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WLDG 205.01M: Applied Metallurgy

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**THE UNIVERSITY OF MONTANA
MISSOULA COLLEGE
INDUSTRIAL TECHNOLOGY DEPARTMENT - WELDING**

COURSE SYLLABUS

COURSE NUMBER AND TITLE: WLDG 205, Welding Metallurgy

DATE REVISED: August 2018

SEMESTER CREDITS: 4

PREREQUISITES: None

INSTRUCTOR NAME: Brad Platts

E-Mail: bradley.platts@umontana.edu

(According to new Federal and UM policies I cannot answer any email that does not come from an official UM email address; no Hotmail, AOL, Yahoo, Gmail, etc.)

PHONE NUMBER: 243-7647

OFFICE LOCATION: West Campus, Welding Lab Office

OFFICE HOURS: 8:00am – 4:00pm or by appointment

RELATIONSHIP TO PROGRAM(S):

Provides metallurgical theory, examples and on-line applications. This course provides a solid understanding of metals as a background for learning welding processes.

COURSE DESCRIPTION: This is an on-line and classroom course that focuses on the study of metals and how they behave with the application of heating and cooling cycles. The study begins with the manufacturing of steel from raw materials, processing and finishing. Identification and examination of physical and mechanical properties of ferrous and non-ferrous metals. The study of phase changes with the application of heating and cooling cycles in ferrous metals. The study of ferrous crystal types and properties. Identification of base metals and filler metals, along with their properties. Identification of metallurgical problems associated with welding and recommendation of ways in which to solve these problems. Suggested welding procedures for low, medium and high carbon steels, alloys steels and cast iron.

STUDENT PERFORMANCE OUTCOMES:

Occupational Performance Objectives

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

1. Demonstrate by written exam the various techniques of steel manufacture, processing and finishing.
2. Demonstrate by written exam the ability to identify various metals and the manner in which industry classifies them, along with their properties and use.
3. Demonstrate by written exam the ability to identify phase changes in ferrous metals along with their properties and use.
4. Demonstrate by written exam the ability to identify and select proper base and filler

5. Demonstrate by written exam the knowledge of common metallurgical problems associated with welding and how to avoid them.
6. Demonstrate by written exam the ability to identify and employ welding procedures for all common types of ferrous metals

STUDENT PERFORMANCE ASSESSMENT METHODS AND GRADING PROCEDURES:

Grading Scale:

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

NOTICE! Be aware that each course listed in your degree or certificate program must be completed with a C or better to graduate.

Grading Breakdown:

Testing	45%
Practical Application Assignments	25%
Quizzes	10%
Professionalism	20%

On-Line Testing: These exams are derived from reading assignments from the required texts, videos, audio/visual course materials, and completion of lab experiments and the application of principles learned in the lab, etc... **Electronic submission of exams, quizzes and coursework is required by midnight of each Monday (12 AM Tuesday morning). No make-up exams are allowed. On-Line submission of work is each student's responsibility. No credit will be given for coursework or exams that are not submitted by midnight, regardless of reason including computer crash/malfunction, loss of internet connection, power failure, etc.**

Practical Application Assignments: These on-line assignments will apply principles and metallurgy-related processes and concepts in practical, real-world applications.

Professionalism: defined as a combination of attitude, motivation, participation organization and cleanliness

POLICIES:

- **Make-up exams or quizzes are not given for any reason.**
- **Assignments will be deducted 10% for each day turned in late .**
- **Assignments more than three days late will not be accepted**
- **Late assignments must be turned into a special file in the teacher's office.**
- **Any forms of cheating during exams, quizzes, or class assignments earn an automatic 0.**
- **Students are expected and required to learn how to access and navigate Moodle by the end of the first week of instruction. This is a requirement to the course.**

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

REQUIRED TEXT:

- Metals and How to Weld Them, 2nd edition
Author: Lincoln Electric Company. Publisher: Lincoln Electric Company
Metallurgy Fundamentals,
- Metallurgy Fundamentals, Brandt

SUPPLIES:

Calculator (Simple add, subtract, multiply, divide)
Eye Protection
Three ring binder with notepaper

COURSE OUTLINE:

- 1.0 Mechanical and physical properties of metals
 - 3.1 Tensile strength
 - 3.2 Yield strength
 - 3.3 Hardness
 - 3.4 Ductility
 - 3.5 Conductivity
 - 3.6 Specific Gravity
- 2.0 Identification and classification of metals
 - 2.1 Appearance and use
 - 2.2 Industry numbering systems
 - 2.3 Common tests for identification
- 3.0 The Manufacture of iron and steel
 - 1.1 Furnaces
 - 1.2 Processing
 - 1.3 Finishing
- 4.0 Structure and heat treatment of metals
 - 4.1 Space lattice types
 - 4.2 Effects of heating and cooling cycles
- 5.0 Metallurgy and welding
- 6.0 Welding of low carbon steel
 - 6.1 Preparation
 - 6.2 Filler Metals
 - 6.3 Procedures
- 7.0 Welding of medium carbon steel
 - 7.1 Preparation
 - 7.2 Filler Metals
 - 7.3 Procedures
- 8.0 Welding of high carbon steel
 - 8.1 Preparation
 - 8.2 Filler Metals
 - 8.3 Procedures
- 9.0 Welding of alloy steel
 - 9.1 Preparation
 - 9.2 Filler Metals

- 9.3 Procedures
- 10.0 Welding of cast iron
 - 10.1 Preparation
 - 10.2 Filler Metals
 - 10.3 Procedures
- 11.0 Solving welding problems
 - 11.1 Metallurgical
 - 11.2 Profiles
 - 11.3 Distortion

