

Welding – Advanced
UCAT Certificate of Completion
Course Descriptions
2008 - 2009

CORE COURSES

BTEC 1110 Computer Literacy **90 Hours**

This course provides a fundamental understanding of computing including knowledge and use of computer hardware, software, and operating systems. The course will cover basic use and common features of applications (word processing, spreadsheet, and database) including internet use and e-mail.

Recommended prerequisite: keyboarding 25 wpm.

Competencies:

- Identify computing fundamentals such as computer hardware, software, and operating systems
- Learn to navigate the windows environment
- Gain knowledge of primary applications such as common program, word processing, spreadsheet, and database functions
- Learn to use online computing including Internet and electronic mail

WELD 1010 Welding Safety **30 Hours**

This course will teach students how to prepare themselves and the work area for a safe accident-free environment.

Competencies:

- Protection of personnel
- Protection of the work area
- Ventilation
- Fire prevention and protection
- Welding in confined spaces
- Safety colors
- Precautionary labeling
- Lock-out/Tag-out procedures

WELD 1110 Welding Math **30 Hours**

This class will teach the basic math skills required for welders.

Competencies:

- US Customary measuring systems
- SI Metric measuring systems
- Add, subtract, multiply, and divide whole numbers
- Fractions, mixed numbers, and decimals
- Round off decimals
- Use measuring devices to determine size, length, angle, or distance
- Use calculator to perform basic mathematical skills
- Convert mixed number fractions to decimals and vice versa

- Convert SI (metric) to US units and vice versa
- Identify geometric shapes
- Understand the parts and angles of a circle
- Lay out parts using primary functions of geometry
- Read and use a US (customary) and SI (metric) tape, ruler, and square

WELD 1120 Communications and Work Assignments 30 Hours

This course will teach students how to listen, learn welding related terminology, express themselves verbally, prepare time and job cards, follow written details, and perform housekeeping duties.

Competencies:

- Follow detailed verbal instructions
- Pronounce key technical words precisely
- Verbalize factual details accurately
- Understand and explain job related messages and problems clearly
- Prepare job reports and time cards
- Read and follow written details
- Perform safe housekeeping duties

WELD 1130 Electrical Fundamentals 30 Hours

This course will teach basic electrical AC and DC currents, polarity for welding machines, troubleshooting, and electrical safety.

Competencies:

- AC-DC fundamentals
- Welder polarity setup
- Troubleshooting welders and equipment
- Electrical safety

WELD 1140 Welding Metallurgy Basics 30 Hours

This course will introduce students to basic metallurgy and heat treat procedures relating to mild steel, high carbon steel, and cast iron.

Competencies:

- Learn steel manufacturing processes
- Learn metal identification methods
- Understand face center and body center cubes
- Identify transition temperature
- Describe annealing, quenching, tempering, and normalizing
- Define cementite, pearlite, ferrite, austenite, and martensite
- Understand heat treat procedures for carbon and iron based metals
- Understand stress and strain loads related to weld strength, tensile strength, and yield strength

WELD 1210 Oxy-fuel Gas Welding 30 Hours

This course will teach how to setup and use oxy-fuel equipment for welding, cutting, and brazing on plain carbon steel. Students will learn basic welding skills and techniques.

Competencies:

- Setup equipment
- Set gases to working pressures
- Light torch and demonstrate oxidizing, neutral, and carburizing flame
- Weld beads with and without filler
- Weld butt, lap, and tee joints in flat position
- Braze beads
- Braze weld butt, lap, and tee joints in flat position
- Make straight line cuts with manual torch
- Make bevel and shape cuts with manual torch
- Straight cutting and bevel cutting – machine track burner

WELD 1250 ARC Cutting Processes - Carbon Air Arc (CAC)/Plasma Arc (PAC) 30 Hours

Students will learn proper operating techniques using the air carbon arc cutting process. Students will also operate a plasma arc cutting machine cutting on plain carbon steel, aluminum, and stainless steel.

