REGIONAL EMPLOYMENT BOARD
OF HAMPDEN COUNTY, INC.

Precision Manufacturing Regional Alliance Project (PMRAP)

Accelerated Weekend Program

At

Springfield Technical Community College

Summary Report

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June 2011

The Precision Manufacturing Regional Alliance Project was funded by the Massachusetts Technology Collaborative- John Adams Innovation Institute.

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Accelerated Weekend Program for Incumbent Employees

September 2012

Section I. Background

In February 2010, the Regional Employment Board of Hampden County, Inc, (REB) working with the Dean, School of Engineering Technologies, and the faculty in the Mechanical Engineering Technology program at Springfield Technical Community College (STCC), conducted a survey of the Regular Member precision machining companies of the Western Massachusetts Chapter of the National Tooling and Machining Association (WMNTMA) to define the current and future technical skills competencies needed by their incumbent workforce. The results of this survey are summarized in the following table:

Priority	Ranking of Needed Skills Competencies
1.	Tool Holding/Measuring and Inspection
2.	Quality Assurance and Process Control CNC Programming and Verification
3.	Quick Change Workholding and Fixturing Process Planning and Estimating
4.	Machine Tool Performance

The PMRAP team analyzed these findings, considered the current emerging positive business patterns of the majority of the regional companies, looked at their need for more technically competent incumbent employees, and determined that the curriculum content in the four (4) existing Certificate programs and the Associate degree program, with some alignment and enhancements, responded to the companies stated needs.

PMRAP determined that the incumbent employees, many of whom had been attending courses sponsored by the REB, with the cooperation of the WMNTMA, would benefit by an accelerated program that would allow the employees to obtain college credits that could be applied toward either a Certificate or an Associate Degree in Mechanical Engineering Technology from STCC. In March 2011, the Project Manager surveyed fifteen (15) incumbent employees who successfully completed selected REB sponsored credit courses at STCC to gauge their thoughts on the development of an accelerated weekend program and their interest in participating in the program as part of a cohort model. The responses from the survey respondents were positive and indicated a strong interest in this training delivery model.

Accordingly, based on the assessment of the present Certificate and Associate degree programs, and the feedback from the incumbent employees, PMRAP and STCC have agreed to develop and implement an **Accelerated Weekend Program** beginning in September 2012, with a cohort of sixteen (16) incumbent employees of the regional precision manufacturing companies. The blended, competency based, project focused delivery model would consist of formal on-campus classroom/laboratory instruction; on-campus independent project based instruction, and off-campus independent technical and research projects.

Section II. Accelerated Weekend Program

A. Students

The students will be incumbent employees from the regional precision manufacturing companies. The class will be a cohort model of 16 employees who will be involved in a competency based delivery model consisting of formal on-campus classroom/laboratory instruction; on-campus independent project based instruction, and off-campus independent technical and research projects.

B. Schedule

September 2012- June 2013

- Four Sessions - 8 Weeks per Session
- Thursday: 5:00 PM-9:00 PM
- Saturday: 8:00 AM- 2:00 PM
- No. of Employees: 16

C. Assessment

Each incumbent employee will be assessed using valid and reliable testing instruments to ensure his/her capacity to successfully complete the instruction that will be presented in this accelerated weekend delivery model.

D. Framework and Competencies

The framework for the Accelerated Weekend Program is detailed in **Attachment A.** The framework identifies the competencies, the hands-on projects related to the competencies, and the proposed sequencing of the competencies in each of the four program instructional sessions. The development of the program framework is on-going and will be completed by December 31, 2011.

E. Technical Competencies Summary

The technical competencies will emphasize an understanding of the application of Computer Numerical Control (CNC) hardware and common productivity software in a manufacturing environment, using the Engineering Design Process to apply technology and mathematical reasoning to solve technological challenges. The concepts within the quality function, including the metrology system, measuring and gauging, and

geometric dimensioning and tolerancing (GD&T) will be a key focal point of the program.

The Solid Works feature-based, parametric solid modeling system will be presented, and employees will become proficient in writing programs for the CNC mill and lathe and the selection of the proper tooling and work holding devices. Computer Aided Manufacturing (CAM) will be will be presented with a focus on learning to use the CAM software to select tools, manipulate part geometry, and convert screen graphics into a CNC program.

F. Program Evaluation

PMRAP will evaluate the implementation and outcomes of the program and will prepare a Report by June 30, 2013.

Section III. Correlation to Credit Granting Courses

The competencies presented in this delivery model will correlate to the following credit granting courses offered in the Mechanical Engineering Technology Certificate and Associate Degree Programs at STCC. Employees who successfully complete the Accelerated Weekend Program will receive **sixteen (16)** college credits that can be applied to either a Certificate or an Associate degree.

