

Grant Title: **Accelerated Pathways in Advanced Manufacturing (APAM)**

Author: **Community College of Rhode Island**

Link: <http://www.ccri.edu/>

Document: DACUM

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# Community College of Rhode Island: Advanced Manufacturing

## EXECUTIVE SUMMARY

The Community College of Rhode Island (CCRI) contracted with the Worldwide Instructional Design System (WIDS) to provide a DACUM for the Advanced Manufacturing program area, as well as technical assistance to determine: 1) which DACUM tasks and duties were currently part of the curriculum, 2) identify gaps between the DACUM and curriculum, and 3) advise on possible program changes to facilitate alignment. The work included face to face meetings, webinars, phone/email communication and follow-up reports.

### DACUM

The DACUM was completed at CCRI's Knight Campus on Wednesday, October 28, 2015. The following participants completed the DACUM process, providing expertise in the job position of Advanced Manufacturing Technician:

John Cronin	Quick Fitting	Warwick, RI
Thomas Hutchinson ✓	Davol, Inc.	Warwick, RI ✓
Scot Jones	Groov-Pin Corp.	Smithfield, RI ✓
Larry Lefebvre	Chemart Co.	Lincoln, RI
Christine Long	Eaton Aerospace	Rumford, RI
Tony Maneca ✓	ArtVac Corporation ✓	Lincoln, RI ✓
Nancy Martin	Electric Boat	N. Kingston, RI
Hudson Pereira	Alcor Scientific	N. Smithfield, RI
Dona Vincent ✓	TEDCO, Inc.	Cranston, RI ✓

### Technical assistance: Program review

The technical assistance meeting to review the program and develop programmatic recommendations was completed on December 9<sup>th</sup>, 2015. The following faculty members participated in the review of the DACUM with the current program course outcomes:

- Ray Ankrom
- Jerry Bernardini
- Vernon Mace
- Philip Miller

Cathy Livingston and Tom Sabbagh also participated, primarily in an observer role.

The faculty reviewed each of the job duty tasks created with the employers on October 28, 2015 (See Appendix A) and identified where and how each of these tasks were assessed within the courses in the current program. A crosswalk report on this analysis was created and used to identify some gaps between job tasks and curriculum outcomes. The faculty discussed where they might incorporate some of the tasks as outcomes in their current courses and where new courses may be required. The faculty also identified the need for additional equipment in the Integrated Manufacturing Lab in order to address the newly identified learning outcomes.

# ADVANCED MANUFACTURING TECHNICIAN DACUM

Duties	Tasks								
	1	2	3	4	5	6	7	8	9
Meet Quality System Requirements	Inspect conformance of process to requirements	Document process conformance	Initiate resolution of non-conformance	Document Audit of Quality System					
Perform Continuous Improve-ment	Perform Standardized work	Provide internal customer service	Perform Root Cause Analysis	Communicate quality improvement info to team	Implement improvements				
Operate Machine Process	Perform daily machine check (list)	Perform 1st piece check	Verify process control	Verify output	Trouble-shoot problems	Implement adjustments	Perform preventive maintenance		
Adhere to Safety Procedure	Follow dress code	Use required PPE	Audit process for safety concerns	Follow safety start checklist	Maintain a safe, clean work area	Initiate safety corrective actions	Use proper material handling rules		
Assess Scope of Work	Review job requirements: Quality, cost, process and QA	Read blueprint & documents	Apply Lean Manufacturing Tools	Verify Materials					
Set up Machines	Perform machine programming	Set up manual equipment	Set up CNC Grinders	Set up robotic welders	Set up multi-axis CNC machines	Set up E.D.M.s	Set up process control systems: vision and sensors	Set up injection molding machines	Set up laser cutting machines

