Mathematic Standards Matrix
ELECTRONIC DRAFTING
January 13, 2009

ELECTRONIC DRAFTING Standards/Measurement Criteria		MATH STANDARDS **Strand #, Concept #, Grade Level** Performance Objective # *(College Work Readiness Level Standards are italicized)*
STANDARD 1.0 – APPLY MEASUREMENT AND SCALE CONCEPTS IN DESIGN DRAFTING		
1.1	Identify types of measurement used in design drafting	See Note
1.2	Select proper measurement tools	See Note
1.3	Perform measurements with hand held instruments	See Note
1.4	Determine and apply appropriate scale	**Strand 4: Geometry and Measurement, Concept 1: Geometric Properties, High School Level** PO 1: Use the basic properties of a circle (relationships between angles, radii, intercepted arcs, chords, tangents, and secants) to prove basic theorems and solve problems. PO 2: Visualize solids and surfaces in 3-dimensional space when given 2-dimensional representations and create 2-dimensional representations for the surfaces of 3-dimensional objects. PO 6: Solve problems using angle and side length relationships and attributes of polygons. **Strand 4: Geometry and Measurement, Concept 4: Measurement, High School Level** PO 1: Use dimensional analysis to keep track of units of measure when converting.
1.5	Transcribe illustrations accurately	**Strand 4: Geometry and Measurement, Concept 2: Transformation of Shapes, High School Level** PO 4: Determine the effects of a single transformation on linear or area measurements of a 2-dimensional figure. **Strand 4: Geometry and Measurement, Concept 4: Measurement, High School Level** PO 1: Use dimensional analysis to keep track of units of measure when converting.
STANDARD 2.0 – INTERPRET ENGINEERING DOCUMENTS AND CONTROL DOCUMENTS		
2.1	Interpret dimensions, symbols, legends, scales, and directions/orientations	See Note
2.2	Analyze how content and information are communicated in schematics, blueprints, and technical drawings	See Note

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2.3	Analyze schematics, blueprints, and technical drawings for clarity, completeness, and accuracy	See Note
2.4	Recognize cross-referencing on technical drawings	See Note
2.5	Identify and describe basic types of drawings by trade	See Note
2.6	Locate and interpret information on specific documents	See Note
2.7	Check prints for dimensional accuracy, completeness, and note detail	See Note
2.8	Compare schematics to dimensional drawings	See Note
2.9	Verify drawing elements	See Note
2.10	Identify conflicting data	**Strand 5: Structure and Logic, Concept 2: Logic, Reasoning, Problem Solving and Proof, High School Level** PO 3: Evaluate a solution for reasonableness and interpret the meaning of the solution in the context of the original problem. PO 6: Synthesize mathematical information from multiple sources to draw a conclusion, make inferences based on mathematical information, evaluate the conclusions of others, analyze a mathematical argument, and recognize flaws or gaps in reasoning.

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STANDARD 3.0 – CREATE TECHNICAL DRAWINGS		
3.1	Identify, select, and use fundamental drafting techniques for drawings	See Note
3.2	Demonstrate freehand lettering technique	See Note
3.3	Identify "Alphabet of Lines" by name, line type variation, order of usage and application on technical drawings	See Note
3.4	Create title blocks	See Note
3.5	Format borders	See Note
3.6	Apply notes and dimensions	See Note
3.7	Plot or print drawings using correct layout	See Note
3.8	Organize and maintain drawings and supporting documents	See Note

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STANDARD 4.0 – UTILIZE BASIC COMPUTER CONCEPTS, OPERATIONS, AND INFORMATION TECHNOLOGY APPLICATIONS		
4.1	Use computer hardware and input/output devices for design drafting problems	See Note
4.2	Apply basic commands of operating system software	See Note
4.3	Apply file and disk management techniques	See Note
4.4	Import and export data files using different formats (dxf, dxb, Tiff, gif, pcx, eps, spd, or other formats as required)	See Note
4.5	Prepare files for electronic transfer	See Note
4.6	Access and use the Internet for file transfer	See Note
4.7	Access and use a computer network for file management and transfer	See Note

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STANDARD 5.0 – USE A CADD/VDCM (VIRTUAL DESIGN AND CONSTRUCTION MODELING) SYSTEMS AND PROCEDURES		
5.1	Explore and determine applicability of CADD/VDCM systems to the project	See Note
5.2	Analyze drawings using CADD/VDCM software functions/commands	See Note
5.3	Use CADD/VDCM software commands to set up drawing scale, format, dimensioning, etc.	See Note
5.4	Apply layers/visible items, colors, line types, editing commands, and grouping techniques	See Note
5.5	Control entity properties	See Note
5.6	Incorporate standard parts, symbol libraries, and/or templates	See Note
5.7	Control viewing commands	See Note
5.8	Create and manipulate views by modifying coordinate system settings	See Note
5.9	Minimize a drawing file for storage and transmission	See Note

