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

Author: **Community College of Rhode Island**

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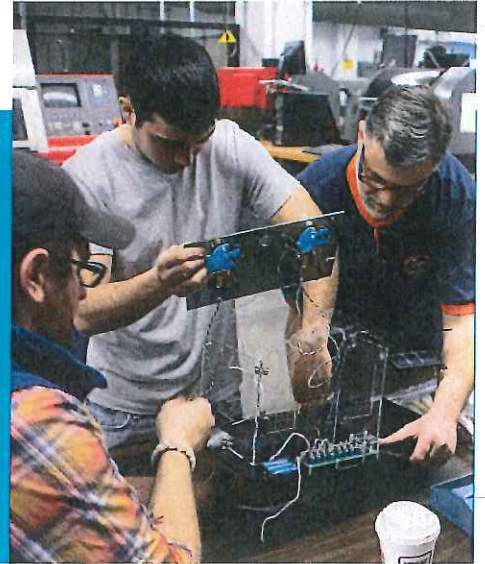
DOL Disclaimer Statement:

Exciting NEW INITIATIVE
for advanced manufacturing jobs for the future at Community College of Rhode Island

Accelerated Pathways in Advanced Manufacturing (APAM)

CCRI is enhancing its programs and educational options in advanced manufacturing. This opportunity is made possible by the college's recent grant award of $2.5 million dollars from the U.S. Department of Labor Employment and Training Administration.

The Trade Adjustment Assistance Community College and Career Training Grant Program (TAACCCT) provides community colleges with funds to expand and improve their ability to deliver education and career training programs that can be completed in two years or less, are suited for workers who are eligible for training under the TAA for Workers program, and prepare program participants for employment in high-wage, high-skill occupations.

Informed by collaborative discussions with several statewide organizations – including, the R.I. Governor's Workforce Board, the Rhode Island Department of Labor and Training, the Office of Higher Education, Rhode Island Manufacturing Association (RIMA) and Rhode Island Manufacturing Extension Services (RIMES) – CCRI has created new pathways and opportunities in advanced manufacturing, an industry that is projected to grow within the next 10 years.

Relevance to the state's economy

Manufacturing of all types employs nearly eight percent of all workers in Rhode Island.

Projected job growth

According to labor market information from the R.I. Department of Labor and Training, employers in manufacturing will need to fill more than 10,000 positions between 2010 and 2020. More recent events suggest that there may be even more openings between now and 2020. Wages associated with these hires are significant to the Rhode Island economy, with two of the top three occupations projecting the highest number of openings paying median wages of more than $20 per hour (*machinists and front-line supervisors of production and operating workers.*)

Key Levers to Promoting Innovative Responsive Programming

Provide assessment opportunities/ Align skills and interests with career opportunities

Adult learning specialists and career counselors will be available to assist interested participants in better understanding how their current skill sets align with educational and career opportunities.

Create statewide standards for awarding credit for prior learning

According to a Lumina and Gallup survey in 2013, 75 percent of adults surveyed would be more likely to enroll in postsecondary education if they could receive credit for what they already know. The TAACCCT grant has provided funding to assemble representatives from Rhode Island's higher education institutions to create statewide policies for awarding credit for prior learning.

Develop online portal for linking "best fit" options with current circumstances

A new online portal will enable Rhode Island residents to link their current skill sets and personal interests with available educational opportunities that lead to current and projected career paths. This up-to-date information makes it possible for adults to select which options are best suited for their current circumstances.

Offer "adult-friendly" services

Mindful that adult learners frequently have many demands on their time, newoptions for online, customized interventions will be created to support an accelerated pathway to degree completion.

Create stacked and latticed credentials

Newly created career pathways that emphasize a "learn and earn" model consist of stackable and latticed credentials that provide opportunities for adult learners to acquire new knowledge and skills that are linked with specific industry requirements. These blocks of new learning are structured to lead to both associate and baccalaureate degrees.

Design new interdisciplinary liberal arts courses

Recognizing the need for creating a foundation for lifelong learning, CCRI faculty will create a series of new interdisciplinary liberal arts courses that focus on the changing nature of the world (e.g., climate changes, changes across the lifespan, changes brought about by a global economy, etc.)