Course No.	Course Title	Credits
MECH 115	Introduction to Engineering Technology	3
MECH-150	Fundamentals of CNC	3
MECH-160	Engineering Graphics with Solid Works	3
MECH-226	Metrology and Geometrics	3
MECH-338	Computer-Aided Manufacturing I (CAM 1)	3
MECH-339	Computer-Aided Manufacturing LAB I	1
TOTAL		**16**

Springfield Technical Community College
Accelerated Weekend Program
Incumbent Employees- Precision Manufacturing Companies

Course(s) in MET Curriculum Where Competency Covered	Project	Session 1	Session 2	Session 3	Session 4
Understand the importance of planning and prioritizing work to manage time effectively and accomplish assigned manufacturing processes and tasks.	All				
Knowledgeable of the manufacturing business as a system that integrates multiple disciplines, processes, and stakeholders.	Mech-115				
Informed on the importance of applying critical-thinking skills to solve problems by generating, evaluating, and implementing solutions to assigned tasks.	Mech-115				
Demonstrate knowledge of problem-solving methodologies by collaborating with team members to develop solutions to open-ended problems	Mech-115				
Understand the need to develop and maintain good working relationships with supervisors and co-workers and choose behaviors and/or actions that best support the team and lead toward the accomplishment of work tasks.	Mech-115				
Participate in team activities and document the results of those activities.	Mech-115 Mech-338				
Recognize the importance of responsible multi-tasking.	None See Note 1				
Knowledgeable of the various manufacturing types, processes, and products.	Mech-150 Mech-390				
Understand the necessity to properly use company property by minimizing loss and waste and reporting loss, waste, or theft of company property to appropriate personnel.	None See Note 1				
Knowledgeable of how companies integrate the basic principles of Lean Manufacturing into its manufacturing operations.	Mech-442				
Identify and utilize DMAIC problem-solving methodology components in relation to a manufacturing process	Mech-115 Mech-327				
Create value stream maps (VSM) as a method of defining a manufacturing process	Mech-442				
Analyze production flow by comparing cycle time to Takt time	Mech-442				
Determine value- vs. nonvalue-added activities in a given process and identify methods of eliminating (or reducing) the nonvalue-aded activity	Mech-442				
Knowledge in lean toolset (Kaizen, 5s, VSM, Standard Work) and how to apply to manufacturing environments	Mech-442				
Compare and contrast traditional batch and queue methods to Lean Manufacturing methods	Mech-442				
Knowledgeable of Quality Management Systems and Continuous Improvement.	Mech-327				

Define the principles of Six Sigma, DMAIC methodology, and Six Sigma implementation in order to conduct, analyze and interpret experiments and apply results to improve precesses	**Mech-327**
Understand the use of Gage R&R to determine acceptability of gage use in a particular manufacturing process.	**Mech-327**
Calculate statistical measures of quality (Cp and Cpk) to determine process control and process capability.	**Mech-327**
Analyze statistical process control (SPC) charts for patterns that indicate out-of-control situations (trends, shifts, instability, freaks and freak patterns)	**Mech-327**
Define ISO 9000 elements relevant to current production environments	**Mech-327**
Recognize need for and engage in lifelong learning with 6s certification options and ASQ professional certifications	**Mech-327**
Successfully read and interpret basic detail/assembly drawings in preparation for manufacturing production parts	**Mech-150** **Mech-160** **Mech-338**
Successfully knowledgeable with process sheets and 1st process sheets for information on specifications and tooling instructions, and to determine material requirements and operational sequences.	**None** **See Note 1**
Understand the basics of geometric dimensioning and Tolerancing.	**Mech-226** **Mech-150**
Understand the use of micrometers, height gauges, calipers in the quality inspection process.	**Mech-226** **Mech-338**
Successfully perform basic inspection of raw/incoming material/stock using appropriate measuring instruments.	**Mech-150** **Mech-338**
Successfully perform basic inspection of first piece parts using appropriate measuring instruments.	**Mech-150** **Mech-338**
Correctly record inspection readings in quality inspection log and attach log to process/operations sheet.	**Mech-226** **Mech-338**
Inspect machined parts to specified tolerances, and in accordance with customer specifications and regulations.	**Mech-150** **Mech-226** **Mech-338**
Be able to perform in process inspection using hand measuring tools at the machine.	**Mech-226** **Mech-338**
Understand the different Geometric symbols and how to interpret the effects of size variations.	**Mech-226** **Mech-338**
Analyze an engineering drawing to understand the geometric tolerances applied to the drawing then inspect a part to see if it conforms to the geometric tolerances.	**Mech-226** **Mech-338**
Understand material condition symbols and how they apply to features subject to variation in size.	**Mech-226**
Demonstrate the ability to use a height gage and dial indicator to measure various tolerances such as flatness, runout, straightness, and parallelism.	**Mech-226** **Mech-338**
Demonstrate the ability to set-up and use the optical projector to check the profile of a surface and other tolerances that this devise lends itself best to inspect.	**Mech-226** **Mech-338**