Project Activity/Milestone(s)	Estimated Time for Completion as Noted in SOW	Current Status	Modified Completion Date	Brief Rationale for Modifying Completion Date
Create Key Elements of Education Commons	04/2014	Completed	NA	NA
Research & Incorporate Key Intake Assessment Tools; Pilot Course	09/2015	Completed	NA	NA
Research & Create Career Preparation Course (Poised for Success) Pilot Course	09/2016	Completed; Course is enrolling students	NA	NA
Research "Best Practices" on Awarding Credit for Prior Learning (CPL); Revise Current Practices for CPL; Implement Changes to Current Systems; Provide Training in New Procedures; Revise Related Print/Media Materials Related to New Processes	Initiated in 5/2014  Stated Completion Date of 09/2016	Research Completed; Engaged CAEL as consultant; New Program set to begin in 03/2016; Training scheduled for 02/2016 Print Materials/Media anticipated completion date of 05/2016	NA	NA
Create 2 New Certificate Programs	Initial deadline <del>05/2105</del> 2015 Final Deadline 05/2016	Basic Electrical Certificate Completed Basic Pipefitting Certificate (50% Completed)	NA	NA
Seek Employer Input on Advanced Manufacturing Program Complete DACUM Process Seek Accreditation	Initiated in 09/2014  Final Completion Date of 09/2016	DACUM Process Completed Proposed curriculum revisions based on employer input Completed Identification of appropriate accrediting body (ATMAE) Completed Accreditation Process Initiated in March 2016	Anticipate Curriculum Revisions Finalized by Governance Structures in May 2016  ATMAE Accrediting Process Requires 12-18 Month Window; Timeline Determined by Accrediting Body	The two processes, reviewing the curriculum from employers' perspectives as completed by the DACUM process, and coordinating the outcomes of the employers' review with the anticipated requirements of the ATMAE accrediting process, was a time-sensitive, complex project. Initially the College had identified seeking ABET accreditation, but ABET does not focus on two-year technical programs so the College had to research appropriate alternatives and sent a staff member to the ATMAE conference in November 2015. The College anticipates completing the ATMAE accreditation in March 2017.
Establish CCRP's Role in Preparing an Educated Workforce to Meet the Needs in Advanced Manufacturing in Rhode Island	Initiated in 09/2014  Final Completion Date of 09/2016	Print materials created; Website redesigned; Special Events promoted; Video near completion	NA	NA
Create Accelerated Pathways for College-Level Learning in English and Math	Initiated in 09/2014 Final Completion Date of 05/2016	English Pathway Completed; Math Pathway under development	NA	NA

*send  
to Hazel*

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COMMUNITY COLLEGE OF RHODE ISLAND:  
ADVANCED MANUFACTURING

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Final Report  
December 2015

This DACUM and program review was completed by the Worldwide Instructional Design System (WIDS), a division of the Wisconsin Technical College system foundation. WIDS has a proven curriculum design, development, and review history around a solid performance-based model.

Karen J. Barr, Ph.D., Learning Design Consultant for WIDS, facilitated the DACUM and program review.



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# Community College of Rhode Island: Advanced Manufacturing

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## OVERVIEW

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The Community College of Rhode Island (CCRI) contracted with the Worldwide Instructional Design System (WIDS) to provide a DACUM for the Advanced Manufacturing program area, as well as technical assistance to determine: 1) which DACUM tasks and duties were currently part of the curriculum, 2) identify gaps between the DACUM and curriculum, and 3) advise on possible program changes to facilitate alignment. The work included face to face meetings, webinars, phone/email communication and follow-up reports.

CCRI opted to adapt one part of the DACUM process, the e-mail validation survey, in seeking input from a broader array of Advanced Manufacturing companies in Rhode Island. Instead of sending out the results of the DACUM process in an e-mail validation survey, the College sent a letter to an additional 60 companies indicating that the College had recently completed a review of its Advanced Manufacturing program, explained the DACUM process, and invited companies to contact College personnel to review and discuss the results. Rhode Island has a wide range of manufacturing companies – with significant differences in size, focus, level of technology use, etc. – and the College believed that follow-up one-on-one discussions would provide more valuable results.

After CCRI reviewed the DACUM, they requested an onsite review of the DACUM with program faculty. The DACUM was examined in conjunction with the learning outcomes found in the current program courses. This review was completed with four faculty members. The faculty members worked through each duty/task on the DACUM with the WIDS consultant and determined whether or not each task was taught in the current curriculum.

Deliverables included: DACUM report, Crosswalk of DACUM and current courses and suggested program realignment options.

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## DACUM

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Nancy Martin	Electric Boat	N. Kingston, RI
Hudson Pereira	Alcor Scientific	N. Smithfield, RI
Dona Vincent	TEDCO, Inc.	Cranston, RI

The employer participants participated in an Affinity process to organize the job duties and tasks for an Advanced Manufacturing Technician position. After the DACUM report (attached) was completed, the participants reviewed the information and provided feedback as needed regarding the completeness and accuracy of the report. No errors were found.

Generally, a survey is emailed to additional people in the industry who were not part of the DACUM process to validate the job duties and tasks. CCRI chose to substitute individual in-person meetings with companies as opposed to sending out a survey via email.

## TECHNICAL ASSISTANCE: PROGRAM REVIEW

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The technical assistance meeting to review the program and develop programmatic recommendations was completed on December 9<sup>th</sup>, 2015. The following faculty members participated in the review of the DACUM with the current program course outcomes:

- Ray Ankrom
- Jerry Bernardini
- Vernon Mace
- Philip Miller

Cathy Livingston and Tom Sabbagh also participated, primarily in an observer role.