Build in strategies for success

To ensure that participants are fully prepared with the full complement of essential skills to be successful, the program will include a Manufacturing Boot Camp to introduce key concepts in the industry and a Poised for Success course that includes a review of the soft skills needed for a 21st century workforce.

CCRI awarded $2.5M federal grant to fund advanced manufacturing pathways

June 9, 2014

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The Community College of Rhode Island announced today it has received a $2.5 million grant from the U.S. Department of Labor Employment and Training Administration to create new pathways and opportunities in advanced manufacturing, an industry that is projected to grow in the Ocean State over the next 10 years.

Rhode Island's full congressional delegation, Gov. Lincoln Chafee and Board of Education Chairwoman Eva-Marie Mancuso joined CCRI President Ray Di Pasquale to announce the college has received a $2.5 million federal grant.

The grant announcement was made this morning at CCRI's Knight Campus in Warwick. U.S. Sens. Jack Reed and Sheldon Whitehouse, U.S. Reps. Jim Langevin and David Cicilline, Gov. Lincoln Chafee and Eva-Marie Mancuso, chairwoman of the Rhode Island Board of Education, spoke about the program and what it means to the future of manufacturing in Rhode Island.

The Accelerated Pathways in Advanced Manufacturing, or APAM, program emphasizes a "learn and earn" model consisting of stackable and latticed credentials that provide opportunities for adult learners to acquire new knowledge and skills that are linked with industry needs. These blocks of new learning are structured to lead to both associate and bachelor's degrees.

For instance, a student enrolling would determine a pathway with the assistance of a career counselor or adult learning specialist, be evaluated for the potential of receiving credit for prior learning and enroll in a Poised for Success course, which includes a review of soft skills needed for the 21st century workforce. A Manufacturing Boot Camp introduces the student to key concepts in the industry. From there, he or she could move on to one or more of four certificate programs at CCRI, then to the college's associate degree in Engineering Systems Technology and a

baccalaureate degree at a four-year institution, increasing his or her salary at each step.

"We are responding to a need to train workers for the manufacturing industry's modern incarnation, computer numerical controlled operations, in which components are designed and machines are controlled via computers rather than manual operations," said CCRI President Ray Di Pasquale. "Demand for workers in this field is expected to be high over the next several years, and we are working to meet the industry need."

According to labor market information from the R.I. Department of Labor and Training, employers will need to fill more than 10,000 manufacturing positions between 2010 and 2020. Wages associated with these hires are significant to the Rhode Island economy, with two of the top three occupations – machinists and front-line supervisors of production and operating workers – projecting the highest number of openings paying median wages of more than $20 per hour.

The grant funds to create the APAM program are made possible through the Trade Adjustment Assistance Community College and Career Training Act (TAACCCT), which provides community colleges with funds to expand and improve their ability to deliver education and career training programs that can be completed in two years or less, are suited for workers who are eligible for training under the TAA for Workers program and prepare program participants for employment in high-wage, high-skill occupations.

CCRI's APAM project's educational design has paid particular attention to the needs of adult learners whose busy lives require learning opportunities that are responsive to their needs. Students will find a portal to link their current skills and interest with available opportunities to find the career path that is the best fit for them. They will have the opportunity to receive college credit for their prior learning and receive support services offering more efficient pathways to fill in skills gaps. New options for online, customized interventions will be created to support an accelerated pathway to degree completion.

"We are mindful that adult learners have many demands on their time – work and family obligations chief among them – and that they want to complete their education to move into their field of choice quickly," said Vice President for Academic Affairs Greg Lamontagne. "We have structured this program to build in strategies for their success at every level."

The APAM program at CCRI was informed by collaborative discussions with statewide organizations, including the Governor's Workforce Board, the Department of Labor and Training, the Office of Higher Education, Rhode Island Manufacturing Association and Polaris MEP, formerly known as Rhode Island Manufacturing Extension.

CCRI's APAM program is an equal opportunity program. Auxiliary aids and services are available upon request to individuals with disabilities.

