
# Multi-State Advanced Manufacturing Consortium

*US DOL SPONSORED TAACCCT GRANT: TC23767*

## MSAMC Master Performance Based Objectives (PBO) Review Template

### Instructions

**The following tab lists PBOs for the topic area *Instrumentation* . Please review each of the PBOs, and rate each PBO with one of the following ratings:**

1 = Skill or understanding is required for students.
2 = Skill is useful, but is not crucial for students to know.
3 = Skill is not useful for students, or isn't relevant for typical work assignments.
0 = PBO is unclear.

**Additionally, for each PBO please**

* Note any comments or recommendations that you may have about how to improve the PBO.
* Indicate whether each PBO is covered in your college's aligned courses, and how (written, lab demo, exercise).

If any PBOs or skill sets seem to be missing from the list, please add them in the space at the bottom of the list.

| Please enter your information below | |
|---|---|
| Name: | |
| Institution: | |
| Date: | |
| Email: | |
| Phone: | |

# Instrumentation

*M-S AMC Academic Partner PBO Review*

| Please enter your information below | |
|---|---|
| Name: | |
| Institution: | |
| Date: | |
| Email: | |
| Phone: | |

| Please indicate which course or courses delivered at your institution align with, or cover, the listed objectiv | | |
|---|---|---|
| Aligned Course(s) | 1 | *Enter course code here* |
| | 2 | *Enter course code here* |
| | 3 | *Enter course code here* |

*** Note**: For each covered PBO, indicate in which of the aligned courses, documented at left, the PBO would be most extensively covered. If there is only one course listed to the left, then you do not have to complete the "Aligned Course" column.

| Sub-Topic | Level | Topic | PBO ID | Performance Based Objective (PBO) | Importance, 1 = Need 2 = Nice to have 3 = N/A 0 = Don't understand | Covered - Written Assignment / Reading? Y/N | Covered - Exercise or Assessment? Y/N | Aligned Course * | Comments *Notes to improve the PBO, PBO is unclear, lacking equipment to cover, etc.* |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | IN | 1 | Convert PSIA readings to PSIG, inches of mercury, inches of water, Bars, and Atmospheres. (written exercise) | | | | | |
| | 1 | IN | 22 | Solve for the missing variables in the following equations: (Written exercise)<br>F = P x A<br>E = I x R<br>F = 9/5 x C + 32<br>C = (F – 32) x 5/9<br>Density = Mass / Volume<br>Flow rate = Volume / Time | | | | | |
| | 1 | IN | 2 | List the advantages of a 4-20 milliamp Current loop as compared to other forms of data transfer in an industrial environment (written exercise) | | | | | |
| | 1 | IN | 3 | Given transmitter current (4 –20 ma) and the input resistance of a receiving device, calculate the input voltage under changing conditions (i.e. changing power supply voltage, additional series connection resistance, etc.) (Written exercise with calculator) | | | | | |
| | 1 | IN | 4 | Match process control characteristics with the following control schemes: Open Loop, Closed Loop On-Off control, proportional control, Proportional plus Integral control and PID control. (Written exercise with book reference) | | | | | |
| | 1 | IN | 5 | Match all of elements in a PID controller with their purpose. (Written exercise with book reference) | | | | | |
| | 1 | IN | 6 | Match all common devices used in instrumentation applications with their proper symbols. (Written exercise with book reference) | | | | | |
| | 1 | IN | 7 | Identify common Pressure transducers and match them to a description of operation and their symbol. (Written exercise with book reference) | | | | | |
| | 1 | IN | 8 | Identify common Temperature transducers and match them to a description of operation and their symbol. (Written exercise with book reference) | | | | | |
| | 1 | IN | 9 | Identify common flow transducers and match them to a description of operation and their symbol. (Written exercise with book reference) | | | | | |
| | 1 | IN | 10 | Identify common level transducers and match them to a description of operation and their symbol. (Written exercise with book reference) | | | | | |
| | 1 | IN | 11 | Identify common Analytic transducers and match them to a description of operation and their symbol. (Written exercise with book reference) | | | | | |
| | 1 | IN | 12 | Using a Hart Protocol Communications device, connect to a transmitter and record the displayed process variables. (I.e. measured variable, upper and lower range limits, Analog output, etc.) (Hands-on exercise with Hart communicator & working transmitter) | | | | | |
| | 1 | IN | 13 | Using a Hart Protocol Communications device, connect to a flow transmitter and perform a loop test. (Hands-on exercise with Hart Communicator & working transmitter) | | | | | |

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| | 1 | IN | 14 | Using a Hart Protocol Communications device, connect to a flow transmitter and change the Upper and Lower Range values. (Hands-on exercise with Hart Communicator & working transmitter) | | | | | | |
| | 1 | IN | 15 | Using commercial web sites locate and download specifications on selected transducers, transmitters and actuators. (Exercise using the Internet) | | | | | | |
| | 1 | IN | 16 | Wire a differential pressure transducer/transmitter to a load and measure output current under varying input conditions noting that variations in supply voltage and load resistance do not affect output current. Adjust Upper and lower range values. (Optional – pending equipment availability) | | | | | | |
| | 1 | IN | 17 | Manually adjust the zero and span points on a transmitter without a Hart Protocol communications device. (Hands-on Lab exercise) | | | | | | |
| | 1 | IN | 18 | Wire a thermocouple to an intelligent transmitter, and using a Hart Communicator set the upper and lower range values. Note the output current with changing temperature to verify the new range values. (Hands on lab exercise) | | | | | | |
| | 1 | IN | 19 | Demonstrate the proper use of a current source simulator, process meter (Fluke) and Milliamp clamp on ammeter. (Hands-on exercise) | | | | | | |
| | 1 | IN | 20 | Given plant Instrumentation prints, identify all symbols, connections, loops and sub-loops. Identify the state of digital (PLC) outputs necessary to actuate all control and proportioning valves in the system. (Written exercise with book reference) | | | | | | |
| | 1 | IN | 21 | Given the following:<br>- Instrumentation drawing<br>- PLC I/O diagram<br>- All field voltages under a faulted condition and currents as measured with an ammeter<br>Troubleshoot and identify the faulted component(s) and describe additional actions that could be further taken to isolate the faulted device. | | | | | | |

| **Additions: Please add any additional objectives that we may have overlooked.** |
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