Hawkeye Community College

Non-Credit to Credit Course Conversion
COURSE COMPETENCIES & COURSE OUTCOMES

Non-Credit Course Title: Fluid Power II **Course Number:** 7900003

Credit Course Title: Fluid Power Systems II **Course Number:** EGT149

For each credit course competency listed on the master syllabus, describe how, and the degree to which, this non-credit course meets the competency.

COURSE OBJECTIVE(S):

This course will:
1. Identify fluid power graphic circuit prints.
2. Demonstrate how to set up and operate fluid power circuits.
3. Demonstrate the repair and evaluate fluid power component parts.

PERFORMANCE OBJECTIVES:

I. Safety
- A. List different safety precautions when working with hydraulic systems. B. Perform safe hydraulic repair procedures.

II. Fluid Power Graphic Symbols
- A. Recognize and understand different symbols used for fluid power prints. B. Recognize device specifications.

III. Fluids
- A. Identify the different types of fluids. B. Describe characteristics of fluids.

IV. Lines and Fittings
- A. Recognize and identify the different types of conductor lines
- B. Recognize and identify different fittings
    1. Perform line assemblies from graphic prints

V. Seals
- A. List seal functions
    1. Name seal applications
- B. Evaluate seal performance

VI. Energy Storage and Intensification Devices
- A. Identify operation of accumulators
- B. Identify receivers and storage devices

VII. Intensifiers and Amplifiers
- A. Name intensifiers functions
- B. Operate and intensifier circuits

COURSE OUTLINE:

I. Safety
    A. Equipment
    B. The workplace
II. Fluid Power Graphic Symbols
    A. Schematics
    B. Device specifications
III. Fluids
    A. Properties
    B. Applications
IV. Lines and Fittings A. Low Pressure B. High Pressure
V. Seals
    A. Normal Operations
    B. Troubleshooting and maintenance
VI. Energy Storage and Intensification Devices
    A. Principles and Applications
    B. Safety and Operation
VII. Intensifiers and Amplifiers
    A. Intensifiers Functions
    B. Operate Intensifier Circuit

Signatures Required:

Non-Credit Course Instructor Carl Carey **Date** 6/25/2015

Credit Course Instructor Dan Hotz **Date** 6-22-15

Credit Dean _____ **Date** _____

Business & Community Ed Exec Dir _____ **Date** _____

Vice President Academic Affairs _____ **Date** _____

Hawkeye Community College

Non-Credit to Credit Course Conversion
COURSE COMPETENCIES & COURSE OUTCOMES

Non-Credit Course Title: Fluid Power 1 **Course Number:** 7700002

Credit Course Title: Fluid Power Egt **Course Number:** 140-1

For each credit course competency listed on the master syllabus, describe how, and the degree to which, this non-credit course meets the competency.

COURSE OBJECTIVE(S):

This course will:
1. Identify basic fluid power operating principle and understand terminology used.
2. Identify basic fluid power symbols and learn how to read fluid power blue prints.
3. Provide hands-on experiences working with fluid power components and their operation.

PERFORMANCE OBJECTIVES:

I. Introduction to Fluid Power
- A. Identify what fluid power is
- B. Select hydraulic pneumatic vacuum systems

II. Laws of Pressure Force and Area
- A. List basic laws which apply to fluid power
- B. Identify fluid power laws and principles

III. Principles of Fluid Flow
- A. Identify how fluid flow affects systems

IV. Pumps and Compressors
- A. Name pump operations B. Recognize pump types C. List compressor types

V. Conditioning and Storage of Fluids
- A. List the importance of fluid conditioning
- B. Recall the different conditioning methods
- C. Identify different storage types

VI. Actuators
- A. Recall different actuator terminology
- B. Identify actuator performance
- C. Explain actuator symbols

VII. Pressure Controls
- A. Recall basic principles of pressure control operation
- B. Identify pressure control functions
- C. Explain pressure control symbols

VIII. Directional Controls
- A. Recall directional control functions
- B. Perform directional control operations

IX. Flow Control
- A. Perform flow control functions
- B. Recall different flow control types

COURSE OUTLINE:

I. Introduction to Fluid Power
    A. Gasses
    B. Liquids
II. Laws of Pressure-Force Area
    A. Laws Defined
    B. Laws Applied
III. Principles of Fluid Flow A. Flow and Pressure B. Velocity and work
IV. Pumps and Compressors
    A. Compressible fluids
    B. Non-compressible fluids
V. Conditioning and Storage of Fluid
    A. Compressible fluids
    B. Non-compressible fluids
VI. Actuators
    A. Linear
    B. Rotary
VII. Pressure Controls
    A. Constant
    B. Variable
VIII. Directional Controls
    A. Manual
    B. Sequential
IX. Flow Control
    A. Constant
    B. Variable

Signatures Required:

Non-Credit Course Instructor Carl Casey **Date** 6/25/2015

Credit Course Instructor Dan Hodge **Date** 6-22-15

Credit Dean _____ **Date** _____

Business & Community Ed Exec Dir _____ **Date** _____

Vice President Academic Affairs _____ **Date** _____

Hawkeye Community College

Non-Credit to Credit Course Conversion
COURSE COMPETENCIES & COURSE OUTCOMES

Non-Credit Course Title: PLC Programming **Course Number:** 7700007

Credit Course Title: PLC's Level 1 **Course Number:** ELT234

For each credit course competency listed on the master syllabus, describe how, and the degree to which, this non-credit course meets the competency.

COURSE OBJECTIVE(S):

This course will:

1. Identify and configure all input/output hardware.
2. Identify, list the function, and interpret the indicators located on the processor module.
3. Demonstrate how to create and delete program files, data files, and data base files.
4. Explain how to utilize the memory map to monitor memory usage, create and delete data files, and examine the concepts of file elements and words.
5. Explain how to utilize and recognize proper addressing procedures and instruction commands appropriate for the PLC family of processors.
6. Explain how to create and execute a given program to verify its operation.
7. Explain how to debug and correct any programming or logic errors which may be encountered.
8. Explain how to save and retrieve the PLC processor memory onto the hard-disk drive of the computer.

PERFORMANCE OBJECTIVES:

I. PLC Overview.

A. Identify and configure all input/output hardware.

B. Use a line printer create a printout of a PLC ladder file.

II. Introduction to PLC Hardware and Programming.

A. Locate and correctly set all switch assemblies and software configurations within the PLC system.

B. Identify, list the function, and interpret the indicators located on the processor module front panel.

C. Install and power-up a PLC system, including the rack, power supply, and computer programmer.

D. Create and delete program files, data files, and data base files.

E. Utilize the memory map to monitor memory usage, create and delete data files, and examine the concepts of file elements and words.

III. Relay Logic Instructions.

A. Utilize and recognize proper addressing procedures and instruction commands. B. Create and execute a given program to verify it's operation.

C. Debug and correct any programming or logic errors which may be encountered.

IV. Timer and Counter Instructions.
    A. Utilize and recognize proper addressing procedures and instruction commands as follows: TON, TOF, RTO, RES, CTD, and CTU.
    B. Create and execute a given program to verify its operation.
    C. Debug and correct any programming or logic errors which may be encountered.
V. Saving, Restoring and Printing PLC Files
    A. Save the PLC processor memory onto the hard-disk drive of the computer.
    B. Restore a program file from the hard-disk drive into the PLC processor.
    C. Save the PLC processor memory onto a flash drive.
    D. Upload a PLC program from a flash drive to the PLC
VI. Forcing from the IBM/AT Computer
    A. Describe the operation of the force commands.
    B. Describe safety considerations required when forcing.
    C. Describe applications which require forcing.
VII. Program Documentation
    A. Plan how to control the operation of a give system.
    B. Write and debug a software ladder-logic program to control the system.
VIII. Searching with the Terminal
    A. Perform global and local searching operations for specified addresses using the appropriate programming device.
    B. Perform global and local searching operations for specified commands using the appropriate programming device.
IX. Symbolic Programming and Data Base Operations
    A. Create and modify a program data base.
    B. Utilize symbolic programming to create and modify a ladder logic program.