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Engineering and Technology Department

Certificate programs in Advanced Manufacturing Technology

Manufacturing Design and Rapid Prototyping certificate (ETMD)

The Manufacturing Design and Rapid Prototyping certificate will allow students to develop the knowledge and skills required for preparing the files and drawings for a variety of mechanical devices and components. The student will develop skills with contemporary CAD software to produce files suitable for machining and 3-D printing.

The emphasis will be placed on designing for advanced manufacturing technology and rapid prototyping using 3-D printers and mechanical simulation.

The certificate can be completed part time in one year and full time in a summer session and one semester. All credits can be applied to the Associate in Science degree in Advanced Manufacturing Technology. *See certificate requirements on reverse.*

Advanced Manufacturing Machining certificate (ETMM)

The Advanced Manufacturing Machining certificate prepares students to develop the knowledge and skills for advanced manufacturing machining through extensive hands-on experience with manual, conversational and CNC machines. Students will be prepared to read blueprints, select the appropriate machining technology and produce a unit while meeting the design specifications.

An emphasis will be placed on safe and efficient setup and operation of industrial-grade machining equipment. Many employment opportunities will be available to students who have all the skills and knowledge associated with CNC and rapid prototyping technology. The program has been designed to provide the student with extensive hands-on laboratory experience, utilizing a recently updated laboratory.

While developing CNC-related skills and knowledge, the certificate will maximize the skills advocated by a manufacturing advisory board. It can be completed part time in one year and full time in a summer session and one semester. All credits can be applied to the Associate in Science degree in Advanced Manufacturing Technology. *See certificate requirements on reverse.*

Manufacturing Automation and Quality certificate (ETMQ)

The Manufacturing Automation and Quality certificate teaches students to measure the quality of manufactured products and develop efficient manufacturing processes. Students will gain experience with a variety of advanced manufacturing technologies, including wire EDM, plasma cutting, 3-D printing and laser cutting.

The program has been designed to provide the student with extensive hands-on laboratory experience using a recently renovated laboratory. This experience will maximize the skills advocated by the college's manufacturing advisory board. The student will receive an OSHA-10 certification and the opportunity to attend four industry presentations.

The certificate can be completed part time in one year or full time in a summer session and one semester. All credits can be applied to the Associate in Science degree in Advanced Manufacturing Technology. *See certificate requirements on reverse.*

Contact information

For more information about the ETMD, ETMM and ETMQ certificate programs, visit www.ccri.edu/engt or contact:

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Certificate programs in Advanced Manufacturing

MANUFACTURING DESIGN and RAPID PROTOTYPING (ETMD)

	COURSE CODE	CREDITS	LECTURE	LAB
Engineering Graphics	ENGR 1030	3	2	3
Blueprint Reading and the Machinery's Handbook	ETCN 1100	3	2	2
Introduction to Manufacturing Processes	ETME 1020	3	1	4
Introduction to AutoCAD (Basic)	ENGT 1060	2	1	2
Advanced Solid Modeling	ENGT 2090	3	2	2
Mechanical Industrial Design	ETCN 1000	3	2	2
3-D Modeling and Prototyping (Direct Digital Manufacturing)	ETCN 2300	3	2	2
Certificate totals		20	12	17

ADVANCED MANUFACTURING MACHINING (ETMM)

Introduction to Manufacturing Processes	ETME 1020	3	2	2
Blueprint Reading and the Machinery's Handbook	ETCN 1100	3	2	2
Advanced Machining Skills	ETCN 2000	3	2	3
CNC Machining I	ETCN 1300	3	1	4
Computer-Aided Manufacturing (MasterCam)	ETCN 2100	3	1	4
CNC Machining II	ETCN 2200	3	1	4
Industry and OSHA-10 Seminars	ETCN 2400	1	0	2
Certificate totals		19	9	21

MANUFACTURING AUTOMATION and QUALITY (ETMQ)

Precision Measurement and Geometric Dimensioning and Tolerance	ETCN 1200	3	2	2
Introduction to Digital Systems (PLCs)	ETEE 1800	3	2	2
Automated Machining Technology	ETCN 2350	3	1	3
Introduction to Robotics and Control	ETME 1010	3	2	2
Automation Systems	ETME 2310	3	2	2
Manufacturing Quality Control	ETCN 2360	3	2	2
Lean Manufacturing	ETCN 2250	2	1	2
Industry and OSHA-10 Seminars	ETCN 2400	1	0	2
Certificate totals		21	12	17

