

Course Title: Introduction to Metal Inert Gas and Flux Cored Arc Welding

Unit 1:	Career Opportunities
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Content Standard(s) and Depth of Knowledge Level(s):	<p>Students will:</p> <ol style="list-style-type: none"> 1. Identify careers available in Metal Inert Gas (MIG) and Flux Cored Arc Welding (FCAW).
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Learning Objective(s) and Depth of Knowledge Level(s):	<p>Students will:</p> <ol style="list-style-type: none"> 1. Identify career opportunities in the MIG and FCAW field. (national, state, local) 2. Discuss educational requirements for careers in welding. 3. Discuss working conditions. 4. Compare benefits in the welding field for MIG and FCAW welders. 5. Fill out application for employment. 6. Develop a résumé. 7. Discuss the history of welding. 8. Define welding terminology. 9. Research the history of welding. 10. Discuss automated welding systems and the impact on jobs.
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Essential Question(s):	What are the benefits and requirements of a career in metal inert gas and flux cored arc welding?
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Content Knowledge	Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)	Suggested Materials, Equipment and Technology Resources
I. Identify careers in welding industry.	Lecture	PowerPoint
II. Research career opportunities.	PowerPoint	Web sites
III. Working conditions.	Note taking	Textbook
IV. Training for welding careers.	Research	Computer
V. Fill out application for employment.	Worksheets	Internet
VI. Develop a résumé.	Guest Speaker	Projector
VII. Determine wages for welding careers.	Portfolio	
VIII. Describe worker benefits associated with metal fabrication careers.	Fieldtrip	
IX. Discuss working conditions in the field.	Guest speaker	
	Lecture	

	PowerPoint Video	
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Unit Assessment:	Participation in discussion, Research Report, Written Test, Performance Task
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Unit/Course CTSO Activity:	Students can develop SAE program. Host a career fair for seniors.
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Unit/Course Culminating Product:	Students will develop a career portfolio.
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Course/Program Credential(s): <input type="checkbox"/> Credential <input type="checkbox"/> Certificate <input checked="" type="checkbox"/> Postsecondary Degree <input type="checkbox"/> University Degree <input type="checkbox"/> Other

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Unit 2:	Safety
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Content Standard(s) and Depth of Knowledge Level(s):	<p>Students will:</p> <ol style="list-style-type: none"> 2. Demonstrate safety concepts required in Metal Inert Gas (MIG) and Flux Cored Arc Welding (FCAW).
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Learning Objective(s) and Depth of Knowledge Level(s):	<p>Students will:</p> <ol style="list-style-type: none"> 1. Explain the meaning of safety. 2. Identify high hazard areas. 3. Explain and demonstrate the use of appropriate personal protective equipment. 4. Demonstrate and explain general hand- and power-tool safety. 5. Recall general shop rules to be followed while in the shop. 6. Explain shop safety color-coding system. 7. Demonstrate knowledge of fire prevention and control methods. 8. Explain and demonstrate proper handling and storing of cylinders. 9. Identify proper lens shade to be used in Oxyfuel, Plasma, and SMAW.
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Essential Question(s):	What are the legal and social reasons for learning to prevent shop accidents?
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Content Knowledge	Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)	Suggested Materials, Equipment and Technology Resources
<ol style="list-style-type: none"> I. Meaning/Importance of shop safety. II. High hazard areas III. PPE IV. Hand and Power Tool Safety V. Shop Rules VI. Safety Colors VII. Fire Safety VIII. Respiratory Protection IX. Ventilation Requirements X. Handling and Storing Cylinders XI. Proper Lens Shade 	<p>Lecture/demonstration Worksheets Laboratory/shop safety tour Hazard identification tour Safe tool operation demonstration Pretest/Posttest</p>	<p>Guest speaker PowerPoints/ Projectors Textbooks Quizzes Web sites Handouts Hand and power tools Videos MSDS PPE Safety Posters</p>

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Unit Assessment:	Participation in class discussion, participation in shop hazard identification, and shop safety test (100% mastery)
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Unit/Course CTSO Activity:	Incorporate safety practices into student's SAE project.
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Unit/Course Culminating Product:	Students will master shop safety by identifying mock safety hazards in the shop and by passing the safety portion of the lesson with a 100 on the shop safety test.
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Course/Program Credential(s): <input type="checkbox"/> Credential <input type="checkbox"/> Certificate <input checked="" type="checkbox"/> Postsecondary Degree <input type="checkbox"/> University Degree <input type="checkbox"/> Other:

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Unit 3:	Planning Metal Structures
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Content Standard(s) and Depth of Knowledge Level(s):	<p>Students will:</p> <ol style="list-style-type: none"> 3. Interpret welding symbols on blueprints. 4. Explain the procedure for planning and estimating materials needed to complete a metal fabrication project. 5. Explain the importance of metal preparation for welding.
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Learning Objective(s) and Depth of Knowledge Level(s):	<p>Students will:</p> <ol style="list-style-type: none"> 1. Identify drafting equipment. 2. Identify common welding symbols used in blue prints. 3. Match basic drafting symbols with their meanings. 4. Read and interpret drawings. 5. Make a three-view drawing of a project. 6. Identify components of a bill of material. 7. Calculate bill of material for a project. 8. Discuss proper metal preparation. 9. Remove rust and scale from metal surfaces. 10. Use various methods to prepare surfaces for fabrication.
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Essential Question(s):	How does the welding field affect my daily life?
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Content Knowledge	Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)	Suggested Materials, Equipment and Technology Resources
I. Identify drafting equipment.	PowerPoint	Textbooks
II. Various types of views on mechanical drawing	Lecture	Rubric
III. Discuss the use of computers in drafting.	Worksheet	Drafting equipment
IV. Interpret scale drawings	Project-based Learning Activity	Blue prints
V. Interpret common symbols used in drafting	Laboratory/shop Lecture	Worksheets
VI. Interpret common welding symbols.	Demonstration	
VII. Interpret a blueprint	Textbook	
VIII. Make a three-view drawing	Worksheet	
	Teacher demonstration	
	Student demonstrations	
	PowerPoint	

IX.	Figure a bill of materials	Demonstration	
X.	Calculate the cost of a project	Student practice	
XI.	Metal preparation	Group assignment	
	A. Steam cleaning	Guest speaker	
	B. Sanding (wire brush or emery cloth)	Individual assignment	
	C. Chemical cleaning		
	D. Sandblasting		

Unit Assessment:	Quizzes, performance task, demonstration project
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Unit/Course CTSO Activity:	Students will build a grill for FFA chapter.
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Unit/Course Culminating Product:	Students will utilize plans to develop a bill of materials and plans of procedure for completing a metal project.
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Course/Program Credential(s):	<input type="checkbox"/> Credential <input type="checkbox"/> Certificate <input checked="" type="checkbox"/> Postsecondary Degree <input type="checkbox"/> University Degree <input type="checkbox"/> Other:
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Unit 4:	Identification and Selection
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Content Standard(s) and Depth of Knowledge Level(s):	<p>Students will:</p> <ol style="list-style-type: none"> 6. Determine uses of tools and equipment in MIG and FCAW. Examples: tools – hacksaw, cold chisel, file, drill, chipping hammer, metal vise grips, grinder, striker, tip cleaner, wire brush, tongs equipment – welding helmet, fuel valves, MIG welder, FCAW welder 5. Distinguish among types of metal used in MIG and FCAW. Examples: iron, aluminum, steel, tin, titanium, copper, magnesium, chromium, zinc
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Learning Objective(s) and Depth of Knowledge Level(s):	<p>Students will:</p> <ol style="list-style-type: none"> 1. Identify tool used MIG and FCAW. 2. Demonstrate proper use of hand tools. 3. Identify welding equipment. 4. Explain the difference in MIG and FCAW welding. 5. Identify and explain the terms associated with metals. 5. Describe how metal is classified. 6. Describe the characteristics used to identify metals. 7. Explain how metal is classified 8. Identify types of metal.
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Essential Question(s):	What affect does mining mineral have on the environment?
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Content Knowledge	Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)	Suggested Materials, Equipment and Technology Resources
IV. Metal fabrication tools and equipment A. Tools 1. Hacksaw 2. Cold chisel 3. File 4. Drill 5. Chipping hammer 6. Metal vise grip 7. Grinder	Lecture Demonstration Textbook Worksheet Flashcards Teacher Demonstration Student demonstrations Lecture Worksheet	Lead Question Computer Internet Projector Hand tools Textbook Various tools used in metal fabrication PPE Metal for student to use in demonstrations

<ul style="list-style-type: none"> 8. Striker 9. Tip cleaner 10. Wire brush 11. Tongs B. Proper use of metal fabrication tools. C. Equipment <ul style="list-style-type: none"> 1. Welder 2. Plasma cutter 3. Oxyfuel torch D. MIG welder E. FCAW F. Metal classify G. Metal characteristics <ul style="list-style-type: none"> 1. Ferrous 2. Nonferrous H. Properties of metal <ul style="list-style-type: none"> 1. Tensile strength 2. Compressive strength 3. Shear strength 4. Fatigue strength 5. Impact strength 6. Flexure strength I. Identify types of metal 	<ul style="list-style-type: none"> PowerPoint Demonstration PowerPoint Lecture Worksheet 	<ul style="list-style-type: none"> Computer Projector Welder Welding helmet Oxyfuel valves Computer Projector
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Unit Assessment:	Written test, Class participation, Quiz, Metal classification
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Unit/Course CTSO Activity:	FFA Agricultural Mechanics CDE
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Unit/Course Culminating Product:	Students will be able to identify and operate tools and equipment for metal fabrication.
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Course/Program Credential(s): <input type="checkbox"/> Credential <input type="checkbox"/> Certificate <input checked="" type="checkbox"/> Postsecondary Degree <input type="checkbox"/> University Degree <input type="checkbox"/> Other:



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Unit 5:	Welding Quality
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<p align="center">Content Standard(s) and Depth of Knowledge Level(s):</p>	<p>Students will:</p> <ol style="list-style-type: none"> 8. Critique MIG and FCAW welds for imperfections. <ul style="list-style-type: none"> • Determining corrective measures to improve welds • Explaining weld testing methods 9. Explain various parts of the MIG and FCAW welding machines. 10. Compare shades of lenses needed in MIG and FCAW welding. 11. Explain how tensile strength, polarity, and rate of travel affect weld quality. 12. Demonstrate the use of MIG and FCAW welders. <ul style="list-style-type: none"> • Identifying various types of weld joints Examples: butt, lap, corner, t • Adjusting MIG and FCAW machine setting for welding positions • Utilizing flat, vertical, horizontal, and overhead welding positions • Identifying stringer, weave, overlap, and fillet welds
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<p align="center">Learning Objective(s) and Depth of Knowledge Level(s):</p>	<p>Students will:</p> <ol style="list-style-type: none"> 1. Discuss weld quality. 2. Identify imperfections in welds. 3. Perform corrective measures to improve welds. 4. Discuss weld testing methods. 5. Identify and explain the function of various parts of the MIG and FCAW welding machines. 6. Evaluate shade lens requirements for MIG and FCAW welders. 7. Demonstrate the use of MIG and FCAW welders to create various welding joints, in flat, vertical, horizontal, and overhead welding positions. 8. Produce stringer, weave, overlap, and fillet welds.
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<p>Essential Question(s):</p>	<p>List and describe different types of welding test and situation were they would be used in today’s welding industry?</p>
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Content Knowledge	Suggested Instructional Activities Rigor & Relevance Framework (Quadrant)	Suggested Materials, Equipment and Technology Resources
I. Characteristics of good quality welds	Lecture Demonstration Textbook Worksheet	Textbook LCD projector Handouts Welding machines

<p>II. Weld inspections</p> <p>A. Nondestructive test</p> <ol style="list-style-type: none"> 1. Visual inspection 2. Magnetic particle inspection 3. Liquid penetration inspection 4. Ultrasound 5. X-ray inspection 6. Eddy current inspection 7. Mass spectrometer detection 8. Air pressure leak 9. Halogen <p>B. Destructive test</p> <ol style="list-style-type: none"> 1. Bend 2. Tensile 3. Impact 4. Hardness 5. Microscopic 6. Macroscopic 7. Chemical 8. Fatigue 9. Hydrostatic 10. Peel test 11. Tensile shear <p>III. Parts of MIG and FCAW welding machine</p> <p>IV. Lens shade requirement for MIG and FCAW</p> <p>V. Weld quality</p> <ol style="list-style-type: none"> A. Tensile strength B. Polarity C. Rate of travel <p>VI. Demonstrate use of MIG and FCAW welders</p> <p>A. Welding joint</p> <ol style="list-style-type: none"> 1. Butt 2. Lap 3. Corner 4. T <p>B. Adjustment settings for MIG FCAW machines</p>	<p>Teacher Demonstration</p> <p>Student demonstrations</p> <p>PowerPoint Presentation</p> <p>Demonstration</p> <p>Student practice</p> <p>Group assignment</p> <p>Guest speaker</p> <p>Individual assignment</p>	<p>Shop lab equipment</p> <p>Welding supplies</p> <p>Rubrics</p> <p>Hand tools</p>
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<p>C. Welding positions</p> <ol style="list-style-type: none"> 1. flat 2. vertical 3. horizontal 4. overhead <p>D. Types of welds</p> <ol style="list-style-type: none"> 1. stringer 2. weave 3. overlap 4. fillet weld 		
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Unit Assessment:	Test, group project, individual project class participation
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Unit/Course CTSO Activity:	Prepare student for Agricultural Mechanic career development contest. Build a grill for FFA chapter.
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Unit/Course Culminating Product:	Students will apply skill learned to build individual project or a group project.
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<p>Course/Program Credential(s): <input type="checkbox"/> Credential <input type="checkbox"/> Certificate <input checked="" type="checkbox"/> Postsecondary Degree <input type="checkbox"/> University Degree <input type="checkbox"/> Other:</p>