Competencies:

- Perform safety inspections of equipment and accessories
- Setup welding machine for manual air carbon arc gouging and cutting operations on plain carbon steel
- Properly operate manual air carbon arc cutting equipment
- Perform metal removal operations by cutting straight line grooves on mild steel
- Gouge out ½" fillet tee joint on both sides
- Setup welding for manual plasma arc cutting operations on mild, steel, aluminum, and stainless steel
- Properly operate manual plasma arc cutting equipment
- Straight line cutting carbon steel
- Shape cutting carbon steel
- Bevel cutting carbon steel
- Straight line cutting aluminum
- Shape cutting aluminum
- Bevel cutting aluminum
- Straight line cutting stainless steel
- Shape cutting stainless steel
- Bevel cutting stainless steel

WELD 1300 SMAW Welding I 90 Hours

This course will teach students how to weld with shielded metal arc processes in the flat and horizontal position.

Competencies:

- Perform safety inspections of equipment and accessories
- Make minor external repairs to equipment and accessories
- Setup shielded metal arc welding equipment for welding on mild steel
- Properly operate SMAW equipment
- Make fillet welds, all positions, on plain carbon steel
- Weld square butt joints flat

- Perform 1G limited thickness qualification tests on mild steel
- Execute 2G weld on 3/8" plain carbon steel to AWS QC10 Performance Qualification

WELD 1310 SMAW Welding II **120 Hours**

Continued training in the SMAW processes in horizontal, vertical, and overhead positions on plain carbon steel.

Competencies:

- 2G Open root
- 3G Backer bar on 3/8" plate to AWS QC10 Performance Qualification
- 3G Open root
- 4G Backer bar
- 2G Pipe

WELD 1400 GMAW Welding I **90 Hours**

Welding training using the gas metal arc welding process.

Competencies:

- Perform safety inspection of equipment and accessories
- Setup power supply, wire feeder, and shielding gas
- Properly set volts, wire feed speed, and shield gas flow meter for welding mild steel
- Operate GMAW equipment properly
- GMAW-S make fillet welds, all positions
- GMAW-S 1G limited thickness qualification tests on mild steel
- Execute AWS QC10 GMAW-S Workmanship Performance Qualification

WELD 1410 GMAW Welding II **90 Hours**

Continued welding training in the GMAW processes welding in the horizontal, vertical, and overhead positions.

Competencies:

- GMAW Short circuit 2G, 3G uphill, downhill, 4G
- GMAW Spray transfer 1F, 2F, 1G
- Sheet metal GMAW – butt, lap, and tee joints
- Perform AWS QC10 GMAW spray transfer Workmanship Qualification

WELD 1500 FCAW Welding I (Dual Shield) **90 Hours**

Welding training in the FCAW process using a dual shield wire.

Competencies:

- Perform safety inspections of equipment and accessories
- Setup power supply, wire feeder, and shielding gas for proper welding operations on plain carbon steel
- Operate flux cored arc welding equipment appropriately
- Weld beads backhand and forehand
- Fillet weld flat and horizontal
- Fillet weld vertical uphill and downhill

- Fillet weld overhead
- Groove weld welder qualification 1G, 2G, 3G uphill and downhill
- Execute AWS QC10 FCAW-G Workmanship Performance Qualification

WELD 1510 FCAW Welding II (Self Shield)

90 Hours

Welding training using FCAW self-shielding wire.

Competencies:

- Perform safety inspection of equipment and accessories
- Set welding machine for correct wire polarity and wire feeder for welding on plain carbon steel
- Operate FCAW welding equipment appropriately
- Weld beads forehand
- Fillet weld flat and horizontal
- Fillet weld vertical uphill and downhill
- Fillet weld overhead
- Groove weld welder qualification 1G flat, 2G horizontal, 3G vertical uphill and downhill
- Execute AWS QC10 FCAW Workmanship Qualification

WELD 1600 GTAW Welding I (Mild Steel)

30 Hours

Provide welding training in the gas tungsten arc welding process welding on plain carbon steel.