Exciting NEW INITIATIVE for advanced manufacturing jobs for the future at Community College of Rhode Island

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Informed by collaborative discussions with several statewide organizations – including, the Governor's Workforce Board, the Rhode Island Department of Labor and Training, the Office of Higher Education, Rhode Island Manufacturing Association (RIMA) and Polaris MEP (formerly RIMES) – CCRI has created new pathways and opportunities in advanced manufacturing, an industry that is projected to grow within the next 10 years.

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Accelerated Pathways Advanced Manufacturing (APAM)
CCRI Engineering Systems Technology Curriculum Model

Baccalaureate Degree

Engineering Systems Technology A.S. Degree

**CNC Manufacturing and
3-D Modeling Certificate
(ETCA)**

Computer numerically controlled
machine tool programmer

Annual R.I. median wage: $48,970

**Advanced Manufacturing
Management Certificate**
(under development)

Contemporary
manufacturing operations

Annual R.I. median wage: $48,000

**Advanced Manufacturing
Design Certificate**
(under development)

Technical supervisor/manager for
manufacturing technical disciplines

Annual R.I. median wage: $58,000

**Introduction to
CNC Manufacturing Certificate
(ETCI)**

Manufacturing processes,
materials, safety

Annual R.I. median wage: $38,000

Certificates (15 to 24 credits)

CCRI Manufacturing Boot Camp

Career counseling services

Utilization of developmental education fast-track

Quantway/Statway, Accelerated Learning Programs (ALP),

Integrated Basic Education and Skills Training (I-BEST)

Education Commons

Poised for Success course

Prior learning assessment/potential for awarding of credit

Determination of career pathway

Statistics: http://data.bls.gov/oes January 2014

Key Levers to Promoting Innovative Responsive Programming

Provide assessment opportunities/align skills and interests with career opportunities

Adult learning specialists and career counselors will be available to assist interested participants in better understanding how their current skill sets align with educational and career opportunities.

Create statewide standards for awarding credit for prior learning

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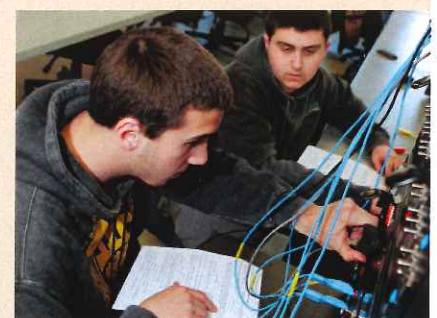## Create stacked and latticed credentials

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To ensure that participants are fully prepared with the full complement of essential skills to be successful, the program will include a Manufacturing Boot Camp to introduce key concepts in the industry and a Poised for Success course that includes a review of the soft skills needed for a 21st century workforce.

Opportunity for Innovation at CCRI

CCRI's new APAM model serves as a replicable model for creating a pathway of stackable and latticed credentials that earn credit toward certificates and associate and baccalaureate degrees. The project's educational design pays particular attention to adult learners whose busy lives require learning opportunities that are responsive to their needs. Student support services embedded in the APAM model offer more efficient pathways for adults to fill in skills gaps in their learning profile, to engage in more experiential and flexible learning modalities, and to benefit from an integrated statewide model that more effectively links education, training and the workplace, while efficiently addressing participants' identified barriers to program completion.

The APAM program is an equal opportunity employer/program offering auxiliary aids and services that are available upon request to individuals with disabilities.

FOR FURTHER INFORMATION ABOUT THE GRANT. CONTACT:

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Engineering and Technology Department

Associate in Science degree in Advanced Manufacturing Technology (ETMA)

Advanced Manufacturing Technology programs at the Community College of Rhode Island

Modern advanced manufacturing has been revolutionized by the use of computers for design, machining and automation. Today, the design of almost all products and components is accomplished with the use of computer-aided design (CAD) and computer-aided manufacturing programs (CAM). Computer numerical control (CNC) machining is at the heart of advanced manufacturing and the accurate and efficient production of complex components. Advanced manufacturing also uses computers to control the supply of materials and the inspection, quality assurance and distribution of finished products.

