

WELDING & FABRICATION (WAF)

WAF 103 Introduction to Gas Tungsten Arc Welding (2 Credits)

15 lecture, 45 lab, 2 total contact hours

In this course, students will be exposed to the gas tungsten arc welding (GTAW) process. The student will weld butt, lap and tee joints in the flat and horizontal positions on mild steel and aluminum. Welding vocabulary, theory and safety precautions will be discussed in the classroom. The student will apply safe work practices, welding techniques and theories related to the composition and properties of these metals. This course is designed for non-welding majors. This class does not meet a requirement for welding certificates or degrees. The title of this course was previously Heli-Arc Welding. Level I Prerequisite: Academic Reading and Writing Levels of 6

WAF 104 Soldering and Brazing (2 Credits)

15 lecture, 45 lab, 2 total contact hours

In this course, students are introduced to the soldering and brazing processes on copper tubing and fittings. Students practice braze butt, lap and tee joints on steel, and perform a variety of solder and braze joints on ferrous and non-ferrous materials. The student will apply safe work practices in the welding laboratory setting. The student's final copper tubing project will be pressurized to ensure proper soldering and brazing applications. This course is designed for non-welding majors. This class does not meet a requirement for welding certificates or degrees. Level I Prerequisite: Academic Reading and Writing Levels of 6

WAF 105 Introduction to Welding Processes (2 Credits)

15 lecture, 45 lab, 2 total contact hours

In this basic welding class, students are introduced to four welding processes: oxy-fuel welding (OFW), gas tungsten arc welding (GTAW), shielded metal arc welding (SMAW) and gas metal arc welding (GMAW). One cutting process is also explored: oxy-fuel cutting (OFC). Students will learn welding vocabulary, welding theory, safe handling practices and set-up of all related welding equipment. Students will weld using each process on ferrous or non-ferrous materials that are commonly used in industries such as automotive, manufacturing, structural and artistic sculpture work. Level I Prerequisite: Academic Reading and Writing Levels of 6

WAF 106 Welding Print Reading (3 Credits)

30 lecture, 30 lab, 3 total contact hours

In this course, students are introduced to print reading and drafting fundamentals and concepts. Students will learn to recognize and apply key terms, line types, dimensioning and tolerances and the different orthographic views while becoming skilled at interpreting AWS A2.4 standard symbols for welding, brazing and non-destructive examination. Level I Prerequisite: Academic Reading and Writing Levels of 6; WAF 125 or WAF 126, minimum grade "C"; may enroll concurrently

WAF 109 Welding Safety and OSHA Regulations (2 Credits)

30 lecture, 2 total contact hours

In this course, students are introduced to the rights and responsibilities of an entry-level general industry and construction personnel along with the responsibilities of an employer. Course topics include hazard recognition, abatement, control and prevention. Several OSHA regulations topics will be covered, including welding, machine guarding, power industrial truck operation, personal protection equipment and HAZMAT. Level I Prerequisite: Academic Reading and Writing Levels of 6

WAF 110 Ironworker Pre-Apprenticeship Orientation and Safety (2 Credits)

15 lecture, 45 lab, 2 total contact hours

In this course, students will be introduced to the history of the Ironworkers Union, basic safety information, terminology and hands-on experience needed to start working as an Ironworker. Areas of study will include personal protective equipment (PPE) use, scaffolding safety, fire watch procedures, OSHA 30, Subpart R, CPR, first aid and power tool safety specific to the Ironworker trade. All the information covered in this course is developed from the Ironworker Orientation Manual. This course is required for the Ironworkers Pre-Apprenticeship Certificate. Level I Prerequisite: Academic Reading Level 3; Academic Writing Level 2

WAF 114 Ironworker Pre-Apprenticeship Introduction to Welding (3 Credits)

15 lecture, 60 lab, 3 total contact hours

In this course, students will be introduced to Shielded Metal Arc Welding (SMAW), Flux-Cored Arc Welding (FCAW), Oxy-Fuel Gas Welding and Cutting (OFC-W/C), Soldering and Brazing processes and how the processes apply to the Ironworker trade. The student will apply these processes to various joint designs using proper techniques on steel plates and structural shapes. Welding vocabulary, welding theory, safety precautions and safe work practices will be covered. This course contains material previously taught in WAF 115. This course is required for the Ironworkers Pre-Apprenticeship Certificate. Level I Prerequisite: Academic Reading Level 3; Academic Writing Level 2

