Butler Community College
Business, Technology and Workforce Division

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Revised Spring 2006
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COURSE OUTLINE
Shielded Arc Welding

Course Description
WE 116. Shielded Arc Welding. 3 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 recognize and apply proper fundamentals of shielded arc metal welding. The student will weld steel in all positions with several types of electrodes, emphasizing fundamentals and procedure. Safety when working with welding equipment is 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 career of welding. This course will enable the student to develop a base skill level from which he or she can further his or her proficiency skills.

Required Materials
Althouse, A.D. (2004). *Modern welding.* Tinley Park, IL: Goodheart-Wilcox 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 a variety of different electrodes primarily through booth exercises and shop experiences
3. Explain the fundamentals theories of shielded metal arc welding through written and/or classroom exercises

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 weld profiles, the student will recognize and understand each individual component necessary to perform a quality weld.
2. Problem Solving
   - Through the analysis of the shielded metal arc welding process and the AWS electrode classification numbering system, the student will be able to identify strengths and/or limitations of various individual selection and application based on that knowledge.
3. Field-Related Training

- Through the use of current industry standards and technology the student will be able to perform basic welding functions using a variety of different electrodes with the shielded metal arc welding process.

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. Showing the use of various electrodes in different positions to perform a quality weld

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 the various electrodes in different positions
   B. The impact of critical welding fundamentals in relation to proper weld profiles
   C. The importance of key fundamental differences between individual electrodes and the proper manipulation of each
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 weld profiles with various electrodes in the flat welding position
   B. Perform specific weld profiles with various electrodes in the vertical welding position
   C. Perform specific weld profiles with various 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 (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 students 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.