The Advanced Manufacturing program at the Community College of Rhode Island builds upon our certificate programs in Introduction to CNC Manufacturing and CNC Manufacturing and 3-D Modeling. The new advanced manufacturing degree and certificate programs cover areas of science and mathematics and their applications to machining practices, CNC programming, and places emphasis on both theoretical and practical phases of the design, cost, quality and production of machined parts. This program is designed to provide students with extensive hands-on laboratory experience while addressing three possible advanced manufacturing tracks: manufacturing design and rapid prototyping, advanced machining skills, and automation and quality.

Associate in Science degree in Advanced Manufacturing (ETMA)

The Associate in Science degree in Advanced Manufacturing at the Community College of Rhode Island can be approached from three possible certificates in manufacturing – design and rapid prototyping (ETMD), advanced manufacturing machinery (ETMM) and manufacturing automation and quality (ETMQ) – or directly as a degree path. Prerequisite courses in math and English may be necessary for students pursuing the degree path, who have not placed into required courses. Full-time students can expect to complete this program in five semesters. *See degree requirements on reverse.*

Contact information

For more information about the EMTA degree program, visit www.ccri.edu/engt or contact:

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Associate in Science degree in Advanced Manufacturing Technology (ETMA)

ASSOCIATE IN SCIENCE DEGREE SUMMARY (ETMA)	COURSE CODE	CREDITS	LECTURE	LAB
General education		22	22	5
Required courses and internship		31	17	165
Elective courses (average hours)		12–26	4–8	8–14
Associate in Science degree totals		65	53	194

GENERAL EDUCATION COURSES

	COURSE CODE	CREDITS	LECTURE	LAB
Composition I	ENGL 1010	3	3	
Applied Technical Mathematics I	MATH 1750	3	4	
Applied Technical Mathematics II	MATH 1760	3	4	
Physics for Technology I	PHYS 1050	4	3	3
Introduction to Renewable Energy	PHYS 1070	3	2	2
Psychology in the Workplace	PSYC 1050	3	3	
Oral Communication I	COMM 1100	3	3	
General education totals		22	22	5

ASSOCIATE IN SCIENCE DEGREE REQUIRED COURSES

	COURSE CODE	CREDITS	LECTURE	LAB
Engineering Graphics	ENGR 1030	3	2	3
Introduction to Manufacturing Processes	ETME 1020	3	1	4
Blueprint Reading and the Machinery's Handbook	ETCN 1100	3	2	2
Precision Measurement and Geometric Dimensioning and Tolerance	ETCN 1200	3	2	2
CNC Machining I	ETCN 1300	3	1	4
Advanced Solid Modeling	ENGT 2090	3	2	2
Introduction to Digital Systems (PLCs)	ETEE 1800	3	2	2
Introduction to Robotics and Control	ETME 1010	3	2	2
Lean Manufacturing	ETCN 2250	2	1	2
OSHA-10 and Industry Seminars	ETCN 2400	1	0	2
Computer Numerical Control (CNC) Practicum/Capstone†	ETCN 2500	4	2	140
Associate in Science degree totals		31	17	165

ELECTIVES – 12 credits minimum

	COURSE CODE	CREDITS	LECTURE	LAB
Introduction to AutoCAD	ENGT 1060	2	1	2
Mechanical Industrial Design	ETCN 1000	3	2	2
3-D Modeling and Prototyping	ETCN 2300	3	2	2
Advanced Machining Skills	ETCN 2000	3	2	3
Computer-Aided Manufacturing (MasterCam)	ETCN 2100	3	1	4
CNC Machining II	ETCN 2200	3	1	4
Automated Machining Technology	ETCN 2350	3	1	3
Automation Systems	ETME 2310	3	2	2
Manufacturing Quality Control	ETCN 2360	3	2	2
Available elective totals (depending on elective choices)		12–26	4–8	8–14

†Practicum/Capstone course requires a 40-hour internship.