WAF 116 Ironworker Pre-Apprenticeship Shielded Metal Arc Welding (4 Credits)

30 lecture, 90 lab, 4 total contact hours

In this course, students will be introduced to the Shielded Metal Arc Welding (SMAW) and the Carbon Arc Cutting and Gouging (CAC/G) processes and how these processes are applied in the Ironworker trade. Students will learn to apply SMAW to various joint designs on plate and structural shapes in multiple positions and perform CAC/G techniques on steel with the various types of CAG electrodes. Welding vocabulary, welding theory, basic electricity, personal protective equipment, (PPE), equipment troubleshooting, safety precautions and safe work practices will be covered along with an introduction to weld quality. The title of this course was previously Shielded Metal Arc Welding for Ironworkers. This course is required for the Ironworkers Pre-Apprenticeship Certificate. Level I Prerequisite: Academic Reading Level 3; Academic Writing Level 2; WAF 110 and WAF 114, minimum grade "C"

WAF 117 Ironworker Pre-Apprenticeship Flux Cored Arc Welding (4 Credits)

30 lecture, 90 lab, 4 total contact hours

In this course, students will be introduced to the Flux-Cored Arc Welding (FCAW) process and gain the understanding of how this process is applied in the Ironworker trade. Students will learn to apply FCAW to various joint designs, on plate and structural shapes in multiple positions, using self-shielded and gas shielded filler wire. Welding vocabulary, welding theory, basic electricity, personal protective equipment (PPE), equipment troubleshooting, welding symbols, safety precautions and safe work practices will be covered along with discussing the various consumables used in FCAW and their applications. The title of this course was previously Flux Cored Arc Welding for Ironworkers. This course is required for the Ironworkers Pre-Apprenticeship Certificate. Level I Prerequisite: Academic Reading Level 3; Academic Writing Level 2; WAF 110 and WAF 114, minimum grade "C"

WAF 119 Ironworker Pre-Apprenticeship Rigging and Cranes (2 Credits)

15 lecture, 45 lab, 2 total contact hours

In this course, students will be introduced to rigging safety, application of rigging equipment and rigging techniques. Topics covered include but are not limited to: rigging hazards, rigger safety, flagger procedures, appropriate rigging signals, material handling, rigging calculations, rigging hardware, crane equipment and operations. Preparation for the Crosby Level 1 Rigging Certification test is also covered. This course is required for the Ironworkers Pre-Apprenticeship Certificate. Level I Prerequisite: Academic Reading Level 3; Academic Writing Level 2

WAF 120 Ironworker Pre-Apprenticeship Print Reading and Contextualized Math (2 Credits)

15 lecture, 45 lab, 2 total contact hours

In this course, the pre-apprentice is provided with training in various line types and symbols used in construction drawings such as steel frame construction, architectural, engineering and specialty drawings used by the ironworker trade. The math portion of this course will present relevant math formulas, math problems, measurements with specified layout tools. Basic fraction problem-solving and conversions required in the ironworker trades will be reviewed. This course is required for the Ironworkers Pre-Apprenticeship Certificate. Level I Prerequisite: Academic Reading Level 3; Academic Writing Level 2

WAF 125 Introduction to Welding Processes I (2 Credits)

15 lecture, 45 lab, 2 total contact hours

In this course, students are given an introduction to the following welding processes: Oxy-Fuel Welding (OFW), Oxy-Fuel Cutting (OFC), Brazing, Gas Tungsten Arc Welding (GTAW) on carbon steel, aluminum, stainless steel plate and sheet metal. This will include the Flat (1G/F) and horizontal (2G/F) positions. Surfacing (Pad welding) will also be performed in the GTAW process. Level I Prerequisite: Academic Reading and Writing Levels of 6; WAF 109 minimum grade "C", may enroll concurrently

WAF 126 Introduction to Welding Processes II (2 Credits)

