and Analyze #3)</a> , <a href="#">65 (Know and Understand #8)</a>

**Standard 10F: dimension objects using current American National Standards Institute (ANSI) standards;**

Breakout	Narrative	Activity
(i) dimension objects using current American National Standards Institute (ANSI) standards	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">131 (Symbols)</a> , <a href="#">131 (Design Feature, Drafting Drawings)</a> <a href="#">124 (Paragraph 3)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">137 (Know and Understand #11)</a>

**Standard 10G: draw single-line two-dimensional pictorial representations; and**

Breakout	Narrative	Activity
(i) draw single-line two-dimensional pictorial representations	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">59 (Paragraph 4)</a> , <a href="#">129-131 (Pictorial Drawings)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">65 (Know and Understand #9)</a> , <a href="#">65 (Apply and Analyze #4)</a>

**Standard 10H: create working drawings that include section views.**

Breakout	Narrative	Activity
(i) create working drawings that include section views	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">131 (Design Feature, Drafting Drawings)</a> <a href="#">122 (Working Drawings)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">131 (Design Feature, Drafting Drawings)</a>

**Standard 11A: identify and define an engineering problem;**

Breakout	Narrative	Activity
(i) identify an engineering problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">78-80 (Steps to Identifying Problems)</a> , <a href="#">51 (Problem Definition)</a> ,	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Communicating about Engineering #1, 2)</a> , <a href="#">91 (Know and Understand #2, 11-18)</a> , <a href="#">91 (Apply and Analyze #1-3)</a>
(ii) define an engineering problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">51 (Problem Definition)</a> , <a href="#">77 (Defining the Problem)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Communicating about Engineering #1, 2)</a> , <a href="#">91 (Know and Understand #2, 11-18)</a> , <a href="#">91 (Apply and Analyze #1-3)</a>

**Standard 11B: formulate goals, objectives, and requirements to solve an engineering problem;**

Breakout	Narrative	Activity
(i) formulate goals to solve an engineering problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">80 (Paragraph 1)</a> , <a href="#">40 (Paragraph 5)</a> , <a href="#">79 (Paragraph 1)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #2)</a>
(ii) formulate objectives to solve an engineering problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">80-81 (Writing the Problem Statement)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">92 (Activity 4-1)</a>
(iii) formulate requirements to solve an engineering problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">110-111 (Trade-Offs)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #3)</a> , <a href="#">91 (Apply and Analyze #4)</a>

**Standard 11C: determine the design parameters such as materials, personnel, resources, funding, manufacturability, feasibility, and time associated with an engineering problem;**

Breakout	Narrative	Activity
(i) determine the design parameters associated with an engineering problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">5 (Problem Solving)</a> , <a href="#">6-7 (Types of Knowledge)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4)</a>

**Standard 11D: establish and evaluate potential constraints, including health, safety, social, environmental, ethical, political, regulatory, and legal, pertaining to a problem;**

Breakout	Narrative	Activity
(i) establish constraints, including health, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Paragraph 1).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>
(ii) establish constraints, including safety, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Paragraph 1).</a> <a href="#">82 (Paragraph 1).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>
(iii) establish constraints, including social, pertaining to a problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Paragraph 1).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>
(iv) establish constraints, including environmental, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Paragraph 1).</a> <a href="#">82 (Paragraph 1).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>
(v) establish constraints, including ethical, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Paragraph 1).</a> <a href="#">82 (Final paragraph).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>
(vi) establish constraints, including political, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Paragraph 1).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>
(vii) establish constraints, including regulatory, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Paragraph 1).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>
(viii) establish constraints, including legal, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Paragraph 1).</a> <a href="#">82 (Paragraph 1).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>
(ix) evaluate constraints, including health, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Researching Criteria and Constraints).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>
(x) evaluate constraints, including safety, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Researching Criteria and Constraints).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>

Breakout	Narrative	Activity
(xi) evaluate constraints, including social, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Researching Criteria and Constraints).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>
(xii) evaluate constraints, including environmental, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Researching Criteria and Constraints).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>
(xiii) evaluate constraints, including ethical, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Researching Criteria and Constraints).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>
(xiv) evaluate constraints, including political, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Researching Criteria and Constraints).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>
(xv) evaluate constraints, including regulatory, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Researching Criteria and Constraints).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>
(xvi) evaluate constraints, including legal, pertaining to [an engineering] problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">83 (Researching Criteria and Constraints).</a> <a href="#">51-52 (Criteria and Constraints)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">91 (Know and Understand #4, 5, 6).</a> <a href="#">91 (Critical Thinking #3)</a>

