



## Course Information

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Credits	4
Campus	Missoula College

## Description

Theory and safe operation of shielded metal arc welding (SMAW) of carbon steel on plate and structural components in all positions to industry standards. Visual inspection and destructive testing used to determine acceptability based upon industry standards (American Welding Society Structural Welding Code-Steel). Power sources and electrodes are covered in depth. Materials are prepared using mechanical plate shears and thermal cutting techniques. Thermal cutting techniques are examined relative to theory of operation and safe practices. Processes used are oxy-fuel cutting, plasma arc cutting, and air carbon arc cutting. Theory and safe operation of oxyacetylene welding examined.

## Relationship to Program(s)

This course covers the theory of operations and skill development with a process that is primary in the welding of iron and steel. This experience complements the other welding processes taught in the program to attain a solid, broad based understanding of welding as an industrial metals joining process.

## Student Performance Outcomes

Upon completion of this course, the student will be able to:

1. Demonstrate by written exam, the theory and safe operation of SMAW equipment.
2. Demonstrate by written exam the theory and safe operation of Oxy-Fuel Cutting (OAC), Plasma Arc Cutting (PAC) and Air Carbon Arc Cutting (AAC).
3. Demonstrate by practical exam, evaluated to AWS Structural Welding Code-Steel (AWS D1.1) standards, skill in the use of SMAW equipment and materials.
4. Demonstrate by practical exam, evaluated to AWS Structural Welding Code-Steel (AWS D1.1) standards, skill in the use of OAC, PAC, AAC equipment and materials.
5. Demonstrate by practical exam, evaluated to industry standards, skill in the use of OAW equipment and materials.

## Textbooks

Welding Principles and Practices, 4<sup>th</sup> Edition; Sachs and Bohnart, McGraw Hill.

Welding Level One NCCER Contren Learning Series, 4<sup>th</sup> Edition; Note: *Students are not required to purchase this book but will be required to access and utilize College copies for completion of reading and course work.*

Suggested Reference Materials: The Welding Journal, published monthly by the American Welding Society





## Attendance

Attendance is not taken, although you are required to be in attendance to successfully complete the course.

## Exams and Assignments

**Practical Welding Tests:** Hands-on welding tests based on lab assignments. Upon successful completion of lab assignments a hands on welding test derived from written specifications and graphics (drawings) will be administered. It will be graded based upon execution i.e. fit-up, weld profile, workmanship, etc. as prescribed by AWS standards and the instructions given at the time of the test.

**Written Exams:** Exams based on class lectures, reading assignments given in class, homework, notes from class video presentations, etc. **No make-up exams will be allowed.**

**Quizzes:** Short impromptu tests given on reading assignments, demonstrations, lectures. Composed of student name/date and three questions. Name and date are worth 25%. Each question is worth 25%. To receive credit for questions the question must be written out and answered correctly. Quizzes may be given at anytime during the course scheduled meeting time. **No make-up quizzes will be allowed.**

**Notebook:** Compilation of class notes and handouts. To receive the full 5% credit, the notebook must be neat and organized. It must also be contained or be found contiguous within a three ring binder.

**Professionalism:** Defined as a combination of attitude, motivation, participation, organization and work area cleanliness as demonstrated on a daily basis in the lab and classroom.

## Grade Breakdown

Lab Work	50%
Exams	30%
Quizzes	10%
Notebook	5%
Professionalism	5%

## Grading Scale

A = 100% - 90%
B = 89% - 80%
C = 79% - 70%
D = 69% - 60%
F = 59% - 0%





### **Safety**

Safety is required to be practices at all times. Disregarding safety practices, endangering yourself or others may result in your being denied access to the lab areas  
Eye protection is mandatory at all times in the lab area.

### **Required Supplies**

1. Welding Helmet with #10 or #11 Lens
2. Welding Gloves
3. Eye Protection
4. Pliers with wire-cutting capabilities
5. Wire hand brush
6. 4" or 4 ½" right angle handheld grinder
7. Upper body protection, leathers, coveralls, or equivalent
8. Lock for Locker

### **Academic Integrity**

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at <http://www.umt.edu/SA/VPSA/index.cfm/page/1321>.

### **Disability Accommodations Policy**

Students with disabilities may request reasonable modifications by contacting me. The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. "Reasonable" means the University permits no fundamental alterations of academic standards or retroactive modifications.





## Course Outline

### 1.0 Industrial Safety

- 1.1 Electrical Safety
- 1.2 Dangers from Arc Radiation
- 1.3 Burn Treatment
- 1.4 Dangers from General Industrial Machinery

### 2.0 SMAW Equipment and Consumables

- 2.1 Theory of Shielded Metal Arc Welding (SMAW)
- 2.2 SMAW Equipment
- 2.3 SMAW Consumables

### 3.0 OAC Equipment and Consumables

- 3.1 Theory of Oxy-Acetylene Cutting (OAC)
- 3.2 OAC Equipment
- 3.3 OAC Consumables

### 4.0 PAC Equipment and Consumables

- 4.1 Theory of Plasma Arc Cutting (PAC)
- 4.2 PAC Equipment
- 4.3 PAC Consumables

### 5.0 AAC Equipment and Consumables

- 5.1 Theory of Shielded Metal Arc Welding (SMAW)
- 5.2 SMAW Equipment
- 5.3 SMAW Consumables

### 6.0 OAW Equipment and Consumables

- 6.1 Theory of Oxy-Acetylene Welding (OAW)
- 6.2 OAW Equipment
- 6.3 OAW Consumables

### 7.0 Practical Arc Welding-Skill Development

- 7.1 SMAW – general electrodes, E-6013, E-7014, E-7024
- 7.2 SMAW – E-6010
  - 7.2.1 Fillets and groove welds in all positions, plate and structural
- 7.3 SMAW – E-7018
  - 7.3.1 Fillets and groove welds in all positions, plate and structural

### 8.0 Practical Cutting – Skill Development

- 8.1 OAC
- 8.2 PAC
- 8.3 AAC

### 9.0 Practical Gas Welding – Skill Development

- 9.1 OA welding in the flat and vertical positions – mild steel
- 9.2 OA brazing and soldering