15 lecture, 45 lab, 2 total contact hours

In this course, students are introduced to the following welding processes: Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW) and Flux Core Arc Welding (FCAW). Multiple weld joints are covered in the flat (1F/G) and horizontal (2F/G) positions on plate and sheet metal. Level I Prerequisite: Academic Reading and Writing Levels of 6; WAF 109 minimum grade "C", may enroll concurrently

WAF 130 Shielded Metal Arc Welding (SMAW) (4 Credits)

30 lecture, 90 lab, 4 total contact hours

In this course, which expands on the Shielded Metal Arc Welding (SMAW) process, students are introduced to all position welding on various joint designs. Other topics in the course include AWS electrode identification, classification and proper weld positioning. Students will apply techniques taught in the course when welding structural shapes and pipe. This course contains material previously taught in WAF 112. Level I Prerequisite: Academic Reading and Writing Levels of 6; Academic Math Level 1; WAF 109 minimum grade "C", may enroll concurrently; WAF 126 minimum grade "C"

WAF 131 Thermal Cutting, Gouging and Weld Repair (3 Credits)

30 lecture, 30 lab, 3 total contact hours

In this course, students are introduced to the following cutting and gouging processes: Oxy-fuel cutting (OFC), Gouging, Plasma Arc Cutting (PAC), Plasma Arc Gouging, Carbon Arc Cutting (CAC), Carbon Arc Gouging, Oxygen Lance Cutting and Gouging. These processes will be applied to plate, sheet metal and pipe. Level I Prerequisite: Academic Reading and Writing Levels of 6; WAF 109 minimum grade "C", may enroll concurrently

WAF 139 Basic Metal Fabrication (3 Credits)

30 lecture, 30 lab, 3 total contact hours

In this course, students are introduced to the principles and practices of metal fabrication and the proper and safe use of various pieces of metal fabricating equipment. Students will apply fabrication techniques of drafting and print reading, layout, assembly, tacking and welding to manufacture basic metal projects. This course contains material previously taught in WAF 227. Level I Prerequisite: Academic Reading and Writing Levels of 6; Academic Math Level 1; WAF 105 and WAF 106, minimum grade "C"; or WAF 125 and WAF 126, minimum grade "C"

WAF 140 Inspection and Testing (3 Credits)

30 lecture, 30 lab, 3 total contact hours

In this course, students are introduced to the most common types of weld inspection and testing methods. Destructive testing methods include bend tests, tensile pulls, charpy V notch and macro etch tests with non-destructive methods focusing on visual, dye penetrant, ultrasonic, magnetic particle and radiographic testing. Welding code acceptance criteria will be interpreted and applied to testing methods where applicable. Level I Prerequisite: Academic Reading and Writing Levels of 6; Academic Math Level 1; WAF 109, WAF 125 and WAF 126, minimum grade "C"

WAF 150 Automated Welding and Cutting (3 Credits)

30 lecture, 30 lab, 3 total contact hours

In this course, students are introduced to basic robotic welding and cutting. Safety, set-up, programming and industry applications are covered. Students will be exposed to five- and six-axis robotic applications of gas metal arc welding (GMAW), laser, spot and resistance welding as well as plasma, laser and water jet cutting methods. Level I Prerequisite: Academic Reading and Writing Levels of 6; Academic Math Level 1; WAF 140, WAF 232 and NCT 120, minimum grade "C"

WAF 174 WAF Co-op Education I (1-3 Credits)

120 to 360 clinical/other, 1 to 3 total contact hours

In this course, students gain skills from a new experience in an approved, compensated, industry-related position. Together with the instructor and employer, students set up work assignments and learning objectives to connect classroom learning with career related work experience. Level I Prerequisite: Academic Reading and Writing Levels of 6; consent required

WAF 210 Welding Metallurgy (3 Credits)

45 lecture, 15 lab, 3 total contact hours

In this course, students will be introduced to grain structure, atomic structure and phase transformations. They will recognize and illustrate the various aspects of extractive, mechanical and physical metallurgy including the theory and practice of metal identification, selection, processing, fabrication, conditioning and testing of ferrous and non-ferrous materials. Heat-treating of various common industry materials will be discussed and students will analyze the root cause of weld failure and identify solutions. Level I Prerequisite: Academic Reading and Writing Levels of 6; Academic Math Level 2; WAF 140 and WAF 232, minimum grade "C"