Competencies:

- Perform safety inspection of equipment and accessories
- Setup welding machine and shielding gas for welding mild steel
- Prepare tungsten for welding mild steel
- Properly operate GTAW welding equipment
- Weld beads with and without filler
- Fillet welds flat, horizontal, vertical up, and overhead
- Groove weld welder qualification 1G flat
- Perform AWS QC10 GTAW Carbon Steel Workmanship Qualification

WELD 1610 GTAW Welding II (Aluminum)

60 Hours

Provide welding training using the gas tungsten arc process welding on aluminum.

Competencies:

- Perform safety inspection of equipment and accessories
- Setup welding machine and shielding gas for welding on aluminum
- Prepare tungsten for welding on aluminum
- Properly operate GTAW welding equipment
- Beads with and without filler
- Fillet welds flat, horizontal, and vertical up
- Groove weld welder qualification 1G flat
- Perform AWS QC10 GTAW Aluminum Workmanship Qualification

WELD 1620 GTAW Welding III (Stainless Steel)

60 Hours

Provide welding training using the gas tungsten arc welding process welding on stainless steel.

Competencies:

- Perform safety inspection of equipment and accessories
- Setup welding machine and shielding gas for welding on stainless steel
- Prepare tungsten for welding on stainless steel
- Properly operate GTAW welding equipment
- Beads with and without filler
- Fillet weld flat, horizontal, and vertical up
- Groove weld welder qualification 1G flat
- Perform AWS QC10 GTAW Stainless Steel Workmanship Qualification

WELD 1700 Welding Inspection and Testing

30 Hours

This course will teach destructive and non-destructive testing. Students will learn different welding codes and welder qualification testing.

Competencies:

- Visual examination functions and defects
- Visual examination on own cutting assignments
- Visual examination of own welding assignments
- Welder qualification testing
- Codes and standards
- Weld defects
- Destructive testing methods
- Non-destructive inspection methods

WELD 1800 Weld Symbols and Blueprint Reading For Welders

60 Hours

This course will teach drawing fundamentals and welding blueprint reading.

Competencies:

- Work from drawings, prints, or sketches
- Drawing elements and interpretation
- Fabricate a part
- Types of welds
- Types of joints
- Weld symbols recognition
- Welding symbol interpretation
- Preparation of welded joints

WKSK 1400 Workplace Relations

60 Hours

Develop essential human-relation skills needed to maintain gainful and satisfying employment. This course includes familiarization with problematic areas found in the workforce including, solving problems; understanding relationships and diversity; increasing personal ethics; and developing strong personal, interpersonal, and human relation skills.

Competencies:

- Utilize problem-solving skills
- Understand working relations and diversity
- Understand business ethics

- Develop interpersonal skills
- Develop personal and human relations skills

ELECTIVES

DRFT 1010 Technical Drafting

120 Hours

This class teaches the use of basic techniques for mechanical drafting. Instruction is given on techniques such as: lettering, use of drawing equipment, geometric construction, sketching, multi-view drawings, dimensioning, section views, auxiliary views, and the introduction of computer aided drafting.

Competencies:

- Use and maintain basic drafting equipment
- Demonstrate correct lettering and sketching techniques
- Utilize basic geometric construction
- Utilize hardcopy reproduction processes
- Construct multi-view drawings (orthographic projection)
- Construct sectional drawings
- Construct auxiliary drawings
- Apply basic annotation and dimensions to a drawing
- Use a CAD system as a drafting tool

MACH 1720 Related Machine Shop

90 Hours

This is a course to support manufacturing programs related to machining. It gives students a working overview of industrial machine shop practice and will teach principles and techniques of manufacturing processes. Students will learn basic operations of a lathe and mill. Students will be trained in areas of milling, machining, blueprint reading, and inspection. They will operate manual machines and be introduced to Computer Numerical Control (CNC) machines.