COURSE OUTLINE:

I. PLC Overview
    A. Hardware
    B. PLC Ladder File
II. Introduction to PLC Hardware and Programming
    A. Switching Assembly and Software
    B. Front Panel
    C. PLC System
    D. Files
    E. Memory Map
III. Relay Logic Instructions
    A. Addresses and Commands
    B. Program Operation
    C. Debugging
IV. Timer and Counter Instructions
    A. Addresses and Commands
    B. Program Operation
    C. Debugging
V. Saving, Restoring and Printing PLC Files
    A. PLC to PC
    B. PC to PLC

VI. Forcing from the IBM/AT Computer
    A. Force Commands
    B. Safety Considerations
    C. Applications
VII. Program Documentation
    A. Planning
    B. Software
VIII. Searching with the Terminal
    A. Addresses
    B. Commands
IX. Symbolic Programming and Data Base Operations
    A. Data Base
    B. Symbolic Program

Signatures Required:

Non-Credit Course Instructor Robert Shelley **Date** 6-26-15

Credit Course Instructor Dan Utley **Date** 6-22-15

Credit Dean _____ **Date** _____

Business & Community Ed Exec Dir _____ **Date** _____

Vice President Academic Affairs _____ **Date** _____

Hawkeye Community College

Non-Credit to Credit Course Conversion
COURSE COMPETENCIES & COURSE OUTCOMES

Non-Credit Course Title: Motors and Controls **Course Number:** 7700005

Credit Course Title: Motors and Controls **Course Number:** ELT215

For each credit course competency listed on the master syllabus, describe how, and the degree to which, this non-credit course meets the competency.

COURSE OBJECTIVE(S):

This course will:

1. Identify the factors influencing the selection of a motor control system.
2. Identify the correct size and type of overload device for a particular installation.
3. Identify a device from its NEMA symbol and create a circuit to accomplish a specified operation when given a sequence of operations.
4. Explain the various types and configurations of mechanical and solid-state timing and control relays, list the typical contact types, and explain their operation.
5. Describe the operation and construction of common pilot devices such as: pushbutton switches, limit switches, and selector switches.
6. Explain how to design, wire, troubleshoot, and operate control circuits in a timely, safe, and competent manner.

PERFORMANCE OBJECTIVES:

I. Introduction to Motor Controls

A. List the factors influencing the selection of a motor control system.

B. Specify the correct size and type of overload device for a particular installation, correctly install the component, and test the system for proper function.

II. Circuit Layout and Connections

A. Identify a device from its NEMA symbol, draw the symbol for a given Device, and create a circuit to accomplish a specified operation when given a sequence of operations.

B. Explain the difference between standard-duty and heavy-duty pushbuttons and pilot devices.

III. Relays, timers, and operations

A. Characterize the various types and configurations of electromechanical and solid-state timing relays, list the typical contact types, and explain their operation.

B. List the various criteria utilized to select a timing device for a particular application.

IV. Control Pilot Devices

A. Given a particular control pilot device the student will state its type, explain its operation, list its characteristics, and demonstrate its uses.

B. Describe the operation and construction of common pilot devices such as: pushbutton switches, selector switches, and limit switches.

V. Basic Control Circuits
    A. Explain the differences between two-wire and three-wire wiring schemes, and specify the type of control for a stated installation.
    B. List the major types of safety interlocking used in control circuits.
    C. Design, wire, troubleshoot, and operate control circuits in a timely, safe, and competent manner.
VI. Reduced Voltage Starters
    A. Describe the reasons for the use of reduced voltage/current in a motor starting system.
    B. Explain the operation of the following types of reduced voltage staring methods: primary resistor, autotransformer, part-winding, star-delta, and variable-frequency drives.
VII. Electrical troubleshooting
    A. Demonstrate knowledge of individual component operation to be able to troubleshoot component.
    B. Demonstrate knowledge of individual component operation to be able to troubleshoot circuit loads.
    C. Use meters to troubleshoot a non-functioning circuit.
    D. Describe safety procedures for conducting live-circuit troubleshooting.

COURSE OUTLINE:

I. Intro to Motor Controls
    A. Selecting Systems
    B. Starters and Overload Devices
II. Circuit Layout and Connections
    A. Symbols and Designs
    B. Duty Ratings
III. Relays, Timers, and Operations
    A. Types and Configurations
    B. Application Criteria
IV. Control Pilot Devices
    A. Types and Configuration
    B. Characteristics and Applications
V. Basic Control Circuits
    A. Two and Three-Wire
    B. Interlocks
    C. Constructions
VI. Reduced Voltage Starters
    A. Purpose
    B. Operation
VII. Electrical Troubleshooting
    A. Control Component Troubleshooting
    B. Troubleshooting the Load
    C. Circuit Troubleshooting
    D. Live Circuit Troubleshooting

Signatures Required:

Non-Credit Course Instructor Robert Shwalley Date 6-26-15

Credit Course Instructor Dan Whitty Date 6-22-15

Credit Dean _____ Date _____

Business & Community Ed Exec Dir _____ Date _____

Vice President Academic Affairs _____ Date _____

Hawkeye Community College

Non-Credit to Credit Course Conversion
COURSE COMPETENCIES & COURSE OUTCOMES

Non-Credit Course Title: Advanced Electrical Systems **Course Number:** 7900002

Credit Course Title: Advanced Electrical Systems **Course Number:** ELT149

For each credit course competency listed on the master syllabus, describe how, and the degree to which, this non-credit course meets the competency.

