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Month	September	October	November	December	January
2014 Common Core Curriculum Standards	8.1.A.1, 8.1.A.3-4, 8.1.B.1, 8.1.C.1, 8.1.D.1-4, 8.1.E.2, 8.1.F.2, 8.2.A.1, 8.2.B.1-3, 8.2.C.1-3, 8.2.D.1, 8.2.E.1, 8.2.F.1-3, 8.2.G.1	8.1.A.1, 8.1.A.3-4, 8.1.B.1, 8.1.C.1, 8.1.D.1-4, 8.1.E.2, 8.1.F.2, 8.2.A.1, 8.2.B.1-3, 8.2.C.1-3, 8.2.D.1, 8.2.E.1, 8.2.F.1-3, 8.2.G.1	8.1.A.1, 8.1.A.3-4, 8.1.B.1, 8.1.C.1, 8.1.D.1-4, 8.1.E.2, 8.1.F.2, 8.2.A.1, 8.2.B.1-3, 8.2.C.1-3, 8.2.D.1, 8.2.E.1, 8.2.F.1-3, 8.2.G.1	8.1.A.1, 8.1.A.3-4, 8.1.B.1, 8.1.C.1, 8.1.D.1-4, 8.1.E.2, 8.1.F.2, 8.2.A.1, 8.2.B.1-3, 8.2.C.1-3, 8.2.D.1, 8.2.E.1, 8.2.F.1-3, 8.2.G.1	8.1.A.1, 8.1.A.3-4, 8.1.B.1, 8.1.C.1, 8.1.D.1-4, 8.1.E.2, 8.1.F.2, 8.2.A.1, 8.2.B.1-3, 8.2.C.1-3, 8.2.D.1, 8.2.E.1, 8.2.F.1-3, 8.2.G.1
Essential Questions	How does engineering transform an idea into a product?	Why are mathematical applications necessary to the design process?	How do engineers, designers and machinist communicate?	What is the significance of 3D modeling in developing prototypes?	Why is it important for engineers to document their work in an engineering notebook?
Content	*Introduction to the Design Process*	*Technical Sketching, Drawing, Measurement, and Statistics*	*Working Drawings and Standards*	*Advanced Modeling*	*Resource Material*
Skills And Topics	• explore the design processes that guide professionals from different career areas • list and provide examples of the steps of the design process used by engineers (e.g., identify the problem, conduct research, develop a design brief, brainstorm ideas, model, optimize, present, qualify, manufacture, and communicate results) • compare and contrast the engineering design process and the	• demonstrate recording and communication skills through engineering sketches • apply engineering sketches to investigate ideas • use pictorials and tonal shading techniques to enhance sketches • develop skills in creating isometric, oblique, perspective, and multi-view sketches • use sketches to maintain an object's visual proportions	• analyze and develop drawing views and standards • demonstrate professional design lab techniques • describe the various types of working drawings and explain the purpose of each • set up a working drawing • explain the procedure for checking a set of working drawings • produce details drawings, assembly drawing, and assembly working drawings	• create sketches, models, and virtual representations of objects and products • use solid modeling programs to create designs for production • compare and contrast solid modeling programs with traditional design methods • use models to evaluate an object or product on the basis of: o problems in the design o functional limitations o communication of information	• describe the function and use of Machinery's Handbook • use possible sections in the Machinery's Handbook used for a technical drawing. • refer to the table of content and index for information • identify heat-treated material used in the design process • indicate possible sections used for threads and fasteners • select materials from different types of industrial catalogs

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	scientific method • research the types of problems engineers seek to resolve • generate engineering drawings, including isometric, orthographic sections, and detailed views leading to complete engineering drawings	• evaluate the various sketching techniques for communication value • insert accurate dimensions to communicate appropriate size information • identify the challenges presented when manufacturing products in different countries • perform dimensional analysis to convert dimensions between systems of measurement • determine the amount of variation based upon the precision of the measurement tool • perform statistical analysis on measurements to verify the quality of a design or process • recognize graphics used to communicate patterns in reports	• develop and use tabulated drawings for standard parts to be produced in a range of sizes • design and draw a title block, incorporating standard items of information • develop a standard bill of materials	• compare and contrast inclined surfaces represented in auxiliary views with their basic multi-view drawings • use sectional views to communicate interior features • difficult to visualize from outside views • create mathematical formulas to establish geometric and functional relationships within designs	• maintain a reference guide for future use • organize technical design information from a variety of sources (e.g., computer data banks, the internet, interviewing industrial experts) • determine manufactures and mechanical components from Machinery's Handbook • develop a manufacturers log and handbook for personal use • collect information from catalogs, books, internet, and people for the design • write a brief, technical report using reference materials • develop and use symbol libraries • access and apply formula charts • Start an Engineering Notebook