Engineering and Technology Department

Certificate programs in Advanced Manufacturing Technology

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The certificate can be completed part time in one year and full time in a summer session and one semester. All credits can be applied to the Associate in Science Degree in Advanced Manufacturing Technology. *See certificate requirements on reverse.*

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While developing CNC-related skills and knowledge, the certificate will maximize the skills advocated by a manufacturing advisory board. It can be completed part time in one year and full time in a summer session and one semester. All credits can be applied to the Associate in Science Degree in Advanced Manufacturing Technology. *See certificate requirements on reverse.*

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Contact information

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Program Courses

Course No.	Course Title	Credits
ENGR 1030	Engineering Graphics	3
ETME 1020	Introduction to Manufacturing Process	3
ETCN 1100	Blueprint Reading and the Machinery's Handbook	3
ETCN 1200	Precision Measurement and Geometric Dimensioning and Tolerance	3
ENGT 2090	Advanced Solid Modeling	3
ETCN 1300	CNC Machining I	3
TOTAL CREDITS		**18**

RECOMMENDED COURSE SEQUENCE:

(accelerated version)

Summer semester: ENGR 1030; ENGT 2090
Fall semester: ETME 1020; 1100, 1200; ETCN 1300

– The certificate can be completed in a summer and fall semester or in a summer, fall and spring semester.

– Currently, the certificate courses are offered only in the evening.

– The accelerated summer-fall version will require attending classes four nights a week. Certificate completion prepares students to enroll in a second, more advanced CNC centered certificate – CNC Manufacturing and 3D-Modeling (ETCA).

– The combination of the two certificates, ETCI and ETCA, can be applied toward the Engineering Systems Technology A.S. degree.

ETCI CIP Code and Job Title:
48.0501   Machine Tool Technology/Machinist
48.0503   Machine Shop Technology/Assistant

Gainful employment information for certificate programs can be found at **www.ccri.edu/acadaffairs/gainful-employment.**

For more information, visit
www.ccri.edu/engt/certificate.html
or contact:

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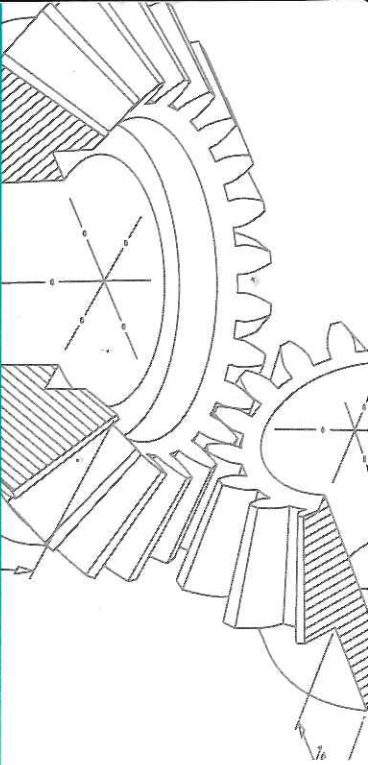manufacturing@ccri.edu

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Introduction to CNC Manufacturing

Certificate Program (ETCI)

COMMUNITY COLLEGE OF RHODE ISLAND

COMMUNITY COLLEGE OF RHODE ISLAND

Introduction to CNC Manufacturing (ETCI) Certificate Program

Companies are integrating computers into engineering and manufacturing environments at a rapid pace. At the heart of advanced manufacturing is CNC machining and the computer applications that support the design and manufacturing process. This program builds the basic skills and knowledge for employment opportunities in the CNC manufacturing environment.