WAF 230 Advanced Shielded Metal Arc Welding (SMAW) (4 Credits)

30 lecture, 90 lab, 4 total contact hours

In this course, students further develop their Shielded Metal Arc Welding (SMAW) skills by learning the American Welding Society (AWS) codes and standards and applying them to welds being performed. Students will create welded samples including sheet metal, plate, "C" channel and "H" beam joints in all positions as well as pipe in the 5F/G and 6G positions with multiple electrodes. Level I Prerequisite: Academic Reading and Writing Levels of 6; Academic Math Level 1; WAF 130 minimum grade "C"

WAF 231 Gas Tungsten Arc Welding (GTAW) (4 Credits)

30 lecture, 90 lab, 4 total contact hours

In this course, students will further enhance their Gas Tungsten Arc Welding (GTAW) skills by performing advanced welding techniques most commonly used in the aerospace, manufacturing and automotive industries. Materials, such as, carbon steel, aluminum, stainless steel, copper and cast iron will be used. Multiple passes will be required using positions such as 2F/G, 3F/G, 4F/G, 5F/G, 6F/G on sheet, plate and pipe. Students will apply filler metal classification and specifications, codes and standards set forth by the American Welding Society (AWS). Level I Prerequisite: Academic Reading and Writing Levels of 6; Academic Math Level 1; WAF 125 minimum grade "C"

WAF 232 Semi-Automatic Welding Processes (4 Credits)

30 lecture, 90 lab, 4 total contact hours

In this course, students enhance their welding skills in the Gas Metal Arc Welding (GMAW), Flux Cored Arc Welding (FCAW) and Metal Cored Arc Welding (MCAW) processes by performing advanced welding techniques most commonly used in the manufacturing, automotive and construction industries. Other topics include filler metal classification and specifications, codes and standards set forth by the American Welding Society (AWS). This course contains material previously taught in WAF 288. Level I Prerequisite: Academic Reading and Writing Levels of 6; Academic Math Level 1; WAF 126 minimum grade "C"

WAF 233 Submerged Arc and Flux Core Arc Welding (3 Credits)

30 lecture, 30 lab, 3 total contact hours

In this course, students are introduced to the Submerged Arc Welding (SAW) and Flux Core Arc Welding (FCAW) processes with automated and semi-automated wire feed systems. Safety, set-up, programming, industry applications as well as AC/DC polarities, waveform technology and applications on longitudinal (plate) and circumferential (pipe) are demonstrated. Level I Prerequisite: Academic Reading and Writing Levels of 6; Academic Math Level 2; WAF 232 minimum grade "C"

WAF 239 Advanced Metal Fabrication (3 Credits)

15 lecture, 60 lab, 3 total contact hours

In this capstone course, students will utilize various skills they have learned throughout the program. Students will be required to utilize their print reading skills to interpret a blueprint, layout a project, cut material, bend, drill, mill, assemble and weld projects in accordance with specifications on the blueprint. Group and individual projects may be required. Level I Prerequisite: Academic Reading and Writing Levels of 6; Academic Math Level 2; WAF 139, WAF 210, WAF 230, WAF 231 and WAF 232, minimum grade "C"; WAF 210 may enroll concurrently

WAF 290 Advanced Training and Weld Certification (3 Credits)

30 lecture, 45 lab, 3 total contact hours

In this course, students will improve their command of welding processes, advance their welding skills and perform welds to the high standards established by the American Welding Society (AWS). The theory and skills needed for certification in specific welding vocations will be covered. Visual inspection of weld discontinuities along with the requirements and duties of the certified welding inspector are discussed. Successful students will perform welding tasks that meet AWS and ASME standards for an industry certification. Level I Prerequisite: Academic Reading and Writing Levels of 6; Academic Math Level 3; WAF 140 minimum grade "B", may enroll concurrently; WAF 230, WAF 231 or WAF 232, minimum grade "B"