The faculty reviewed each of the job duty tasks and identified where and how each of these tasks were assessed within the courses in the current program. A crosswalk report on this analysis is found at the end of this report. The crosswalk identified some gaps between job tasks and curriculum outcomes. These gaps are highlighted in the crosswalk. The faculty discussed where they might incorporate some of the tasks as outcomes in their current courses and where new courses may be required.

Once these were determined, the faculty reviewed their current program courses, credits, and additional courses required. The group worked together to reconfigure the program in light of the industry input. Additionally, they suggested three certificates as ladders into the program or for incumbent workers. The recommendations are as follows:



## Proposed Advanced Manufacturing AAS or AS program

**General Education courses: 22 credits**  
 (same as current ETST program with Speech substituted  
 for one of the Sociology options)

ETME 2310	3 credits
ENGR 1030	3 credits
ETME1010	3 credits
ETME 1020	4 credits
ENGT2090	3 credits
ETCN 1200	2 credits
ETCN 2100	3 credits
ETCN2300	3 credits
ETCN 2200	3 credits
ETCN1100	3 credits
ETCN1300	3 credits
ENGT1060	3 credits
Quality Course (NEW)	3 credits
Robotic Welding (NEW) OR	
EDM/Laser (NEW)	3 credits each

**Total Credits: 64**

### Proposed Certificates

Design/Rapid prototype = 15 Credits	CNC 1=15 Credits	CNC 2 = 12credits
ENGR 1030	Quality Course	ETME 2310
ENGT2090	ETME 1020	ETCN2300
ETCN2300	ETCN 1200	ETCN 2200
ENGT 1060	ETCN1100	Robotic Welding OR
Quality Course	ETCN1300	EDM/Laser

### NEXT STEPS

The faculty need to finalize their proposed curriculum changes following the processes and procedures of CCRI. The faculty also need to prepare information for the college to support the purchase of an EDM machine and a robotic welder to provide the necessary equipment on which the students will practice and be assessed. Finally, the college (faculty and related staff) need to develop an advisory committee, to provide for ongoing feedback and recommendations for the Advanced Manufacturing program.

## ADVANCED MANUFACTURING TECHNICIAN DACUM

	Duties	Tasks								
		1	2	3	4	5	6	7	8	9
<b>A</b>	<b>MEET QUALITY SYSTEM REQUIREMENTS</b>	Inspect conformance of process to requirements	Document process conformance	Initiate resolution of non-conformance	Document Audit of Quality System					
<b>B</b>	<b>PERFORM CONTINUOUS IMPROVEMENT</b>	Perform Standardized work	Provide Internal customer service	Perform Root Cause Analysis	Communicate quality improvement info to team	Implement improvements				
<b>C</b>	<b>OPERATE MACHINE PROCESS</b>	Perform daily machine check (list)	Perform 1st piece check	Verify process control	Verify output	Troubleshoot problems	Implement adjustments	Perform preventive maintenance		
<b>D</b>	<b>ADHERE TO SAFETY PROCEDURES</b>	Follow dress code	Use required PPE	Audit process for safety concerns	Follow safety start checklist	Maintain a safe, clean work area	Initiate safety corrective actions	Use proper material handling rules		
<b>E</b>	<b>ASSESS SCOPE OF WORK</b>	Review job requirements: Quality, cost, process and QA	Read blueprint and documents	Apply Lean Manufacturing Tools	Verify Materials					
<b>F</b>	<b>SET UP MACHINES</b>	Perform machine programming	Set up manual equipment	Set up CNC Grinders	Set up robotic welders	Set up multi-axis CNC machines	Set up E.D.M.s	Set up process control systems: vision and sensors	Set up injection molding machines	Set up laser cutting machines