Course Descriptions

ENGR 1030 - Engineering Graphics (3 credits)
This course is a study of the theory of orthographic projection and the principles of descriptive geometry. It develops the abilities to construction exact drawings of three-dimensional objects including auxiliary views, cross-sections, dimensioning, pictorial drawings and free-hand sketching. This course utilizes, and is an introduction to, SolidWorks design software. *Lecture: 2 hours, Lab: 3 hours*

ENGT 2090 - Advanced Solid Modeling (3 credits)
This course enables students to work with advanced designs and assemblies. This includes mold design, sheet metal design, weldments and industry-specific design tools. Students learn to use COSMOSWorks to study deflections and load stress on their designs. Other applications would include rendering in PhotoWorks and animation techniques. *(Prerequisite: ENGR 1030) Lecture: 2 hours, Lab: 2 hours*

ETCN 1100 - Blueprint Reading and the Machinery's Handbook (3 credits)
This course uses two resources to teach the student how to interpret the language of industrial blueprints. Using the Machinery's Handbook, the student will learn how to find required information regarding machining processes such as speeds, feeds and cutting tool applications. *Lecture: 2 hours, Lab: 2 hours*

ETCN 1200 - Precision Measurement and Geometric Dimensioning and Tolerance (3 credits)
This course is designed to develop the student's ability to interpret Geometric Dimensioning and Tolerance (GD&T) language and accurately and precisely measure manufactured parts and assemblies. The student will use micrometers, digital calipers, dial indicators, sine bars and other measuring accessories. *Lecture: 1 hour, Lab: 4 hours*

ETME 1020 - Introduction to Manufacturing Processes (3 credits)
This course provides the student with practical experiences in the setup and operation of the basic conventional machine tools including lathes, milling machine surface grinders, power band saws and the drill press. Students will use measuring tools, blueprints and operation sheets to fabricate mechanical components. *Lecture: 1 hour, Lab: 4 hours*

ETCN 1300 - CNC Machining I (3 credits)
This course introduces the student to CNC programming using flow chart process operation sheets. Fundamental part programming using word address G and M code will be written. The students also will use CNC simulation software to create part programs for 3-axis milling machines and 2-axis turning operations. *(Prerequisite: ENGR 1030) Lecture: 1 hour, Lab: 4 hours*

Program Courses

Course No.	Course Title	Credits
ETEE 1800	Introduction to Digital Systems	3
ETCN 2300	3D-Modeling and Prototyping (Direct Digital Manufacturing)	3
ETCN 2100	Computer Aided Manufacturing (MasterCam)	3
ETCN 2200	CNC Machining II	3
ETCN 2500	Computer Numerical Control (CNC) Practicum/Capstone	4
TOTAL CREDITS		**16**

RECOMMENDED COURSE SEQUENCE:
(accelerated version)
Spring semester: ETCN 2100, ETCN 2200, ETCN 2300, ETEE 1800, ETCN 2500

— The certificate can be completed in one spring semester or two fall and spring semesters.

— Currently, the certificate courses are offered only in the evening.

— The accelerated one-spring semester version will require attending classes four nights a week.

— The combination of the two certificates, ETCI and ETCA can be applied to the Engineering Systems Technology A.S. degree without a loss of credit.

ETCA CIP Code and Job Title:

48.0510	Computer Numerically Controlled (CNC) Machinist Technology/CNC Machinist
15.0613	Manufacturing Engineering Technology/Technician
15.0406	Automation Engineer Technology/Technician

Gainful employment information for certificate programs can be found at **www.ccri.edu/acadaffairs/gainful-employment.**

For more information, visit www.ccri.edu/engt/certificate.html or contact:

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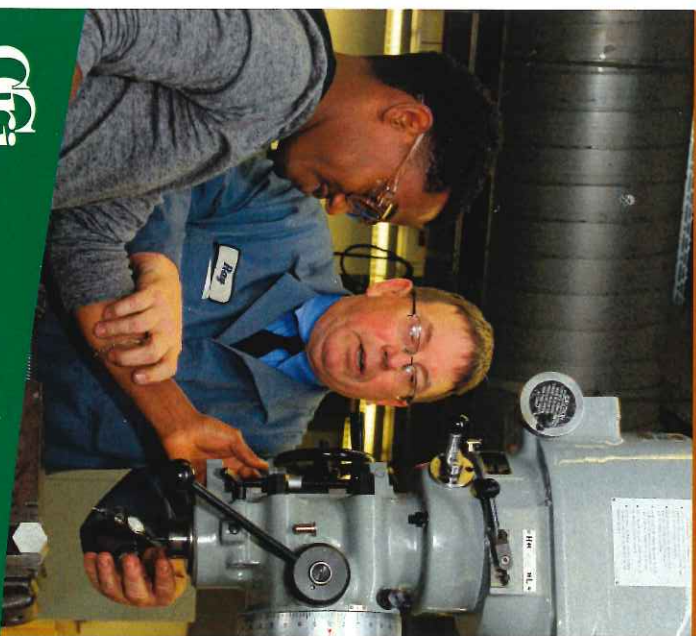Warwick, RI 02886
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CNC Manufacturing and 3D-Modeling
Certificate Program (ET CA)