**Standard 11E: identify or create alternative solutions to a problem using a variety of techniques such as brainstorming, reverse engineering, and researching engineered and natural solutions;**

Breakout	Narrative	Activity
(i) identify or create alternative solutions to a problem using a variety of techniques	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">53-55 (Solution Creation).</a> <a href="#">61-62 (Reverse Engineering).</a> <a href="#">84-87 (Brainstorming).</a> <a href="#">48 (Engineering Design).</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">64 (Know and Understand #4, 7)</a>

**Standard 11F: test and evaluate proposed solutions using engineering methods such as creating models, prototypes, mock-ups, or simulations or performing critical design review, statistical analysis, or experiments;**

Breakout	Narrative	Activity
(i) test proposed solutions using engineering methods	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">140-160 (chapter 7).</a> <a href="#">55-57 (Testing/Analysis).</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">71 (Activity 3-6).</a> <a href="#">162 (Apply and Analyze #4)</a> <a href="#">162 (Critical Thinking #1, 2)</a>
(ii) evaluate proposed solutions using engineering methods	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">140-160 (chapter 7).</a> <a href="#">55-57 (Testing/Analysis).</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">71 (Activity 3-6).</a> <a href="#">162 (Apply and Analyze #4)</a> <a href="#">162 (Critical Thinking #1, 2)</a>

**Standard 11G: apply structured techniques such as a decision tree, design matrix, or cost-benefit analysis to select and justify a preferred solution to a problem;**

Breakout	Narrative	Activity
(i) apply structured techniques to select a preferred solution to a problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">30 (Tools Feature, Cost-Benefit Analysis).</a> <a href="#">110 (Trade-offs).</a> <a href="#">111-112 (Selecting the Best Approach)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">115 (Apply and Analyze #4).</a> <a href="#">115 (Critical Thinking #2)</a>
(ii) apply structured techniques to justify a preferred solution to a problem	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">6 (Mathematical Knowledge).</a> <a href="#">112 (Analyze Data)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">115 (Apply and Analyze #4).</a> <a href="#">115 (Critical Thinking #2)</a>

**Standard 11H: predict performance, failure modes, and reliability of a design solution; and**

Breakout	Narrative	Activity
(i) predict performance of a design solution	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">152 (Predictive Analysis).</a> <a href="#">142-145 (Mathematical Modeling).</a> <a href="#">146 (Paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">161 (Know and Understand #2, 4).</a> <a href="#">162 (Apply and Analyze #2, 5)</a>
(ii) predict failure modes of a design solution	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">152 (Predictive Analysis).</a> <a href="#">146 (Paragraph 2)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Apply and Analyze #2, 5).</a> <a href="#">161 (Know and Understand #2, 4).</a>
(iii) predict reliability of a design solution	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">152 (Predictive Analysis).</a> <a href="#">142-145 (Mathematical</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">162 (Apply and Analyze #2, 5).</a>



## Goodheart-Willcox Publisher

18604 West Creek Drive • Tinley Park, IL 60477 • 800.323.0440 • www.g-w.com

Breakout	Narrative	Activity
	<a href="#">Modeling</a> , <a href="#">146 (Paragraph 2)</a>	<a href="#">161 (Know and Understand #2, 4)</a>

**Standard 11I: prepare a project report that clearly documents the designs, decisions, and activities during each phase of the engineering design process.**

Breakout	Narrative	Activity
(i) prepare a project report that clearly documents the designs during each phase of the engineering design process	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">159-160 (Final Project Report)</a> , <a href="#">160 (Production Documents)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">164 (Activity 7-2)</a> , <a href="#">162 (Apply and Analyze #3)</a> , <a href="#">161-162 (Know and Understand #12, 13)</a>
(ii) prepare a project report that clearly documents the decisions during each phase of the engineering design process	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">159-160 (Final Project Report)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">164 (Activity 7-2)</a> , <a href="#">162 (Apply and Analyze #3)</a> , <a href="#">161-162 (Know and Understand #12, 13)</a>
(iii) prepare a project report that clearly documents the activities during each phase of the engineering design process	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">159-160 (Final Project Report)</a>	<b>Engineering Fundamentals 2023 OLS</b> <a href="#">164 (Activity 7-2)</a> , <a href="#">162 (Apply and Analyze #3)</a> , <a href="#">161-162 (Know and Understand #12, 13)</a>