

Student Name

PA State ID # (10)

Unit/Standard Number	High School Graduation Years 2018, 2019 and 2020			
	Year 1	Year 2	Year 3	
The School District of Philadelphia Office of Career and Technical Education Engineering Technologies/Technicians, Other Performance Assessment Log (PAL) CIP 15.9999 - Engineering Technologies	Key N = Not Exposed to Task 1 = Knowledge (Exposed to Task) 2 = Guidance (Accomplishes Task w/ Instruct 3 = Mastery (Accomplishes Task w/o Instruct			
	Secondary Competency Task List			
100	ENGINEERING SAFETY			
101	Implement a safety plan.			
102	Operate lab equipment according to safety guidelines.			
103	Use appropriate personal protective equipment.			
104	Comply with OSHA and EPA regulations for a safe work site.			
105	Identify emergency first aid procedures.			
106	Maintain safe working practices around tools and equipment.			
107	Participate in classroom and laboratory management and clean-up activities.			
108	Demonstrate a professional attitude toward classroom and laboratory activities.			
109	Demonstrate lockout/tag out procedures.			
200	KNOWLEDGE OF ENGINEERING			
201	Demonstrate knowledge of the history of engineering.			
202	Investigate engineering careers, training and associated opportunities.			
203	Explain the purpose and functions of an engineering team.			
300	ETHICS IN ENGINEERING			
301	Analyze current Professional Engineering codes of ethics.			
302	Analyze ethical engineering issues.			
303	Analyze and explain ethical and technical issues contributing to an engineering disaster.			
400	PROBLEM SOLVING IN ENGINEERING			
401	Identify the engineering problem.			
402	Gather information about problems and solutions.			

403	Identify information resources.			
404	Apply steps in the problem solving method.			
405	RESERVE			
500	TEAMWORK			
501	Actively participate as a member of an engineering project team.			
502	Apply constructive feedback.			
503	Resolve conflict within the team.			
504	Demonstrate active listening techniques.			
505	Demonstrate formal and informal speaking skills.			
506	Explain the importance of selling a project idea to team members.			
507	Identify ways to motivate, coach, counsel, and reward individuals and teams.			
508	Perform a team peer review.			
509	Perform evaluations (e.g. self-evaluation and management evaluation).			
600	ENGINEERING GRAPHICS			
601	Proper use of graphics equipment and tools.			
602	Describe various types of drawings.			
603	Perform metric-U.S. system conversions.			
604	Use engineer's and architect's scales.			
605	Prepare freehand sketches.			
606	Apply line conventions.			
607	Prepare orthographic projection drawings.			
608	Prepare additional views to clarify the design.			
609	Apply principles of dimensioning and annotation.			
610	Prepare drawings for product assembly, fabrication, or construction.			
611	Create schematics.			
612	Revise an existing drawing to meet modifications or changes.			
700	ENGINEERING DESIGN PROCESSES			
701	Identify the steps of an iterative design process.			
702	Create an engineering solution for a real-world problem.			
703	Determine whether design is safe for a given user.			
704	Generate a design improvement to address specific flaws/failures.			
705	Create a proposal for an engineering project.			
706	Participate in a design review.			
707	Prepare a schedule for a design project.			
800	MODELING			

801	Identify the three areas of modeling (i.e., physical, conceptual, and mathematical).			
802	Create a scale model or working prototype.			
803	Evaluate a scale model or a working prototype.			
804	RESERVE			
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900	MANUFACTURING AND INDUSTRIAL SYSTEMS			
901	Research the history of manufacturing and its milestones.			
902	Research a topic in manufacturing.			
903	Describe procedures used in manufacturing.			
904	Identify basic flowcharting and discuss their functions.			
905	Create and apply a flowchart that portrays a manufacturing process.			
906	Create a control system that replicates a factory cell.			
907	RESERVE			
908	Evaluate a product prototype and the processes used in its manufacture.			
1000	MANUFACTURING PROCESSES			
1001	Demonstrate how research is used in Engineering Economics.			
1002	Demonstrate the relationship of time and cost to manufacturing systems.			
1003	Explain the difference between primary and secondary manufacturing processes.			
1004	Evaluate and present a production line activity.			
1005	Outline the product-development process.			
1006	Plan steps of production for a manufactured product.			
1007	List tools needed for a manufactured product.			
1008	Make a list of the production processes in manufacturing.			
1009	Apply manufacturing systems to develop and produce a prototype for a product.			
1010	Evaluate a product prototype and the processes used in its manufacture.			
1011	Write a step-by-step procedure for an assembly.			
1012	Identify methods and sources for obtaining materials and supplies.			
1013	Compile a materials list that includes vendors and costs for all required materials and equipment to build the prototype.			
1100	COMPUTER ASSISTED MANUFACTURING (CAM)			
1101	Prepare a process, identify machines that will be used to carry out the process, and then describe the work that each machine performs.			
1102	Research the history and industrial use of CAM.			
1103	Demonstrate how to use CAM software to create a program for a machine part.			
1200	POWER AND ENERGY			

1201	Define "Power."			
1202	Discuss the forms of potential energy.			
1203	Design a vehicle that stores and releases potential energy for propulsion.			
1204	Discuss the forms of kinetic energy.			
1205	Research methods of energy conversion (e.g., electrical, fluid, mechanical).			
1206	Define terms used in power systems.			
1207	Name the Laws of Thermodynamics.			
1300	MECHANICAL ADVANTAGE AND MECHANISMS			
1301	Locate and explain examples of the six simple machines, their attributes and components.			
1302	Measure forces and distances related to mechanisms.			
1303	Calculate mechanical advantage and drive ratios of mechanisms.			
1304	Design, create, and test various drive systems.			
1305	Determine efficiency in a mechanical system.			
1306	Convert power between units.			
1307	Measure torque, and use it to calculate power.			
1308	Demonstrate principles of mechanical systems as they relate to power transmission.			
1400	FLUID POWER SYSTEMS			
1401	Design, create, and test a fluid power system.			
1402	Identify components of a fluid system.			
1403	Calculate values in a fluid power system, using Pascal's Law.			
1404	Calculate values in a pneumatic system, using the ideal gas laws.			
1405	Calculate flow rate, flow velocity, and mechanical advantage in a fluid power system.			
1406	Maintain a fluid power system.			
1500	GREEN ENERGY			
1501	Produce mechanical power, using alternative energy systems.			
1502	Research renewable/non renewable energy sources.			
1503	Study energy efficiency and conservation.			
1504	Create a model that will utilize a renewable energy concept.			
1505	Investigate bio-degradable materials for an alternative energy source.			
1506	Prepare a concept of an alternative energy for transportation.			
1600	MACHINE CONTROLS AND AUTOMATED SYSTEMS			
1601	Choose appropriate machine control inputs and outputs, based on the need of a technological system.			
1602	Design and create a control system, based on given needs and constraints.			
1603	Differentiate between the characteristics of digital and analog devices.			
1604	Select between open and closed loop systems to solve a technological problem.			

1605	Create system control programs using flowchart logic.			
1606	Define and discuss open and closed loop systems.			
1607	Create and use flowcharts.			
1608	Identify components needed to integrate computer controls for an automated system.			
1609	Plan, design, and construct an automated system.			
1610	Program an automated system using computer hardware and software.			
1611	Interface system output to an other automated system.			
1612	Create and program a simulated work cell with simulation software.			
1613	Demonstrate the ability to program timers, counters and loops.			
1614	Identify and explain various types of motors.			
1615	Interface output devices to a computer, microcontroller or programmable logic controller.			
1700	PROPERTIES OF MATERIALS			
1701	Describe the properties of materials.			
1702	Investigate methods used to alter materials.			
1703	Illustrate causes of failure in materials.			
1704	Calculate material properties relating to a stress strain curve.			
1705	Create a written report of material test evaluations.			
1800	NATURAL, COMPOSITE AND SYNTHETIC MATERIALS			
1801	Investigate various types of metals and application.			
1802	Investigate various types of manufacturing wood and applications.			
1803	Investigate various types of ceramics and applications.			
1804	Investigate various composite and synthetic materials.			
1805	Solve a problem, design a product, or a prototype, that requires natural, composites and/or synthetic materials.			
1900	STRENGTH OF MATERIALS			
1901	Demonstrate knowledge of the principles of statics and dynamics to calculate the strength of various engineering materials used to build a structure.			
1902	Create free body diagrams of objects, identifying all forces acting on the object.			
1903	Locate the centroid of a rectangle and a triangle, using mathematics.			
1904	Calculate the moment of inertia for a rectangular shape.			
1905	Differentiate between scalar and vector quantities.			
1906	Identify magnitude, direction, and sense of a vector.			
1907	Calculate the X and Y components, given a vector.			
1908	Calculate moment forces, given a specified axis.			
2000	KINEMATICS			

2001	Given a set of data, calculate distance, displacement, speed, velocity, and acceleration.			
2002	Calculate acceleration due to gravity, based on data from a free-fall device.			
2003	Calculate the X and Y components of a projectile motion.			
2004	Determine the needed angle to launch a projectile a specific range, given the projectile's initial velocity.			
2100	TOTAL QUALITY CONTROL			
2101	Explain the eight "Ms" as they relate to total quality control in the manufacturing industry: Machines, Methods, Materials, Manpower, Measurement, Milieu, Management, and Maintenance.			
2102	Demonstrate knowledge of ISO quality standards.			
2103	Demonstrate the application of the following Total Quality Management techniques: Cause and Effect Diagram, Check Sheet, Control Chart, Histogram, Pareto Chart, Scatter Diagram, and Flow Chart.			
2104	Create a total quality control checklist for a product.			
2105	Communicate total quality control expectations to user groups.			
2106	Identify how to correct, and improve, a finding from an inspection document.			
2107	Develop a report of total quality control inspection observations and findings.			
2200	PRECISION MEASUREMENT FOR INDUSTRY			
2201	Convert numbers between the hexadecimal or octal number systems and the decimal number system.			
2202	Make linear measurements accurately to 1/16".			
2203	Use a micrometer to measure accurately to .001".			
2204	Use a dial caliper to measure accurately to .001".			
2205	Use combination squares and protractors for angular measurement.			
2206	Use a height gauge to layout and measure part to measure accurately to .001".			
2207	Use inside micrometers and telescoping gauges to measure accurately to .001".			
2208	Identify the way numbers are expressed in scientific notation, engineering notation, and System International (SI) notation.			
2300	BASIC ELECTRICITY AND ELECTRONICS			
2301	Identify and demonstrate safety rules in the use of electrical lab machines and equipment.			
2302	Define and describe basic terms in electricity and electronics.			
2303	Identify electrical and electronic symbols on a schematic.			
2304	Follow a schematic and construct series and parallel electrical and electronic circuits.			
2305	Identify resistors by type and value.			
2306	Describe various types of sensing and control devices.			
2307	Use a digital multi-meter to measure circuit values of current, resistance, and voltage.			
2308	Compute values of current, resistance and voltage using Ohm's Law.			
2309	Compare DC and AC waveforms, using an oscilloscope.			
2310	Analyze and measure values in AC circuits (including inductance, capacitance, reactance, and LRC circuits).			

2311	Calculate voltage, amperage, resistance, and power in all types of circuits.			
2312	Troubleshoot all types of circuits.			
2313	Identify functions, operation, and characteristics of grounding systems.			
2314	Interpret the NEC requirements for electrical installations.			
2315	RESERVE			
2316	Identify and install electrical panel boards and switchboards.			
2317	Identify, select, and install over-current devices.			
2318	Identify/install various ground fault circuit interrupter (AFCI & GFCI) and arc fault devices.			
2319	Explain transformer operation.			
2320	Describe and identify types of oscillators.			
2321	Identify and describe semiconductor atomic structure and construction methods.			
2322	Construct an amplifier circuit and verify the characteristics.			
2323	Construct a power supply circuit and verify operation.			
2324	Use circuit simulation software to construct and analyze digital and microprocessor circuit characteristics.			
2325	Identify and explain various types of motors, e.g. induction, etc., and the principles of their operation.			

PA Academic Standards for Career Education and Work

	<i>The Career Education and Work (CEW) Standards were developed by the Pennsylvania Department of Education and complement all disciplines and other academic standards. These skills outline certain skills that students need to obtain prior to high school graduation if they are to succeed in the workplace. Although they are not required under each CIP Code's Program of Study Task List, the School District of Philadelphia requires that all CTE students are taught and master these essential skills.</i>			
	<i>Click on the following links for more information on the CEW Standards:</i>			
	PA Dept. of Education CEW Website			
	CEW Standards			
	Career Awareness and Preparation			
4000	Relate careers to individual interests, abilities, and aptitudes.			
4001	Analyze career options based on personal interests, abilities, aptitudes, achievements and goals.			
4002	Analyze how the changing roles of individuals in the workplace relate to new opportunities within career choices.			
4003	Evaluate school-based opportunities for career awareness/preparation, such as, but not limited to career days, community service, internships, and job shadowing.			
4004	Justify the selection of a career.			
4005	Analyze the relationship between career choices and career preparation opportunities, such as, but not limited to college degrees, certificates/licensures, entrepreneurship, and industry and military training.			

4006	Assess the implementation of the individualized career plan through the ongoing development of the career portfolio.			
4007	Review personal high school plan against current personal career goals and select postsecondary opportunities based upon personal career interests.			
	Career Acquisition (Getting a Job)			
4008	Apply effective speaking and listening skills used in a job interview.			
4009	Apply research skills in searching for a job utilizing various job search resources (e.g. CareerLinks, O-Net, Professional Organizations).			
4010	Develop and assemble, for career portfolio placement, career acquisition documents, such as, but not limited to job application, letter of introduction, postsecondary education/training applications, request for letter of recommendation and resume.			
4011	Analyze, revise, and apply an individualized career portfolio to chosen career path.			
4012	Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to commitment, communication, dependability, health/safety, and scheduling/time management.			
	Career Retention and Advancement			
4013	Evaluate personal attitudes and work habits that support career retention and advancement.			
4014	Evaluate team member roles to describe and illustrate active listening techniques such as clarifying, encouraging, and summarizing.			
4015	Evaluate conflict resolution skills as they relate to the workplace such as constructive criticism, group dynamics, managing/leadership, negotiation and problem solving.			
4016	Develop a personal budget based on career choice, such as, but not limited to charitable contributions, fixed/variable expenses, gross and net pay, and savings.			
4017	Evaluate time management strategies and their application to both personal and work situations.			
4018	Evaluate strategies for career retention and advancement in response to the changing global workplace.			
4019	Evaluate the impact of lifelong learning on career retention and advancement.			
	Entrepreneurship			
4020	Analyze entrepreneurship as it relates to personal career goals and corporate opportunities.			
4021	Analyze entrepreneurship as it relates to personal character traits.			
4022	Develop a business plan for an entrepreneurial concept of personal interest and identify available resources, such as, but not limited to community-based organizations, financial institutions and venture capital.			

Signed:	
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CTE Instructor	Date

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for Help)
or Help)
Inst. Initials <i>(if 3 is Achieved)</i>