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Month	September	October	November	December	January
Performance Assessments	• Concept Project • Portfolio • The history of design, organizations, and careers • Student participation • Assessments	• Project: series of isometric-oblique-orthographic sketches • Student participation • Assessments	• Project based series of industry standard mechanical and engineering drawings • Student participation • Assessments	• Project: 3D modeling • Student participation • Assessments	• Internet Research • Technical Reading • Report Writing • Student participation • Assessments

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Month	February	March	April	May	June
2014 Common Core Curriculum Standards	8.1.8.A.1-5, 8.1.8.B.1, 8.1.8.C.1, 8.1.8.D.1-2, 8.2.8.B.1-3, 8.2.8.D.1, 8.1.8.E.1, 8.1.8.F.1-2, 8.1.8.G.1-2	8.1.8.A.1-5, 8.1.8.B.1, 8.1.8.C.1, 8.1.8.D.1-2, 8.2.8.B.1-3, 8.2.8.D.1, 8.1.8.E.1, 8.1.8.F.1-2, 8.1.8.G.1-2	8.1.8.A.1-5, 8.1.8.B.1, 8.1.8.C.1, 8.1.8.D.1-2, 8.2.8.B.1-3, 8.2.8.D.1, 8.1.8.E.1, 8.1.8.F.1-2, 8.1.8.G.1-2	8.1.8.A.1-5, 8.1.8.B.1, 8.1.8.C.1, 8.1.8.D.1-2, 8.2.8.B.1-3, 8.2.8.D.1, 8.1.8.E.1, 8.1.8.F.1-2, 8.1.8.G.1-2	8.1.8.A.1-5, 8.1.8.B.1, 8.1.8.C.1, 8.1.8.D.1-2, 8.2.8.B.1-3, 8.2.8.D.1, 8.1.8.E.1, 8.1.8.F.1-2, 8.1.8.G.1-2
Essential Questions	Why are precision measuring tools not always accurate?	How can the fabrication process improve the efficiency of a product?	How do engineers work and communicate as a team?	What holds the world together?	How are designs engineered to be earth friendly?
Content	*Precision Measurement and Tool Design*	*Safety and Project Fabrication*	*Reverse Engineering*	*Threads and Fasteners*	*Design Ethics and Teams*
Skills And Topics	• demonstrate the ability to measure accurately with different devices and scales • explain how to measure in different contexts • measure using both the Standard and Metric systems • differentiate between the Standard and Metric measuring systems • observe how inaccurate measurement methods of the past compare to standards in use today	• demonstrate safe work habits • read and follow written safety procedures • safely operate tools and equipment • identify a safe work plan for each process • demonstrate safe working methods and procedures • develop a plan for safety in the work environment • demonstrate the safe use of all tools and equipment • pass a general safety test with a minimum score of 90%	• perform reverse engineering on products to study their visual, functional, and structural qualities • delineate the sequence of the operations of a product's function • identify the inputs and outputs of product operations within a system • explore the methods of securing objects (e.g., adhesives, fasteners, joinery) review precision measurement tools and techniques used	• Research the history and importance of threads and fasteners • identify and describe various types of fasteners and their common uses • define common screw thread terms • specify threads and fasteners on a technical drawing • draw details, schematic, and simplified thread representations • name and describe common thread series • describe and specify classes of thread fits	• examine all parameters of a potential material to be used in manufacturing • evaluate environmental impact of material usage • recognize legal guidelines established to protect humans and the global environment • investigate recycling as a solution to the future • self-regulate a team of students through brainstorming and consensus • explore the

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Month	February	March	April	May	June
	• measure parts using calipers, micrometer, and scales • read calipers, micrometer, and scales	• identify the seven steps of the problem-solving model. o define the problem o set goals o develop alternatives o select the best solution o implement the solution o evaluate the results and make changes o if the product is acceptable end the process. If not, go back to #4 and repeat process from there • demonstrate that engineering design is an iterative process involving modeling and optimization to find the best solution within given constraints • use a variety of verbal and graphic techniques to present	to accurately record the geometry of an object • examine specific parameters to determine the material composition of a design (e.g., operational conditions, material properties, manufacturing methods) • calculate the mass properties of designed objects using reference sources and the Inventor software program • explore the use of mechanisms in simple machines to move loads through the input of applied effort forces	• draw various types of threaded fasteners using sketching or CAD techniques • Explain the purpose of thread engagement	implementation of a Gantt chart to plan, manage, and control team actions on projects with definitive due dates

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Month	February	March	April	May	June
		conclusions • develop work schedules and plans, which include optimal use of materials, processes, time, and expertise • demonstrate how societal interests, economics, ergonomics, and environmental considerations influence a solution • explain the importance of safety, cost, ease of use, and availability when selecting tools • develop the process of creating a scale model of an object or structure (e.g., a model automobile, building, bridge) • use technical drawings (e.g., blueprints, schematics, mechanical drawings) to construct an object or structure			

