



# DAKOTA HIGH SCHOOL

## 2014 - 2015 Technical Design – Curriculum Map

| Month  | September  | October   | November   | December   | January  |
|--|--|---|--|--|--|
| <b>2014 Common Core Curriculum Standards</b> | 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   |
| <b>Essential Questions</b>                   | What is the difference between designers and engineers?  | What skill is used for the daily communication of ideas and concepts  | How do designers and engineers develop an idea into a technical drawing?   | What is the significance and advantages of CAD in developing drawings?   | Why is it important for engineers and designers to use CAD?  |
| <b>Content</b>                               | <i>Introduction to Design and Careers</i>  | <i>Technical Sketching</i>  | <i>Introduction to CAD and Basic Drawing Techniques</i>  | <i>CAD Single View Precision Drawings</i>  | <i>CAD Single View Precision Drawings</i>  |
| <b>Skills And Topics</b>                     | <ul style="list-style-type: none"> <li>identify current and emerging careers related to design technology program</li> <li>describe the advantages and disadvantages of being an entrepreneur</li> <li>prepare an individual career plan</li> <li>explain how to prepare for a design, drafting or engineering career</li> <li>demonstrate skills and techniques for applying for a job</li> <li>demonstrate workplace skills</li> </ul> | <ul style="list-style-type: none"> <li>describe the three basic aspects of design</li> <li>describe the traditional and concurrent engineering design processes</li> <li>Explain the importance of freehand sketching for communicating technical ideas.</li> <li>develop design ideas using freehand multi-view and pictorial sketches</li> <li>develop techniques for estimating proportions</li> </ul> | <ul style="list-style-type: none"> <li>employ safe practices in the design labs</li> <li>Prepare a drawing sheet for technical drawing</li> <li>use basic drafting tools and equipment properly and efficiently to produce technical drawing</li> <li>identify and use the lines and line symbols recommended by the American National Standards Institute (ANSI)</li> <li>produce a technical drawing using board-drafting techniques</li> <li>Explain how computer technology</li> </ul> | <ul style="list-style-type: none"> <li>create sketches, models, and virtual representations of objects and products</li> <li>identify and describe various geometric shapes and constructions used by technical designers</li> <li>construct various geometric shapes accurately</li> <li>solve technical and mathematical problems through geometric constructions using drafting instruments and CAD commands</li> <li>solve technical and mathematical</li> </ul> | <ul style="list-style-type: none"> <li>create sketches, models, and virtual representations of objects and products</li> <li>identify and describe various geometric shapes and constructions used by technical designers</li> <li>construct various geometric shapes accurately</li> <li>solve technical and mathematical problems through geometric constructions using drafting instruments and CAD commands</li> <li>solve technical and mathematical</li> </ul> |



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|-------|---|--|--|--|--|
|       | <ul style="list-style-type: none"> <li>• identify the workplace rights and responsibilities of both employee and employer</li> <li>• describe appropriate techniques for finding, adapting to, and resigning from a job</li> <li>• explain typical uses of board and CAD techniques for industry</li> </ul> | <ul style="list-style-type: none"> <li>• letter clear, neat freehand notes and dimensions on a technical drawing or sketch</li> <li>• sketch using different geometric shapes</li> <li>• explain the concept of sketching from a CAD operator's point of view</li> </ul> | <p>is revolutionizing drafting, design and engineering</p> <ul style="list-style-type: none"> <li>• Describe the basic features and operations of CAD</li> <li>• create and set up a drawing file on a CAD system using ANSI or ISO standard layouts</li> <li>• use CAD commands efficiently to create basic geometry</li> <li>• explain the basic commands used to create objects in CAD</li> <li>• list different types of CAD software and their application</li> <li>• explain why principles of drafting are common to both traditional drafting and CAD</li> <li>• explain the importance of CAD file management</li> <li>• produce a technical drawing using CAD</li> </ul> | <p>problems through geometric constructions using CAD system</p> <ul style="list-style-type: none"> <li>• create mathematical formulas to establish geometric and functional relationships within designs</li> </ul> | <p>problems through geometric constructions using CAD system</p> <ul style="list-style-type: none"> <li>• create mathematical formulas to establish geometric and functional relationships within designs</li> </ul> |