## Crosswalk of Automated Mfg. DACUM Duties and Tasks with Current Adv. Mfg. track in ETST

	ETME2150 Can't find in catalog	ETME1020	ETCN1200	ETCN1300	ENGR1020*or ENGR 1030??	ETME1010*	EE1800	ETCN2200	ETCN 2300	ETCN2500	ETCN2100	ETME 2310*	ETCN1100
<b>Meet Quality System Requirements</b>													
Inspect conformance of process to requirements												x	
Document process conformance												x	
Document Audit of Quality System												x	
Initiate resolution of non-conformance												x	
<b>Perform Continuous Improvement</b>													
Perform Standardized work		x	x	x									
Provide Internal customer service					x	x							
Perform Root Cause Analysis	Currently not done in any course												
Communicate quality improvement info. With team		x											
Implement improvements					x								
<b>Operate machine process</b>													
Perform daily machine check(list)		x	x					x					
Perform 1st piece check		x	x					x					
Verify process control		x	x					x					
Verify output		x						x					
Troubleshoot problems			x					x					
Implement adjustments			x					x					
Perform preventive maintenance	Currently not done in any course												
<b>Adhere to safety Procedures</b>													
Follow dress code		x	x										
Use required PPE and material handling procedures		x	x										
Audit process for safety concerns	Not Done												
Follow safety start checklist		x											
Maintain a safe, clean work area		x											
Initiate safety corrective actions		x											
Use Proper material handling materials	Not Done												
<b>Assess Scope of Work</b>													
Review job requirements: Quality, cost, process and QA procedures	Not Done												
Read blueprint and documents			x										x
Apply Lean Manufacturing Tools	Not Done												
Verify Material(s)	Not Done												
<b>Set up Machines</b>													
Perform machine programming							x	x	x	x			
Set up manual equipment		x		x									
Set up CNC Grinders		x											
Set up robotic welders	No equipment* add a new course or expand												
Set up multi-axis CNC machines				x				x			x		
Set up E.D.M.s	No equipment*												
Set up process control systems: vision and sensors						x						x	
Set up injection molding machines	No equipment												
Set up laser cutting machines	No equipment*												

\* Indicates a course currently taught only in AAS program

## APPENDIX A

(Submitted by the College)

Proposed Timeline for Approving Revisions to the Advanced Manufacturing Program Based on the DACUM Process

Timeline Submitted by Department Chair, Jerry Bernardini, via email dated 12/22/2015 and shared with the Department, the Dean, and Key Members of the TAACCCT-3 Staff

**Question posed to Department Chair:** Finally, given that we're moving forward to purchase additional equipment, I need to reassure our Program Officer that the Program will be accepting the recommendations and proposed new curriculum that resulted from the DACUM process. I also need to include a date that the curriculum revisions will be implemented. Can you provide this information?

**Response via email dated 12/22/2015 (From Department Chair)**

*"On a whole the DACUM produced some very useful results, supporting are our existing efforts and exposing some of our weaknesses. Our previous studies of existing programs including industry feedback, the Rhode Island Advanced Manufacturing Apprenticeship program, "The Manufacturing Industry: Producing Rhode Island's Future" –Good-fit study and the Connecticut manufacturing program. They indicated that we covered most of what industry required for developing an advance manufacturing workforce. What it not provide is a perspective of how to parse the various needed learning outcomes into marketable certificates that employers would value.*

*The most important DACUM result for program development was to cause us the "see" that we have a manufacturing program that blends design, machining skills and quality measurement. The DACUM participants seemed to indicate that employers would value separating these skills. (A CNC machine operator would not necessarily have to know SolidWorks or perform elaborate quality measurements.)"*

This perspective resulted in Dr. Barr's help in organize our existing courses in to three certificates, focusing on design, machining skills and quality measurement. I have discussed this focus with Dean Woodberry and he has recommended that we proceed with preparing curriculum material for these changes. This is the timeline that we should be able to follow:

- February-20 Program revision draft for internal and industry review (submitted to more that the eight DACUM participants)
- March-18 Curriculum Committee draft to Deans and Academic VP
- March-25 Deans and Academic VP recommendations
- April-1 Curriculum Committee submission
- April-22 Curriculum Committee meeting for approval
- May-? Board Higher Approval?

## APPENDIX B

(Prepared by Tom Sabbagh)