Competencies:

- Read shop drawings and prints
- Demonstrate shop safety
- Use layout tools
- Demonstrate proper use of measuring tools
- Demonstrate proper use of hand tools
- Operate metal working equipment
- Operate a metal lathe
- Operate a mill
- Discuss and become familiar with Computer Numerical Control

WELD 2100 Blacksmithing

60 Hours

This course will teach basic blacksmithing fundamentals. The art of blacksmithing will be learned by identifying and using various tools to complete several projects.

Competencies:

- Drawing down
- Splitting
- Punching

- Twisting
- Making scrolls
- Fullering
- Bolt and rivet heading
- Collaring
- Matrix and eye punching
- Forge welding
- Horseshoeing

WELD 2300 Pipe Welding

60 Hours

Learn pipe welding techniques related to pipelines, petroleum related facilities, and waterworks on carbon steel pipe.

Competencies:

- Perform safety inspections of equipment and accessories
- 1F Rotated single and multiple pass fillets
- 2F Horizontal single and multiple pass fillets
- 4F Overhead single and multiple pass fillets
- Visually inspect workmanship of welds
- 2G Open root groove weld on carbon steel pipe
- 5G Open root groove weld on carbon steel pipe
- 6G Open root groove weld on carbon steel pipe

WELD 2400 Ornamental Iron

60 Hours

A decorative object whether it be a metal stairway, handrails, window frames, fences, furniture, entry gates, security doors, or hand tools can be classified as ornamental welding. Ornamental iron objects have closer tolerances, smoother finishes, and better fit-ups than most other welding. Students will learn how to fabricate a variety of ornamental projects using castings, bending radiuses and curves on pipe, tubing, and flat bar.

Competencies:

- Reading the blueprint
- Preparing a bill of materials
- Learn use of bending machines and metal tools
- Bending curves and radiuses
- Twisting of square bar stock
- Layout, fit-up, tacking, and jiggling of part
- Welding methods for ornamental iron and components
- Controlling warpage
- Deburring and finishing final project
- Inspection of project for correct size, tolerances, and appearance

WELD 2900 Special Applications

1-180 Hours

A course or courses providing competencies which meet an immediate occupational need beyond the skills available in the program's currently approved outline. The need, competencies, and length have been specified and documented by the campus' employer advisory committee. Each course will carry a title on the transcript descriptive of the competencies addressed. A campus may advise students to use a Special

Applications course as a program elective to meet current industry needs. Special Applications course(s) may not exceed 150 hours total per certificate or degree.

Competencies:

- A list of competencies reviewed by the employer advisory committee will be provided to the student prior to enrollment in the course.

WELD 2910 Welding Special Projects 60 Hours

This class provides students an opportunity to earn credit for drawing, layout, and fabricating welding related class projects.

Competencies:

- Draw prints for projects.
- Draw welding prints and symbols for projects.
- Write bill of materials in US Customary units and convert into SI Metric units.
- Make cut out sheet for projects.
- Layout and tack weld projects.
- Weld projects.
- Inspection of projects.
- Instructor's approval.

WKSK 1500 Job Seeking Skills 30 Hours

Prepare students to successfully apply for a job. This course will present essential job-seeking skills needed to find gainful employment.

Competencies:

- Complete a job application form
- Develop a current resume
- Create a letter of application
- Perform successfully in an interview
- Demonstrate appropriate follow-up procedures

Related Welding Processes

These classes will provide students with optional choices when selecting electives to fulfill their requirements for the AAT Degree. The course list was comprised over a large spectrum of welding courses offered throughout the state in various welding programs. Since not all of these courses will be offered at every college, students will have the opportunity to select the courses they desire from the ones available at their college. There is a broad selection to choose from so students can prepare themselves as an entry-level welder in the field of work they desire.

WELD 2200 Plastic Welding 30 Hours

This class will teach students how to identify different types of plastic, the use of plastic welding equipment, and proper techniques to weld various types of plastics.