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CNC Manufacturing and 3D-Modeling (ETCA) Certificate Program

Today modern manufacturing depends upon the use of computers, robots, CNC and 3D-printing technology, and digital technology and PLCs. This program builds on the basic skills and knowledge developed in the Introduction to CNC Manufacturing certificate (ETCI).

The certificate will prepare students for careers in the industry by enabling them to:

- Develop CNC programming skills.
- Learn the concepts of rapid prototyping, and digital direct manufacturing.
- Use 3D-laser scanning and 3D-printing.
- Gain working knowledge of 3D-modeling with SolidWorks, tool control with G and M codes and MasterCam.
- Develop a basic understanding of digital systems and the programming of PLCs.
- Acquire hands-on experience through an industry practicum or internship.
- Earn credits toward an associate degree (ETST).

NOTE: To enroll in this certificate program, students must have successfully completed the Introduction to CNC Manufacturing certificate (ETCI).

Course Descriptions

ETEE 1800 - Introduction to Digital Systems (3 credits)

This course provides the student with a basic understanding of digital systems through the use of programmable logic controllers. The student will explore fundamental properties of digital logic controllers, digital control components and systems. Students also will analyze and develop basic control systems solutions, using logic controller simulation software to configure and test systems, using logic controller simulation software to configure and test systems. (Prerequisite: MATH 0600) Lecture: 2 hours, Lab: 2 hours

ETCN 2100 - Computer Aided Manufacturing (MasterCam) (3 credits)

In this course, students will use MasterCam to draw and create tool paths for CNC machining operations for the lathe and milling machines. Students will import CAD files from SolidWorks and AutoCAD and create CAM files from existing drawing files. (Prerequisite: ETCN 1300) Lecture: 1 hour, Lab: 4 hours

ETCN 2200 - CNC Machining II (3 credits)

This course is a continuation of ETCN 1300. It expands the use of the CNC machining simulation software and MasterCam software. Complex shapes, detailed part features, setup procedures and machining processes will be studied. The students will use their part-programs to machine the parts in the lab using the appropriate CNC machine tools. (Prerequisite: ETCN 1300) Lecture: 1 hour, Lab: 4 hours

ETCN 2300 - 3D-Modeling and Prototyping (Direct Digital Manufacturing) (3 credits)

This course studies the types of Additive Fabrication (3D- printing). Topics include types of materials, binders and sub-binders used in the AF process. The types of machines, their constraints and applications also will be studied. Students will use SolidWorks and MasterCam files to create 3D-geometry. The student will gain experience with the entire rapid prototyping process and the use of industrial grade 3D- printers and then will use the Dimension SST-1200 machine to produce the part. (Prerequisite: ENGR 1030) Lecture: 2 hours, Lab: 2 hours

ETCN 2500 - Computer Numerical Control (CNC) Practicum/Capstone (4 credits)

This course gives students an opportunity to apply knowledge and skills learned in the CNC certificate program in an industrial setting. Students spend 140 hours in a manufacturing environment setting up and operating CNC machine tools under the guidance of full-time employees. This class also has a two-hour meeting requirement that is used to develop a portfolio outlining the types of working experiences acquired in the practicum. Students keep a working journal during the semester that will be used to assist in building their portfolio to chronicle their experience in order to address any problems or concerns that may arise. The Engineering Department provides assistance in matching students in practicum settings. (Prerequisite: Completion of ETCI - Introduction to CNC Manufacturing Certificate; Corequisites: ETCN 2100 and ETCN 2200) Lecture: 2 hours, Practicum: 140 hours