**ATMAE Associate Degree Program Requirements (60 credits)**

VS

**CCRI ETST Program (63 credits)**

<b>ATMAE: Communication</b> (Must be both oral and written course)			<b>(6-9 credits)</b>	<b>Status</b>
CCRI:	ENGL 1010	(3 credits)		
	<i>COMM 1100*</i>	<i>(3 credits) -need to add to curriculum as Humanities</i>		
		<b>Total Credits:</b>	<b>(6 credits)</b>	<b>non-compliant</b>
<b>ATMAE: Mathematics</b>				
CCRI:	MATH 1750	(3 credits)		
	MATH 1760	(3 credits)		
		<b>Total Credits:</b>	<b>(6 credits)</b>	<b>compliant</b>
<b>ATMAE: Physical Sciences</b>			<b>(3-12 credits)</b>	
CCRI:	PHYS 1050	(4 credits)		
	PHYS 1070	(3 credits)		
		<b>Total Credits:</b>	<b>(7 credits)</b>	<b>compliant</b>
<b>ATMAE: Management and/or Technical</b>			<b>(29-45 credits)</b>	
CCRI:	ENGR 1020	(3 credits)		
	ENGR1030	(3 credits)		
	ETEE 1050	(3 credits)		
	ETEE 1800	(3 credits)		
	INST 1010	(3 credits)		
	ETEE 1500 OR ETME 1500	(3 credits)		
	ETME 1020	(2 credits)		
	ETEE 2360	(3 credits)		
	ETME 1010	(3 credits)		
	ETEE 1120 Or ETME 1510	(3 credits)		
	ETME 2310	(3 credits)		
	ETEE 1100	(3 credits)		
	ETEE 2390	(3 credits)		
	ETEE 2500	(3 credits)		
		<b>Total Credits:</b>	<b>(41 credits)</b>	<b>compliant</b>
<b>General Electives</b>			<b>0-12 credits</b>	<b>compliant</b>
<i>(1) Social Science (3 credits) -need to reduce current SS electives by 3-credits</i>				

## APPENDIX C

Timeline and Steps in Accreditation Process  
 ATMAE (Association of Technology Management and Applied Engineering)  
 January 2016 – November 2017  
 (Prepared by Tom Sabbagh)

<b>TASK</b>	<b>TIMEFRAME TO COMPLETE</b>	<b>RESPONSIBILITY</b>	<b>STATUS</b>
<b>1. Application</b>	early February 2016	Sabbagh	pending
<b>2. Advisory Board</b>	end of February 2016	Sabbagh, Woodberry, Bernardini	ongoing
<b>3. Curriculum changes</b>	end of February 2016	Woodberry, Bernardini	pending
<b>4. ATMAE Consultant</b>	mid-February 2016	Sabbagh	pending
<b>5. Outcomes data</b>	March 2016 – September 2016	IR, Department	pending
<b>6. Evaluation of data and draft self-study</b>	October 2016 – December 2016	IR, Sabbagh & Department	pending
<b>7. Submit Final Self-Study</b>	January 2017	Woodberry	pending
<b>8. Schedule Site visit</b>	February 2017 – April 2017	Sabbagh	pending
<b>9. Visiting Team Report</b>	March 2017 – April 2017	ATMAE	pending
<b>10. Review recommendations</b>	July 2017	President CCRI	pending
<b>11. Implementation</b>	November 2017	ATMAE Board	pending

## Appendix D

**APPENDIX D CCRIS TAACT III Grant Equipment Purchasing Requests rev.03**

Unit/Item Name	Equipment description & Basic Specifications	Serial/Model ID /or SKUI#	Supplier & Contact Person	Estimate of cost to install & make usable for purposes of grant	Estimate of item's "useful life" expectancy in years	estimated cost per unit	Total # of items units required	Campus where item will be housed	Total cost \$ for multiple units	Purpose of item relating to grant	Page # in CCRIS Statement of Work that links	Contact information
GF Machining Solutions - Wire EDM	CNC Wire EDM Machine	CUT 200Sp	High Performance Machinery, LLC Kenneth Otzel	Included	20+	\$148,500	1	Knight	\$148,500	To provide a wire EDM capability indicated by a DACUM for CCRIS manufacturing program		
Festo Heavy Duty CNC Mill	Robot integrated CNC Mill and accessories	5600-B 5601-1 5612-1 5613-1 5616 5660	AET Labs Bob Mancuso	Included	20+	\$41,606	1	Knight	\$41,606	To provide a robot controlled integrated machining capability indicated by a DACUM for CCRIS manufacturing program		
Torchmate Delux 4x4 CNC Plasma Table Kit and Hypertherm Powermax 105 Torch	CNC Plasma Cutter and Torch	Delux 4x4 and 05-0105-002	TrickiTools 877-826-7268	Included	20+	\$16,950	1	Knight	\$16,950	To provide CNC plasma cutting capability indicated by a DACUM for CCRIS manufacturing program		
Motor Bracket Assembly	X-axis motor bracket for Fagor CNC Drive unit	DO	Rice Machinery Peter McLaughlin	Included	20+	\$1,095	1	Knight	\$1,095	To complete a milling machine previously ordered and installed		
Sharp LMV Machine Accessories Kit	Sharp milling accessories	LMV	Rice Machinery Peter McLaughlin	Included	20+	\$1,500	3	Knight	\$4,500	To complete three milling machines previously ordered and installed		
<b>Totals</b>									<b>\$212,651</b>			

## **Appendix E**

**(Revised curriculum will be inserted upon completion - anticipated completion April 22, 2016)**