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Month	February	March	April	May	June
Performance Assessments	• Project: Fab Lab sample part from Sintra • Break down Drill Jig • Student participation • Assessments	• Tool and equipment familiarization • Tool location assessment • Student Participation • Assessments	• Project: APV Reverse Engineering • Student Participation • Assessments	• Thread identification samples • Fab Lab locations of threads and fasteners • Student Participation • Assessments	• Internet research • Student participation • Assessments

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Integration of Technology	*Autodesk AutoCAD and Inventor* software, Internet, Web Quests, wireless laptop computers, computer laboratory, portable language, laboratory, classroom computers, SMART Boards, multimedia presentations, simulations, video streaming, podcasting
Writing	Open-ended responses, conclusions and analysis of exploratory activities
Formative Assessments	Warm-up activities, exploratory activities, class discussions, student participation, quizzes, design briefs, sketches, Inventor research, benchmark assessments
Summative Assessments	Quizzes, tests, authentic assessments, projects, final examination, benchmark assessments
Interdisciplinary Connections	*ELA: RST.9-10.1-10, RST.11-12.1-10, WHST.9-10.1-2, 4-10, WHST.11-12.1-2, 4-10, SL.9-10.1-6, SL.11-12.1-6, L.9-10.1-6, L.11-12.1-6, SL.1-6, L.1-6, RST.1-10, WHST.1-2, WHST.4-10 *Mathematics: N-Q.1-3, N-VM.1-5, F-IF.1-2, F-IF.4-7, F-BF.1.a-c, F-LE.1-5, A-SSE.1, A-CED.1-4, A-REI.1-3, A-REI.10-11 Science: 5.1.12.A.1-3, 5.1.12.B.1-4, 5.1.12.C.1-3, 5.1.12.D.1-2, 5.2.12.A.1-4, 5.2.12.B.1, 5.2.12.C.1-2, 5.2.12.D.4-5 Arts: The Arts are exemplified through the implementation of the elements of design applied while developing industrial solutions via sketches, drawings and prototypes. Technology: 8.1.12.A.1-4, 8.1.12.C.1 World Language: 7.1.AL.B.5 21st Century Life/Careers: 9.1.12.A.1-4, 9.1.12.B.1-3, 9.1.12.C.4-5, 9.1.12.E.4-5, 9.1.12.F.1-2, 9.1.12.F.5-6, 9.3.12.C.1-6
21st Century Themes	Global Awareness, Civic Literacy, Financial, Economic, Business, and Entrepreneurial Literacy
21st Century Skills	Creativity and Innovation Media Literacy Critical Thinking and Problem Solving Life and Career Skills Information and Communication Technologies Literacy Communication and Collaboration Information Literacy
Resources	*National Educational Technology Standards for Students: Connecting Curriculum and Technology. (2000).* Eugene, OR: International Society for Technology in Education, *Technical Drawing, 13th Edition*, *Giesecke and Mitchell, Jig and Fixture Design, 4th Edition,* Edward Hoffman, *Machinery's Handbook, 26th Edition,* Erik Oberg and Franklin D. Jones
Careers	Applicable career options are discussed as they arise throughout the Engineering Design program. Career options include, but are not limited to, the following career clusters: Architecture and Construction Career Cluster; Arts, A/V Technology, and Communications Career Cluster; Business, Management, and Administration Career Cluster; Education and Training Career Cluster; Government and Public Administration Career Cluster; Information Technology Career Cluster; Law, Public Safety, Correction, and Security Career Cluster; Manufacturing Career Cluster; Marketing Career Cluster; Science, Technology, Engineering and Mathematics Career Cluster; Transportation, Distribution, and Logistics Career Cluster.

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2014 Common Core Content Standards:

RST: Reading in Science and Technical Subjects

WHST: Writing in History, Science, and Technical Subjects

SL: Speaking and Listening

L: Language

CCCS for Mathematics

N:	Real Number System	**N-VM**	Vector and	**G-CO**	Congruence
A:	Algebra	**A-SSE**	See Structure in Expressions	**G-SRT**	Similarity, Right Triangles and Trigonometry
F:	Functions	**A-REI**	Reasoning with Equations and Inequalities	**G-C**	Circles
G:	Geometry	**F-IF**	Interpreting Functions	**G-GPE**	Expressing Geometric Properties w/Equations
S:	Statistics and Probability	**F-BF**	Building Functions	**S-ID**	Making Inferences and Justifying Conclusions
MD:	Measurements and Data	**F-LE**	Linear, Quadratic and Exponential Models	**S-CP**	Conditional Probability & the Rules of Probability
N-Q	Quantities	**F-TF**	Trigonometric Functions	**S-MD**	Using Probability to Make Decisions