Demonstrate the ability to set-up and use a Coordinate Measuring Machine (CMM) for part inspection.	Mech-226 Mech-338
Understand the use of gage blocks for various inspection requirements. Set-up and use a sine bar utilizing gage blocks.	Mech-226 Mech-338
Be proficient in the use of hand measuring tools such as outside micrometers, depth micrometers, dial calipers.	Mech-226
Correctly perform 1st piece and in process inspection on machined parts.	Mech-338
Successfully perform basic sequential start-up operations, control panel operations, machining operations, and shut-down operations on a CNC Lathe.	Mech-150 Mech-338
Monitor the feed and speed of machines during the machining cycle.	Mech-150 Mech-338
Successfully set up datum point, tool offsets and cutter compensation on a CNC Lathe.	Mech-150 Mech-338
Learn proper machine maintenance schedules on CNC Lathe.	Mech-150 Mech-338
Successfully perform basic sequential start-up operations, control panel operations, machining operations, and shut-down operations on a CNC Milling machine.	Mech-150 Mech-338
Successfully set up datum point, tool offsets and cutter compensation on a CNC Milling machine.	Mech-150 Mech-338
Learn proper machine maintenance schedules on CNC Milling Machine.	Mech-150 Mech-338
Knowledgeable in basic use of computer tools to the manufacturing and business environment (Word, Excel, Powerpoint)	Mech-115 Mech-160
Knowledgeable in computer-aided design (CAD) software	Mech-160
Identify and utilize DMADV problem-solving methodology in relation to an industry accepted 3D solid modeling package	Mech-160
Understand how to sketch, refine and add parametric dimensions and relationships in an industry accepted 3D solid modeling package	Mech-160
Manipulate the view of the part when working with CAD/CAM systems.	Mech-160 Mech-338
Understand the Feature tree describing the methodology of part creation in a 3D solid modeling package	Mech-160
Generate 3D parametric solids using feature based generation (Extrude, Revolve, Applied features - holes, patterns, mirror, chamfer, fillet, Advanced feature - loft, rib, sweep)	Mech-160
Identify, and then create part features for a 3D solid model.	Mech-160
Edit part features when engineering changes occur.	Mech-370
Knowledgeable in the use and manipulation of reference planes and axes to best model solids	Mech-160
Create 3D workplanes to create complex parts requiring multi-axis machining.	Mech-370
Create fully associative assemblies by inserting components and applying appropriate mates	Mech-160
Create a 2D orthogonal drawing from a solid model in accordance with ASME Y14.3 and Y14.5.	Mech-280
Demonstrate an understanding of CAM basics.	Mech-338
Prepare CAD files for manufacturing.	Mech-338

Perform milling operations on solid models use CAM software.	Mech-338
Perform turning operations on solid models use CAM software.	Mech-338
Verify program and create CNC Code.	Mech-338
Setup and operate CNC mill or lathe to create part.	Mech-150 Mech-338
Understand CAD/CAM integration for both 2D and 3D Applications.	Mech-338
Create lathe and mill operation setups using CAD solid modeling.	Mech-338
Create setups for 4-axis machining.	Mech 251
Open lathe and milling setups in CAM and perform manufacturing operations.	Mech-338
Setup and operate CNC mill with 4th axis turret.	Mech150
Understand the Cartesian Coordinate System as it applies to both CNC milling and turning.	Mech-150 Mech-338
Calculate both RPM and feed rates for a given material and tool parameters.	Mech-150
Understand different work holding devises and how to properly install these devises on a CNC mill.	Mech-150 Mech-338
Understand the different mill tool holding devises and which holder is best suited for the tool.	Mech-150 Mech-338
Understand the different chip removal tools as applied to both milling as well as turning and which is best suited for the job.	Mech-150 Mech-338
Based on the lathe turning tools chosen for a job be able to properly install these tools on the lathe turret.	Mech-150 Mech-338
Understand the CNC controller for both the mill and lathe. What function keys are used to perform what sequence of events?	Mech-150 Mech-338
Analyze an engineering drawing to determine the sequence of events to manufacture a part.	Mech-150 Mech-338
Write a CNC program to perform drilling operations and utilize sub-programs.	Mech-150
Write a CNC program to perform contour milling using tool radius compensation.	Mech-150
Write a CNC program utilizing the fourth axis of the mill.	
Write a CNC program to perform turning and boring operations using tool radius compensation as well as threading operations.	Mech-150

Note 1: Competency not formally covered in MET curriculum making it unique to this program

Upon successful completion, the following courses in the Mechanical Engineering Technology Program may be applied toward either a Certificate or an Associates degree at STCC. The credit courses are color coded and are correlated with the competecies and the courses shown above. Some of the competencies listed above are also covered in other courses that will not be credited in this program. These course designations are not color coded.

Mech-150, Mech-226, Mech-160, Mech-115, Mech-338/Mech 339 - (16 Credits Total)