Texas CTE

Manufacturing (2010): Grade 10

Adopted 2010

Principles of Manufacturing

(1) The student describes the importance of teamwork, leadership, integrity, honesty, work habits, and organizational skills. The student is expected to:

(A) describe how teams function;

(B) use teamwork to solve problems;

(C) distinguish team roles such as team leaders and team members;

(D) identify characteristics of good leaders;

(E) identify employers' work expectations;

(F) discuss Equal Employment Opportunity law in the workplace;

(G) use time-management techniques to develop work schedules;

(H) describe how teams measure results; and

(I) develop a method to reward team performance.

(2) The student explores the employability characteristics of a successful worker in the global economy. The student is expected to:

(A) explore academic knowledge and skills required for postsecondary education;

(B) identify employers' expectations to foster positive customer satisfaction;

(C) demonstrate the skills required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;

(D) evaluate personal career goals;

(E) communicate effectively with others to clarify objectives; and

(F) demonstrate skills related to health and safety in the workplace, as specified by appropriate government regulations.

(3) The student describes how a systems model can be used to describe manufacturing and technological activities. The student is expected to:

(A) identify the manufacturing processes such as input, output, and feedback;

(B) describe system differences such as open and closed; and

(C) describe how technological systems interact to achieve common goals.

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(4) The student applies manufacturing concepts to specific problems. The student is expected to:

- (A) distinguish between disciplines such as engineering, science, and technology;
- (B) analyze engineering concepts to solve practical problems;
- (C) use problem-solving tools such as calculators and computers;
- (D) evaluate computers for simulation tasks;
- (E) use tools for laboratory equipment testing;
- (F) use precision measuring instruments; and
- (G) evaluate software to design quality assurance models.

(5) The student designs products or systems using appropriate processes and techniques. The student is expected to:

- (A) improve a product that meets a specified need;
- (B) identify system improvements such as quality, reliability, and safety;
- (C) produce engineering drawings using standard technical communication techniques; and
- (D) research the patenting process.

(6) The student investigates emerging and innovative applications of technology in engineering. The student is expected to:

- (A) report on innovative applications of technology in engineering; and
- (B) experiment with new technologies.

(7) The student describes quality and how it is measured in manufacturing. The student is expected to:

- (A) evaluate different quality control applications in manufacturing; and
- (B) research how the quality of products and services affects engineering decisions.

(8) The student manufactures products or systems using the appropriate tools, equipment, machines, materials, and technical processes. The student is expected to:

- (A) analyze engineering properties such as chemical, mechanical, and physical;
- (B) analyze the processes needed to complete a project;
- (C) use a variety of tools such as equipment and machines; and
- (D) produce an item that is student designed.

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(9) The student practices safe work habits. The student is expected to:

- (A) master relevant safety tests;
- (B) analyze hazardous materials; and
- (C) safely dispose of hazardous materials.

(10) The student describes the importance of maintenance. The student is expected to:

- (A) perform maintenance on selected equipment;
- (B) store materials correctly; and
- (C) analyze the results of improper maintenance.

(11) The student manages a manufacturing project. The student is expected to:

- (A) participate in the operation of a manufacturing project; and
- (B) develop a plan for completing an individual project.

(12) The student applies the appropriate codes, laws, standards, or regulations such as Occupational Safety and Health Administration, National Electrical Code, American Society for Testing Materials, standard symbols, and line weights. The student is expected to:

- (A) research the importance of regulations such as codes, laws, and standards; and
- (B) follow the appropriate regulations.

(13) The student describes the intended and unintended effects of technological solutions to the manufacturing process. The student is expected to:

- (A) evaluate an assessment strategy such as the risks and benefits of engineering activities; and
- (B) demonstrate how engineering changes environments.

(14) The student describes the factors that affect the evolution of technology. The student is expected to:

- (A) analyze how changes in technology affect manufacturing practices;
- (B) evaluate how the development of technology in manufacturing is influenced by past events;
- (C) analyze the international effects of technology;
- (D) demonstrate how advancements in technology have affected the field of engineering;
- (E) evaluate the factors that affect the implementation of new ideas; and
- (F) analyze how manufacturing evolves.

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) The student solves problems, thinks critically, and makes decisions related to manufacturing. The student is expected to:

(A) apply an engineering approach to problem solving to improve a manufactured product;

(B) apply critical-thinking strategies to the analysis of proposed solutions; and

(C) apply decision-making techniques to engineering solutions.

(16) The student identifies the factors that influence the cost of an item or service. The student is expected to:

(A) defend a budget for a project; and

(B) determine the most effective strategies to minimize costs.

(17) The student applies communication, mathematics, and science knowledge and skills to manufacturing activities. The student is expected to:

(A) demonstrate communication techniques consistent with industry standards;

(B) locate relevant information needed to solve problems;

(C) apply mathematics concepts to solve manufacturing problems;

(D) analyze science principles used to solve problems; and

(E) use the appropriate units of measure.

(18) The student describes the relationship between manufacturing and marketing. The student is expected to:

(A) prepare a marketing plan for a product;

(B) analyze the effect of customer satisfaction on the image of a product; and

(C) analyze how customer demands influence the design of an object.

(19) The student selects and reports on career opportunities, requirements, and expectations in engineering and technology. The student is expected to:

(A) investigate an area of interest in manufacturing;

(B) analyze the various specializations in manufacturing; and

(C) describe the functions of engineers, technologists, and technicians.

Welding

(1) The student describes the importance of teamwork, leadership, integrity, honesty, work habits, and organizational skills. The student is expected to:

(A) describe how teams function;

(B) use teamwork to solve problems;

(C) distinguish team roles such as team leaders and team members;

(D) identify characteristics of good leaders;

(E) identify employers' work expectations;

(F) discuss Equal Employment Opportunity law in the workplace;

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(G) use time-management techniques to develop work schedules;

(H) describe how teams measure results; and

(I) develop a method to reward team performance.

(2) The student explores the employability characteristics of a successful worker in the global economy. The student is expected to:

(A) explore academic knowledge and skills required for postsecondary education;

(B) identify employers' expectations to foster positive customer satisfaction;

(C) demonstrate the skills required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;

(D) evaluate personal career goals;

(E) communicate effectively with others in the workplace to clarify objectives; and

(F) demonstrate skills related to health and safety in the workplace, as specified by appropriate government regulations.

(3) The student applies academic skills to the requirements of welding. The student is expected to:

(A) demonstrate effective communication skills with individuals from varied cultures such as fellow workers, management, and customers;

(B) demonstrate mathematical skills to estimate costs;

(C) demonstrate technical writing skills related to work orders;

(D) apply accurate readings of measuring devices, both U.S. customary and metric;

(E) accurately use an appropriate tool to make measurements;

(F) compute measurements such as area, surface area, volume, and perimeter;

(G) determine how changes in dimension affect geometric figures;

(H) calculate problems using whole numbers, fractions, mixed numbers, and decimals;

(I) use a calculator to perform computations;

(J) perform conversions between fractions and decimals;

(K) understand the functions of angles;

(L) apply right triangle relationships using the Pythagorean Theorem;

(M) understand the parts of a circle;

(N) identify the most reasonable mathematical solution using estimation;

(O) use cross-sections of three-dimensional figures to relate to plane figures;

(P) describe orthographic views of three-dimensional figures; and

(Q) describe isometric views of three-dimensional figures.

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The student knows the function and application of the tools, equipment, technologies, and materials used in welding. The student is expected to:

(A) use welding equipment according to safety standards;

(B) properly dispose of environmentally hazardous materials used in welding; and

(C) use appropriate personal protective equipment as needed to follow safety measures.

(5) The student understands welding joint design, symbols, and welds. The student is expected to:

(A) demonstrate knowledge of a welding blueprint;

(B) interpret blueprints, drawings, charts, and diagrams;

(C) analyze components of the welding symbol;

(D) analyze types of welding joints;

(E) analyze positions of welding; and

(F) identify types of welds such as fillet, groove, spot, plug, and flanged.

(6) The student applies the concepts and skills of welding to simulate actual work situations. The student is expected to:

(A) explore careers in welding;

(B) work independently to fabricate a welded project with minimal assistance;

(C) work collaboratively with other students to complete a relevant project; and

(D) troubleshoot equipment.

(7) The student knows the concepts and intricacies of inspections and related codes. The student is expected to:

(A) evaluate weld inspection processes; and

(B) analyze welding codes.

(8) The student performs oxy-fuel processes on carbon steels. The student is expected to:

(A) observe safe operating practices;

(B) perform safe handling of compressed gases;

(C) identify components of oxy-fuel gas cutting;

(D) demonstrate proper set-up procedures for oxy-fuel process;

(E) distinguish factors affecting base metals;

(F) demonstrate proper cutting techniques such as piercing, straight line, and bevel;

(G) perform welding and brazing; and

(H) identify acceptable cuts.

(9) The student performs plasma arc cutting on metals. The student is expected to:

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(A) observe safe operating practices;

(B) demonstrate knowledge of the theories of plasma arc cutting;

(C) apply safe handling of compressed air supply;

(D) identify components of plasma arc cutting;

(E) demonstrate correct set-up procedure for plasma arc cutting;

(F) define cutting terms; and

(G) perform shape cutting.

(10) The student performs shielded metal arc welding principles and practices on metals. The student is expected to:

(A) use safe operating practices;

(B) demonstrate knowledge of the theories of electrical relationships such as alternating current and direct current, heat transfer, and polarity;

(C) apply shielded metal arc welding principles;

(D) demonstrate proper set-up procedure for shielded metal arc welding;

(E) determine appropriate filler for base metal in shielded metal arc welding;

(F) perform welds such as fillet and groove;

(G) perform passes such as root, hot, filler, and cover;

(H) perform plate preparation; and

(I) perform heating processes such as pre-heating and post-heating.

(11) The student performs gas metal arc welding principles and practices. The student is expected to:

(A) use safe operating practices;

(B) demonstrate knowledge of the theories of electrical relationships such as alternating current and direct current, heat transfer, and polarity;

(C) apply gas metal arc welding principles;

(D) demonstrate proper set-up procedure for gas metal arc welding;

(E) determine appropriate filler for base metal in gas metal arc welding; and

(F) perform fillet welds.

(12) The student performs flux cored arc welding principles and practices on metals. The student is expected to:

(A) use safe operating practices;

(B) demonstrate knowledge of the theories of electrical relationships such as alternating current and direct current, heat transfer, and polarity;

(C) apply flux cored arc welding principles;

(D) demonstrate proper set-up procedure for flux cored arc welding;

(E) determine appropriate filler for base metal in flux cored arc welding;

(F) perform fillet welds; and

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(G) perform welds in all appropriate positions.

(13) The student performs gas tungsten arc welding on metals. The student is expected to:

(A) use safe operating practices;

(B) demonstrate knowledge of the theories of electrical relationships such as alternating current and direct current, heat transfer, and polarity;

(C) determine the common types of tungsten and filler materials;

(D) demonstrate proper set-up procedure for gas tungsten arc welding;

(E) perform fillet welds;

(F) perform welds in all appropriate positions; and

(G) perform welds on carbon steel.

Precision Metal Manufacturing

(1) The student knows the importance of teamwork, leadership, integrity, honesty, work habits, and organizational skills. The student is expected to:

(A) describe how teams function;

(B) use teamwork to solve problems;

(C) distinguish team roles such as team leaders and team members;

(D) identify characteristics of good leaders;

(E) identify employers' work expectations;

(F) discuss Equal Employment Opportunity law in the workplace;

(G) use time-management techniques to develop work schedules;

(H) describe how teams measure results; and

(I) develop a method to reward team performance.

(2) The student explores the employability characteristics of a successful worker in the global economy. The student is expected to:

(A) determine academic knowledge and skills required for postsecondary education;

(B) identify employers' expectations to foster positive customer satisfaction;

(C) demonstrate the skills required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;

(D) evaluate personal career goals;

(E) communicate effectively with others in the workplace to clarify objectives; and

(F) demonstrate skills related to health and safety in the workplace, as specified by appropriate government regulations.

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The student applies advanced academic skills to the requirements of precision metal manufacturing. The student is expected to:

(A) demonstrate effective communication skills with individuals from varied cultures such as fellow workers, management, and customers;

(B) successfully complete work orders;

(C) demonstrate mathematical skills to estimate costs;

(D) interpret blueprints such as schematics, drawings, charts, and diagrams; and

(E) use mathematics as it applies to precision machining operations.

(4) The student knows the concepts and skills that form the technical knowledge required in a machine shop. The student is expected to:

(A) examine the resources found in recognized machinery manufacturing reference materials; and

(B) demonstrate knowledge of the uses of abrasives.

(5) The student knows the function and application of the tools, equipment, technologies, and materials used in a machine shop. The student is expected to:

(A) safely use equipment commonly employed in machine shops;

(B) properly dispose of environmentally hazardous materials used in machine shops;

(C) demonstrate knowledge of numerical control operations; and

(D) demonstrate knowledge of emerging technologies that may affect the machine shop.

(6) The student applies technical knowledge and skills of precision metal manufacturing to simulated and actual work situations. The student is expected to:

(A) demonstrate proficiency in cutting processes such as drilling, turning, boring, milling, and broaching;

(B) use various work mounting procedures on all machines;

(C) properly execute lathe procedures such as threads, turn tapers, polishes, knurls, and bores;

(D) mill flat surfaces, bevels, chamfers, grooves, and key-seats using proper milling procedures;

(E) use proper procedures for surface grinding operations;

(F) accurately machine precision pieces;

(G) demonstrate knowledge of heating metals such as hardening, tempering, annealing, normalizing, and case hardening steel; and

(H) apply technical knowledge and skills in a machine shop to career preparation experiences.

Flexible Manufacturing

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(1) The student describes the importance of teamwork, leadership, integrity, honesty, work habits, and organizational skills. The student is expected to:

(A) describe how teams function;

(B) use teamwork to solve problems;

(C) distinguish team roles such as team leaders and team members;

(D) identify characteristics of good leaders;

(E) identify employers' work expectations;

(F) discuss Equal Employment Opportunity law in the workplace;

(G) use time-management techniques to develop work schedules;

(H) describe how teams measure results; and

(I) develop a method to reward team performance.

(2) The student explores the employability characteristics of a successful worker in the global economy. The student is expected to:

(A) determine advanced knowledge and skills required for postsecondary education;

(B) identify employers' expectations to foster positive customer satisfaction;

(C) demonstrate the skills required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;

(D) evaluate personal career goals;

(E) communicate effectively with others in the workplace to clarify objectives; and

(F) demonstrate skills related to health and safety in the workplace, as specified by appropriate government regulations.

(3) The student applies academic skills to the requirements of metal materials. The student is expected to:

(A) demonstrate effective oral and written communication skills with individuals from varied cultures, including fellow workers, management, and customers;

(B) appraise blueprints, drawings, charts, diagrams, and welding symbols; and

(C) select algebraic and geometric principles and formulas required for precision measuring operations.

(4) The student differentiates the technical concepts that form the knowledge and skills of metal trades. The student is expected to:

(A) analyze the resources found in The Machinery's Handbook and various American Welding Society specification and code reference books;

(B) examine the theory of shielded metal arc-welding and gas metal arc-welding;

(C) examine the sheet metal industry; and

(D) examine the use of abrasives.

(5) The student differentiates the function and application of the tools, equipment, technologies, and materials used in metal manufacturing. The student is expected to:

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(A) safely use hand and power tools and equipment commonly employed in metal manufacturing; and

(B) properly handle and dispose of environmentally hazardous materials used in metal manufacturing.

(6) The student applies the technical concepts and skills of the machining industry to simulated and actual work situations. The student is expected to:

(A) use various work mounting procedures on all appropriate machines;

(B) examine the cutting operations such as drill press, lathe, saw, grinders, and milling machines;

(C) properly execute lathe procedures such as cut threads, turn tapers, drills, reams, polishes, knurls, and bores;

(D) mill flat surfaces, bevels, chamfers, grooves, and key-seats; and

(E) machine precision pieces.

(7) The student applies the technical concepts and skills of the welding industry to simulated and actual work situations. The student is expected to:

(A) examine the cutting processes such as oxy-fuel and plasma;

(B) explore the use of the common types of electrodes;

(C) use various welding machines to weld multiple joints; and

(D) inspect welds.

(8) The student applies the technical concepts and skills of the sheet metal industry to simulated and actual work situations. The student is expected to:

(A) use mathematics in precision measuring operations; and

(B) interpret blueprints, drawings, charts, and diagrams as related to the sheet metal industry.

(9) The student differentiates the concepts that form the technical knowledge and skills of sheet metal manufacturing. The student is expected to:

(A) analyze the types, sizes, and properties of sheet metal materials;

(B) analyze the fundamentals of oxy-fuel processes as related to sheet metal; and

(C) analyze the fundamentals of shielded metal arc-welding as related to sheet metal under American Welding Society code.

(10) The student understands the function and application of the tools, equipment, technologies, and materials used in sheet metal manufacturing. The student is expected to:

(A) safely use equipment; and

(B) properly dispose of environmentally hazardous materials used in sheet metal manufacturing.

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(11) The student applies the knowledge and skills of sheet metal manufacturing in simulated and actual work situations. The student is expected to:

(A) draw simple sheet metal layouts; and

(B) construct common sheet metal seams.