COURSE OBJECTIVE(S):

This course will:

1. Describe residential, commercial, and industrial distribution systems and demonstrate techniques for electrical system grounding and ground fault interrupters.
2. Describe the construction, operation, and installation of typical electrical transformers.
3. Explain the operation and mechanical considerations associated with DC motors.
4. Explain the major AC motor classifications, give examples of applications for each type, and specify pertinent motor selection criteria.
5. Demonstrate the applications of magnetic starters.
6. Specify the correct size and type of overload device for a particular installation.
7. Demonstrate component and circuit troubleshooting methods.

PERFORMANCE OBJECTIVES:

I. Electrical Distribution Systems

A. Describe primary distribution systems, residential, commercial, and industrial distribution systems.

B. Explain and demonstrate techniques for electrical system grounding and ground fault interrupters.

C. Interpret electrical diagrams of in-plant distribution systems.

II. Transformer Theory and Configurations

A. Describe the magnetic theory by which all transformers operate.

B. Describe the construction and operation of different types of electrical transformers.

C. Connect both control and power system transformers.

III. DC Generators and Motors

A. List the component parts of a DC generator, and state their functions and interaction concepts.

B. Describe the operation of a typical DC generator with respect to mechanical considerations, voltage output, and generator losses.

C. Recognize, draw, and describe typical voltage/ current/efficiency curve for the following DC generator types: series, shunt, separately excited, and compound.

D. State the operation and mechanical considerations associated with DC motors. E. List the principles and applications for the following DC motor types: series, shunt, PM, and compound.

F. Demonstrate the maintenance skills necessary to perform the following tasks: brush inspection and replacement, bearing inspection, field and armature conductor testing, and motor installation and wiring.

IV. AC Motors

A. List the major AC motor classifications, give examples of applications for each type, and specify pertinent motor selection criteria.

B. Perform the calculations required to predict slip percentages, synchronous field speed, rotor speed, torque, and loading effects.

C. Regarding the functions of single-phase motors the student will explain the principle of phase-splitting, capacitor start/run, repulsion/ induction, shaded-pole, and universal motors.

D. Given a typical motor nameplate, the student will describe the data listed thereon.

V. Manual and Magnetic Starters and Overloads

A. Explain the construction and operating principles of starters relating to the magnet coil, power contacts, auxillary contacts, and shading poles.

B. Explain the principles of magnetic starters relating to the magnet coil, main contacts, auxiliary contacts, and shaded poles.

C. Give usage examples for both toggle style and pushbutton style manual starting systems.

D. Explain the purpose of a motor overload protection system/device, list the primary types of over load devices, and define the operational characteristics of each particular type.

VI. Electrical troubleshooting

A. Demonstrate the use of voltmeters, ammeters, ohmmeters, and megohmeters in troubleshooting.

B. Demonstrate knowledge of individual component operation to be able to Troubleshoot components.

C. Use meters to troubleshoot a non-functioning circuit.

D. Describe safety procedures for conducting live-circuit troubleshooting.

COURSE OUTLINE:

I. Electrical Distribution Systems

A. Primary, residential, commercial, and industrial distribution

B. Grounding and bonding

C. Distribution system components

II. Transformer Theory and Configurations

A. Transformer Theory

B. Types of Transformers

C. Connecting Transformers

III. DC Generators and Motors

A. Basic Generator Theory

B. Types of Generators

C. Generator Applications

D. DC Motor Theory

E. Types of DC Motors

F. DC Motor Applications and Controls

IV. AC Motors

A. AC Motor Theory

B. Types of Single-Phase AC Motors

C. Types of Three-Phase AC Motors

D. AC Motor Applications and Controls

V. Manual and Magnetic Starters and Overloads
    A. Starter construction
    B. Magnetic starters C. Manual starters D. Overloads
VI. Electrical troubleshooting
    A. Meters for Troubleshooting
    B. Component Troubleshooting
    C. Circuit Troubleshooting
    D. Live Circuit Troubleshooting