Competencies:

- Perform safety inspections of equipment and accessories

- Identify the different types of plastic
- Learn welding techniques including starting the weld, continuing the weld, and finishing the weld
- Learn the four essentials for making acceptable plastic welds
- Beads with filler
- Butt joints
- Lap joints
- Tee joints
- 1G Vee groove
- Weld a useful plastic rod case out of 2" plastic pipe

WELD 2210 Resistance Spot Welding (RSW)

30 Hours

Spot welding consists of applying pressure to two or more sheets of material by means of conducting electrodes and then passing a high current at low voltage through the sheets from one electrode to the other. This action combined with correct pressure causes fusion. Spot welding is done on primarily thin material and is a common welding process for auto body sections and other sheet metal assemblies.

Competencies:

- Setup welding machine with parameters to weld 16-gauge mild steel
- Perform safety inspection of equipment and accessories
- Shear two pieces of mild steel 16 gauge 1"x4' long
- Clean the pieces so they are free of rust and contaminants
- Place the pieces in the spot welder tongs overlapping 1" on ends
- Tong pressure, timer, and current should have been preset
- Turn on power switch and make weld
- Destructively test weld by pulling it on a tensile testing machine
- Evaluate weld coupons for acceptable criteria

WELD 2450 GMAW Aluminum

30 Hours

This class will teach students how to setup welding equipment with the GMAW process for welding on aluminum. Aluminum presents special problems the welder does not encounter when welding on carbon steel. It has a very low melting temperature, it will not support its own weight when heated to near melting temperature, it has a high affinity for oxides, and it is relatively hard to clean. Students will learn how to deal with these problems and make sound welds on various types of aluminum using the GMAW process.

Competencies:

- Perform safety inspections of equipment and accessories
- Weld stringer beads
- Weld square butt joints flat, horizontal, and vertical positions
- Weld tee joints flat, horizontal, and vertical
- Weld lap joints flat, horizontal, and vertical
- GMAW aluminum 1G certification on ¼" aluminum plate
- Prepare 1G certification for destructive testing
- Test root and face bends
- Evaluate bends for acceptable criteria

WELD 2800 Submerged Arc Welding (SAW)

30 Hours

Students will learn how to set up and run an SAW machine and make acceptable welds. Submerged Arc welding is a process wherein an electric arc is submerged or hidden beneath a granular material. The process is either semi-automatic or fully automatic. The arc meets the wire, base metal, and flux in a common pool. The arc is not visible since it is buried in the flux, thus there is not flash or spatter. Submerged arc is best adapted where relatively thick sections are to be joined, because of its high deposition rates. Students will learn proper SAW welding techniques for welding on 1" mild steel plates.

Competencies:

- Setup SAW machine, wire feeder, and flux accessories
- Perform safety inspections of equipment and accessories
- Weld 6 stringer beads 8" long
- Weld single pass fillet weld in tee joint 8" long
- Weld 1" multiple pass fillet weld in tee joint 8" long
- SAW 1G certification plate on 1" mild steel plate
- Prepare plate for destructive testing by cutting 3/8" side bends
- Bend side bends
- Evaluate side bends for acceptable criteria

WELD 2920 Robotics

60 Hours

Today in the United States there are several thousands of robots being used to weld, palletize, handle material, and many other things. Industry uses robotics for two reasons, repeatability and reliability. As the number of robotic systems increases, the need for trained technicians becomes greater. Robotic welding programs will teach students the operations and welding programming of robotic systems.

Competencies:

- Robotic safety – emergency stop buttons
- Learning the teach pendant
- Function of the controller
- The robot and its axis's
- The power supply
- Metric method of measurement
- Programming the robot
- Power up and manual jog
- Running a program
- Programming linear travel
- Programming changes in welding parameters
- Circular motion and weave function
- Naming a program – delete, insert programs and blocks
- Axis display – position alter – shift function – linking programs
- Programming a 1/2" fillet weld
- 1G welding certification on mild steel
- Machine lock – tool center point
- Disc drive operations
- Loop and counter codes