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STANDARD 6.0 – DETAIL PROJECTION VIEWS/COMPONENTS		
6.1	Determine views for projection (i.e., plan, top, front, etc.)	See Note
6.2	Identify, create, and place views for orthographic features	See Note
6.3	Identify, create, and place auxiliary views to determine true size, shape, and location of non-orthogonal features	See Note
6.4	Identify, create, and place appropriate section views	See Note
6.5	Construct full, half, and offset section of an object	See Note
6.6	Utilize various material hatch patterns in section views	See Note

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STANDRA 7.0 – UTILIZE ELECTRICAL/ELECTRONICS DRAFTING/DESIGN CONCEPTS AND PROBLEMS		
7.1	Use electrical/electronics terminology in context	See Note
7.2	Identify and apply electrical/electronic symbols	See Note
7.3	Solve problems using Ohm's law	**Strand 3: Patterns, Algebra, and Functions, Concept 3: Algebraic Representations, High School Level** PO 2: Solve formulas for specified variables.
7.4	Use industry-standards, codes, and regulations application software for electrical/electronics drafting to solve a problem	**Strand 3: Patterns, Algebra, and Functions, Concept 3: Algebraic Representations, High School Level** PO 2: Solve formulas for specified variables. **Strand 5: Structure and Logic, Concept 2: Logic, Reasoning, Problem Solving and Proof, High School Level** PO 1: Analyze a problem situation, determine the question(s) to be answered, organize given information, determine how to represent the problem, and identify implicit and explicit assumptions that have been made. PO 3: Evaluate a solution for reasonableness and interpret the meaning of the solution in the context of the original problem.
7.5	Evaluate accuracy of electrical/electronics drawings	See Note
STANDARD 8.0 - DEMONSTRATE DRAFTING/DESIGN CONCEPTS AS RELATED TO PRINTED CIRCUIT BOARD (PCB) DESIGN		
8.1	Draft a logic diagram	**Strand 2: Data Analysis, Probability, and Discrete Mathematics, Concept 4: Vertex-Edge Graphs, *College Work Readiness Level*** *PO 2: Understand, analyze, and apply vertex-edge graphs to model and solve problems related to paths, circuits, networks, and relationships among a finite number of elements, in real-world and abstract settings.*
8.2	Identify symbols in a schematic	See Note
8.3	Design schematics to and from specifications	See Note
8.4	Draw a harness layout	See Note

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8.5	Prepare wiring diagrams	**Strand 2: Data Analysis, Probability, and Discrete Mathematics, Concept 4: Vertex-Edge Graphs, *College Work Readiness Level*** *PO 1: Study the following topics related to vertex-edge graphs: Euler circuits, Hamilton circuits, the Travelling Salesperson Problem (TSP), minimum weight spanning trees, shortest paths, vertex coloring, and adjacency matrices.*
8.6	Determine minimum board size	**Strand 3: Patterns, Algebra, and Functions, Concept 3: Algebraic Representations, High School Level** PO 2: Solve formulas for specified variables.
8.7	Prepare single-sided PCB layout drawing	**Strand 5: Structure and Logic, Concept 2: Logic, Reasoning, Problem Solving and Proof, High School Level** PO 1: Analyze a problem situation, determine the question(s) to be answered, organize given information, determine how to represent the problem, and identify implicit and explicit assumptions that have been made. PO 3: Evaluate a solution for reasonableness and interpret the meaning of the solution in the context of the original problem.
8.8	Prepare double-sided to multi-layered PCB layout drawings	**Strand 5: Structure and Logic, Concept 2: Logic, Reasoning, Problem Solving and Proof, High School Level** PO 1: Analyze a problem situation, determine the question(s) to be answered, organize given information, determine how to represent the problem, and identify implicit and explicit assumptions that have been made. PO 3: Evaluate a solution for reasonableness and interpret the meaning of the solution in the context of the original problem.
8.9	Prepare an assembly drawing	See Note
8.10	Design circuit board artwork	See Note

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STANDARD 9.0 – DEMONSTRATE DESIGN DRAFTING CONCEPTS AS RELATED TO INTEGRATED CIRCUIT (IC) DESIGN		
9.1	Identify analog and digital gate and transistor device symbols	See Note
9.2	Sketch analog symbols (capacitor, resistor)	See Note
9.3	Sketch digital symbols at gate and transistor levels	See Note
9.4	Draft common IC layout structures (resistors, capacitors, digital gates, etc.)	See Note
9.5	Prepare sketches of pin configurations and gate locations	See Note
9.6	Explain basic logic operations	**Strand 2: Data Analysis, Probability, and Discrete Mathematics, Concept 4: Vertex-Edge Graphs, *College Work Readiness Level*** *PO 2: Understand, analyze, and apply vertex-edge graphs to model and solve problems related to paths, circuits, networks, and relationships among a finite number of elements, in real-world and abstract settings.*
9.7	Draft a logic diagram	**Strand 2: Data Analysis, Probability, and Discrete Mathematics, Concept 4: Vertex-Edge Graphs, *College Work Readiness Level*** *PO 2: Understand, analyze, and apply vertex-edge graphs to model and solve problems related to paths, circuits, networks, and relationships among a finite number of elements, in real-world and abstract settings.*
9.8	Diagram schematics	See Note

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