Butler Community College
Business, Technology, and Workforce Division

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Revised Spring 2006
Implemented Summer 2006

COURSE OUTLINE
Welding Methods

Course Description

WE 114. Welding Methods. 2 hours credit. Prerequisite: A score at a pre-determined level in reading, writing, and math on a diagnostic instrument selected by the department. This course will enable the student to perform arc welding of fillet welds in all positions using the Shielded Arc Welding process. The student will also study comparative tests of operators and cover research in modern welding practices. Safety practices are emphasized.

Course Relevance

The principles learned in this course will allow the student to understand how proper fundamental skills and process analysis will prepare them for a position in a career of welding. A career in welding offers many options for employment and personal development, to national defense, to sales and repair, the varied welding industry impacts virtually every industry.

Required Materials

Athouse, A.D. (2004). *Modern welding.* Tinley Park, IL: Goodheart-Willcox Company, Inc.

Learning Outcomes

The intention is for the student to be able to

1. Demonstrate safety in the use of shielded metal arc welding
2. Demonstrate basic shielded metal arc welding skills using 70 series electrodes primarily through booth exercises and shop experiences
3. Explain the fundamental theories of shielded metal arc welding through written and/or classroom exercise.

Primary Learning PACT Skills that will be DEVELOPED and/or documented in this course

Through the student's involvement in this course, he/she will develop his/her ability in the following primary PACT skill areas:

1. Critical Thinking
   - Through the analysis of proper welding fundamentals, the student will recognize and understand the role these fundamentals play in obtaining a high quality weld.
2. Problem Solving
   - Through the analysis of the shielded metal arc welding process the student will be able to identify strengths and/or limitations of 70 series electrodes and make decisions regarding the applications of these electrodes based on that knowledge.
3. Field-Related Technology

Through the use of current industry standards and technology the student will be able to perform basic welding functions in a variety of positions with a high level of proficiency.

Secondary skills (developed but not documented):
Health Management
Reading

Major Summative Assessment Task(s)
These learning outcomes and the primary Learning PACT skills will be demonstrated by
1. Performing specific weld profiles using 70 series electrodes in various positions

Course Content
I. Themes – Key recurring concepts that run throughout this course:
   A. Safety
   B. Quality
II. Issues – Key areas of conflict that must be understood in order to achieve the intended outcome:
   A. The force of gravity in relation to molten metal and various welding positions
   B. The impact of critical welding fundamentals in relation to proper weld profiles
III. Concepts – Key concepts that must be understood to address the issues:
   A. Heat selection
   B. Proper joint preparation
   C. Process analysis
   D. Terminology
   E. The principles of electrode manipulation
IV. Skills/Competencies – Actions that are essential to achieve the course outcomes:
   A. Perform specific fillet weld profiles using E-7018 electrodes in the flat welding position
   B. Perform specific fillet weld profiles using E-7018 electrodes in the vertical welding position
   C. Perform specific fillet weld profiles using E-7018 electrodes in the overhead welding position

Learning Units
I. Safety in the welding shop
   A. Accidents
   B. General shop safety
   C. Safety in the welding environment
   D. Oxy-fuel Gas Welding and cutting safety
   E. Arc Welding and cutting safety
   F. Resistance welding safety
   G. Safety around welding robots
   H. Special welding process safety

II. Shielded Metal Arc Welding equipment and supplies
   A. Arc Welding power source classifications

B. Constant current power sources
C. NEMA Arc Welding Power Source classifications
D. Welding leads
E. SMAW electrodes
F. Carbon and low-alloy steel covered electrode classification
G. Non-ferrous electrode classifications
H. Electrodes care
I. Power source remote controls
J. Weld-cleaning equipment
K. Shields and helmets
L. Special arc welder clothing

III. Shielded metal arc welding
A. Direct Current (dc) Arc Welding fundamentals
B. DCEN and DCEP fundamentals
C. Alternating Current (ac) Arc Welding fundamentals
D. Selecting an arc welding machine
E. Staring, stopping, and adjusting the arc welding power source of SMAW
F. DC arc blow
G. Arc welded joint designs

Learning Activities
Learning activities will be hands-on exercises in both booth and shop. Classroom lecture is designed to enable the student to understand the key principles in process analysis, welding fundamentals, process and electrode classification analysis, and correct use of associated equipment.

Grade Determination
The student will be graded on completion of assessment tasks, learning activities, adequate participation (discussion) and the final project.