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|--------------------------------|--|--|--|--|--|
| <b>Performance Assessments</b> | <ul style="list-style-type: none"><li>• Concept Project</li><li>• Portfolio Binder</li><li>• The history of design, organizations, and careers</li><li>• Student participation</li><li>• Assessments</li></ul> | <ul style="list-style-type: none"><li>• Project based series of technical sketches</li><li>• Student participation</li><li>• Assessments</li></ul> | <ul style="list-style-type: none"><li>• Project based series of industry standard technical and CAD drawings</li><li>• Student participation</li><li>• Assessments</li></ul> | <ul style="list-style-type: none"><li>• Project based series of industry standard technical and CAD drawings</li><li>• Student participation</li><li>• Assessments</li></ul> | <ul style="list-style-type: none"><li>• Project based series of industry standard technical and CAD drawings</li><li>• Student participation</li><li>• Assessments</li></ul> |



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## 2014 - 2015 Technical Design – Curriculum Map

| Month  | February  | March  | April  | May  | June   |
|--|---|--|--|--|--|
| <b>2014 Common Core Curriculum Standards</b> | 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  |
| <b>Essential Questions</b>                   | Why are some measuring tools not always accurate?   | Why do designers call it the imaginary box?  | How many views does it take to complete a technical drawing?   | Is the world really flat?  | How do we go from Art-to-Part?   |
| <b>Content</b>                               | <i>Scale Reading and Measurement</i>  | <i>Multi-view Drawing</i>  | <i>Multi-view Drawing</i>  | <i>Introduction to 3D Modeling</i>   | <i>Safety and Project Fabrication</i>  |
| <b>Skills And Topics</b>                     | <ul style="list-style-type: none"> <li>demonstrate the ability to measure accurately with different devices and scales</li> <li>explain how to measure in different contexts</li> <li>measure using both the Standard and Metric systems</li> <li>differentiate between the Standard and Metric measuring systems</li> <li>observe how inaccurate measurement methods of the past compare to</li> </ul> | <ul style="list-style-type: none"> <li>understand the principles of orthographic projection</li> <li>use orthographic projection to develop multi-view drawings</li> <li>identify and explain projection lines and planes</li> <li>determine the views necessary to completely describe an object</li> <li>identify various types of features existing within objects</li> <li>identify and explain positive and negative mass as it relates to an object</li> </ul> | <ul style="list-style-type: none"> <li>understand the principles of orthographic projection</li> <li>use orthographic projection to develop multi-view drawings</li> <li>identify and explain projection lines and planes</li> <li>determine the views necessary to completely describe an object</li> <li>identify various types of features existing within objects</li> <li>identify and explain positive and negative mass as it relates to an object</li> </ul> | <ul style="list-style-type: none"> <li>explain the principles of solid modeling, assembly modeling, related to engineering design</li> <li>describe the key functions of CAD</li> <li>list the four kinds of Inventor files</li> <li>describe the Inventor user interface and the design support system</li> <li>construct parametric sketches and solid features from sketches</li> <li>construct and place features within a 3D model</li> </ul> | <ul style="list-style-type: none"> <li>demonstrate safe work habits</li> <li>read and follow written safety procedures</li> <li>safely operate tools and equipment</li> <li>identify a safe work plan for each process</li> <li>demonstrate safe working methods and procedures</li> <li>develop a plan for safety in the work environment</li> <li>demonstrate the safe use of all tools and equipment</li> <li>pass a general safety test with a minimum score of 90%</li> </ul> |