Signatures Required:

Non-Credit Course Instructor Robert Tisdale _____ **Date** 6-26-15

Credit Course Instructor Dan Hatty _____ **Date** 6-22-15

Credit Dean _____ **Date** _____

Business & Community Ed Exec Dir _____ **Date** _____

Vice President Academic Affairs _____ **Date** _____

Hawkeye Community College

Non-Credit to Credit Course Conversion
COURSE COMPETENCIES & COURSE OUTCOMES

Non-Credit Course Title: Electrical Systems **Course Number:** 7900001

Credit Course Title: Electrical Systems I **Course Number:** ELT139

For each credit course competency listed on the master syllabus, describe how, and the degree to which, this non-credit course meets the competency.

COURSE OBJECTIVE(S):

This course will:
1. Demonstrate safety and safe work habits for an industrial shop.
2. Identify the major parts of both DC series and parallel circuits.
3. Explain the terms 'voltage', 'current', and 'resistance'.
4. Explain how to perform any mathematical computations necessary to solve electrical circuits.
5. Explain the types of wire splicing devices/methods available to the electrician.
6. Explain magnetic principles appropriate to the study of electronic circuits.

PERFORMANCE OBJECTIVES:

I. Safety
- A. Describe the effect of electrical shock on a human being.
- B. Demonstrate, at all times, the appropriate behavior when working with electrical systems and devices.
- C. Identify various lockout/tagout devices specific to the electrical trade, and demonstrate their use in a laboratory environment
- D. Wear appropriate safety and personal protective equipment in all laboratory exercises.

II. Tool Identification and Use
- A. Identify the applications and proper uses for digital and analog meters.
- B. Demonstrate the proper applications of voltage testers.
- C. Demonstrate the appropriate use of wire strippers and electrical tools

III. DC Theory
- A. Identify the major parts of both DC series and parallel circuits, define the terms 'voltage', 'current', and 'resistance' with respect to basic circuit analysis and operation, and perform appropriate calculations.
- B. Differentiate between voltage rise sources and voltage drop sources, and state the points in a given circuit where each would be located.
- C. Perform resistance measurements, voltage rise and drop measurements, and current measurements using a DMM in a safe and approved manner with a minimum accuracy of 90%.
- D. Perform any mathematical computations necessary to solve electrical circuits and problems.

IV. AC Theory

A. Identify the major parts of both AC series and parallel circuits, define the terms 'voltage', 'current', and 'resistance' with respect to basic circuit analysis and operation, and perform appropriate calculations.

B. Differentiate between peak, peak-to-peak, average and RMS voltages, and perform conversion calculations as required.

C. Perform resistance measurements, voltage rise and drop measurements, and current measurements using a DMM in a safe and approved manner.

D. Perform any mathematical computations necessary to solve electrical circuits and problems.

V. Conductor Sizes and Types

A. Describe the 'mil' unit and perform calculations necessary to determine circular mil - area, square mil area, and conversions between the measures.

B. State the factors affecting the resistivity of a material, and perform calculations to determine the resistance of a given conductor.

C. Specify the effects that temperature will have on a given conductor, perform temperature conversions, and calculate the resistance of a particular material when given the temperature conditions.

D. List several types of common insulation materials used for electrical conductors, utilize the NEC charts to determine ampacity, and specify the most appropriate insulation for various applications.

VI. Wiring Methods

A. Calculate line loss and line drop for a given conductor.

B. Describe the types of wire splicing devices/methods available to the electrician, and state the applications and advantages/disadvantages for each.

C. Design, wire, and troubleshoot two-way, three-way, four-way, split outlet, and various other electrical circuits in a timely fashion and according to NEC and company specifications.

VII. Magnetic Theory and Applications

A. Describe the three major classes of magnets, the laws describing their actions, and state the major magnetic materials and their properties with a minimum acceptable score of 77.5%

B. Demonstrate the left-hand rules for conductors and coils, and state what each part of the hand indicates.

C. List the rules for magnetic lines of force, and their application to the operation of electromagnets.

D. Define the terms used to describe magnetic characteristics.

E. List magnetic principles appropriate to the study of electronic circuits, determine applications of magnetism in these circuits, and calculate various appropriate magnetic values.

