**§130.323. Welding (One to Two Credits).**

(a)  General requirements. This course is recommended for students in Grades 10-12. Recommended prerequisite: Algebra 1.

(b)  Introduction. Rapid advances in technology have created new career opportunities and demands in many industries. Welding provides the knowledge, skills, and technologies required for employment in metal technology systems. Students develop knowledge and skills related to this system and apply them to personal career development. This course supports integration of academic and technical knowledge and skills. Students will reinforce, apply, and transfer knowledge and skills to a variety of settings and problems. Knowledge about career opportunities, requirements, and expectations and the development of workplace skills prepare students for future success.

(c)  Knowledge and skills.

(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 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.

(4)  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:

(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

(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.