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| Month | February   | March   | April   | May  | June  |
|-------|--|---|---|--|---|
|       | <p>standards in use today</p> <ul style="list-style-type: none"><li>• measure parts using calipers, micrometer, and scales</li><li>• read calipers, micrometer, and scales</li></ul> | <ul style="list-style-type: none"><li>• explain the difference between primary and secondary views of objects and features</li><li>• center a multi-view drawing on the drawing sheet</li></ul> | <ul style="list-style-type: none"><li>• explain the difference between primary and secondary views of objects and features</li><li>• center a multi-view drawing on the drawing sheet</li></ul> | <ul style="list-style-type: none"><li>• use work features in constructing 3D solids</li><li>• construct derived solid parts</li><li>• set lighting, color styles, material and assign properties to 3D solid part file</li><li>• demonstrate ways to export files and import files</li></ul> | <ul style="list-style-type: none"><li>• demonstrate that design and fabrication is an iterative process involving modeling and optimization to find the best solution within given constraints</li><li>• develop work schedules and plans, which include optimal use of materials, processes, time, and expertise</li><li>• develop the process of creating a scale model of an object or structure (e.g., a model automobile, building, bridge)</li><li>• use technical drawings (e.g., blueprints, schematics, mechanical drawings) to construct an object or structure</li></ul> |



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| Month                          | February   | March  | April  | May  | June  |
|--------------------------------|--|--|--|--|---|
| <b>Performance Assessments</b> | <ul style="list-style-type: none"><li>• Project based series of industry standard technical and CAD drawings</li><li>• Student participation</li><li>• Assessments</li></ul> | <ul style="list-style-type: none"><li>• Project based series of industry standard technical and CAD drawings</li><li>• Student participation</li><li>• Assessments</li></ul> | <ul style="list-style-type: none"><li>• Project based series of industry standard technical and CAD drawings</li><li>• Student participation</li><li>• Assessments</li></ul> | <ul style="list-style-type: none"><li>• Project based series of industry standard technical and CAD drawings</li><li>• Student participation</li><li>• Assessments</li></ul> | <ul style="list-style-type: none"><li>• Tool and equipment familiarization</li><li>• Tool location assessment</li><li>• Student Participation</li><li>• Assessments</li></ul> |



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|                                       |  |
|---------------------------------------|--|
| <b>Integration of Technology</b>      | <i>Autodesk AutoCAD and Inventor</i> software, Internet, Web Quests, wireless laptop computers, computer laboratory, portable language, laboratory, classroom computers, SMART Boards, multimedia presentations, simulations, video streaming, podcasting  |
| <b>Writing</b>                        | Open-ended responses, conclusions and analysis of exploratory activities   |
| <b>Formative Assessments</b>          | Warm-up activities, exploratory activities, class discussions, student participation, quizzes, design briefs, sketches, Inventor research, benchmark assessments   |
| <b>Summative Assessments</b>          | Quizzes, tests, authentic assessments, projects, final examination, benchmark assessments  |
| <b>Interdisciplinary Connections</b>  | <p>*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</p> <p>*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</p> <p>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</p> <p>Arts: The Arts are exemplified through the implementation of the elements of design applied while developing industrial solutions via sketches, drawings and prototypes.</p> <p>Technology: 8.1.12.A.1-4, 8.1.12.C.1</p> <p>World Language: 7.1.AL.B.5</p> <p>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</p> |
| <b>21<sup>st</sup> Century Themes</b> | Global Awareness, Civic Literacy, Financial, Economic, Business, and Entrepreneurial Literacy  |
| <b>21<sup>st</sup> Century Skills</b> | Creativity and Innovation, Media Literacy, Critical Thinking and Problem Solving, Life and Career Skills, Information and Communication Technologies Literacy, Communication and Collaboration, Information Literacy   |
| <b>Resources</b>                      | <i>National Educational Technology Standards for Students: Connecting Curriculum and Technology. (2000)</i> . Eugene, OR: International Society for Technology in Education, <i>Technical Drawing, 13th Edition, Giesecke and Mitchell, Jig and Fixture Design, 4th Edition</i> , Edward Hoffman, <i>Machinery's Handbook, 26th Edition</i> , Erik Oberg and Franklin D. Jones   |
| <b>Careers</b>                        | 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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### 2013 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

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