VIII. Electrical troubleshooting

A. Demonstrate the use of voltmeters, ammeters, ohmmeters, and megohmeters in troubleshooting.

B. Demonstrate knowledge of individual component operation to be able to troubleshoot component.

C. Use meters to troubleshoot a non-functioning circuit.

D. Describe safety procedures for conducting live-circuit troubleshooting.

COURSE OUTLINE:

I. Safety
- A. Basic Electrical Safety
- B. OSHA Safety for Electricians
- C. Lockout/Tagout
- D. PPE

II. Tool Identification and Use
- A. Digital and Analog Meters
- B. Voltage Testers
- C. Wire Strippers and Electrical Tools

III. DC Theory
- A. Voltage
- B. Current
- C. Resistance
- D. Circuit Construction and Analysis

IV. AC Theory
- A. Voltage
- B. Current
- C. Resistance
- D. Circuit Construction and Analysis

V. Conductor Sizes and Types
- A. Using the NEC
- B. Resistivity, Line Loss, and Wire Sizing.
- C. Temperature
- D. Insulation

VI. Wiring Methods
- A. Residential
- B. Commercial
- C. Industrial

VII. Magnetic Theory and Applications
- A. Types of Magnets
- B. Magnetic Theory
- C. Applications of Magnetic Theory in Industrial Settings
- D. Magnetic terms
- E. Magnetic principles

VIII. Electrical Troubleshooting
- A. Meters for Troubleshooting
- B. Component Troubleshooting
- C. Circuit Troubleshooting
- D. Live Circuit Troubleshooting

Signatures Required:

Non-Credit Course Instructor Robert Stradley **Date** 6-26-15

Credit Course Instructor Dan [illegible] **Date** 6-22-15

Credit Dean _____ **Date** _____

Business & Community Ed Exec Dir _____ **Date** _____

Vice President Academic Affairs _____ **Date** _____

Hawkeye Community College

Non-Credit to Credit Course Conversion
COURSE COMPETENCIES & COURSE OUTCOMES

Non-Credit Course Title: Basic Mechanical Systems **Course Number:** 7700004

Credit Course Title: Basic Mechanical Systems **Course Number:** IND100

For each credit course competency listed on the master syllabus, describe how, and the degree to which, this non-credit course meets the competency.

COURSE OBJECTIVE(S):

This course will:

1. Identify and use basic hand tools required for a maintenance mechanic.
2. Demonstrate safe work habits of a maintenance mechanic.
3. Explain right to know laws and MSDS.
4. Demonstrate proper use of pullers and small press equipment.
5. Explain terminology of bearings, seals, clutches, chain, belts, couplings, gears, lube devices.
6. Identify various types of fasteners.

PERFORMANCE OBJECTIVES:

I. Safety for You and Others
    A. Identify and use of hand tools, pullers and jacks
    B. Perform safe use of drill press, pedestal grinder, and arbor press
II. Portable Tools
    A. List names, use, and common misuse
    B. Perform task with portable tools
III. Pulling, Lifting, or Compressing Systems
    A. List use, specifications and limitations
    B. Perform tasks with systems
IV. Measurement
    A. List common types of uses
    B. Perform and document measurements
V. Sketches and Drawings
    A. Develop drawing skills to document disassembly/assembly tasks
    B. Practice sketches for use in fabrication or repair
VI. Drive Components
    A. List ten types, their manufacturers, and their uses
    B. Perform disassembly/assembly of components

COURSE OUTLINE:

I. Safety for You and Others
    A. Portable Tools
    B. Tool Stations
    C. Your Stations
II. Portable Tools
    A. Identification
    B. Proper and Improper Use
III. Pulling, Lifting, or Compressing Systems
    A. Common Types
    B. Proper and Improper Use
IV. Measurement
    A. Tools
    B. Techniques
V. Sketches and Drawings
    A. Disassembly and Assembly Aids
    B. Working Drawings for Repair
VI. Drive Components
    A. Types and Principles
    B. Maintenance and Repair

Signatures Required:

Non-Credit Course Instructor _____ **Date** 6/26/15

Credit Course Instructor _____ **Date** 6-22-15

Credit Dean _____ **Date** _____

Business & Community Ed Exec Dir _____ **Date** _____

Vice President Academic Affairs _____ **Date** _____

This workforce solution is funded by the IHUM Consortium which is 100% financed through a $15,000,000 grant from the U.S. Department of Labor's Employment & Training Administration. The product was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership.