Grant Title: **Accelerated Pathways in Advanced Manufacturing (APAM)**
Author: **Community College of Rhode Island**
Link: http://www.ccri.edu/

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DOL Disclaimer Statement:

COURSE PROPOSAL APPROVAL TRACKING FORM

Name of Proposal: Advanced Machining Skills

SIGNATURES REQUIRED PRIOR TO SUBMISSION

Academic Department

Proposal Originator(s): _____ _____
Signature **Date**

_____ _____
Signature **Date**

Department Vote for Approval: **# Yes** 10 **# No** ____ **# Not Voting** ____
(Department members voting "no" may submit a separate report)

Department Chair: _____ _____
Signature **Date**

Academic Dean: _____ _____
Signature **Date**

Note: ***All sections of this form must be completed and submitted with all required attachments to the Chair of the Curriculum Committee according to published distribution schedule. Should you have any questions, call the Office of the Dean of Business, Science and Technology, 825-2147.***

CURRICULUM REVIEW COMMITTEE MEETING FOLLOW UP

Meeting Date: _____ **Committee Vote:** **# Yes** 10 **# No** ☐ **# Abstentions** ☐

Curriculum Committee Chair: _____ _____
Signature **Date**

☐ **Forward to VPAA and President** ☐ **Return to Department**

V.P. for Academic Affairs: _____ _____
Signature **Date**

READY FOR IMPLEMENTATION

President: _____ _____
Signature **Date**

File: Office of Vice President for Academic Affairs

Community College of Rhode Island

Course Proposal:

x	**New Course**
	Revised Course

Please attach a course syllabus with course topics, textbook titles and evaluation methods.

Date Submitted: **11 / 2 / 12**

DEPARTMENT: **Engineering and Technology Ed Hanrahan**

DEVELOPED BY: **Ed Hanrahan**

COURSE TITLE: Advanced Machining Skills

COURSE NUMBER: **ETCN-2000**

CREDITS: 3

CONTACT HOURS PER WEEK					
Lecture hours:	2	**Lab hours:**	3	**Other:** (Clinical hrs., Practicum, etc.)	

ACTUAL COURSE MEETING TIME -- HOURS / MINUTES PER WEEK					
Lecture hours / minutes:		**Lab hours / minutes:**		**Other:** (Clinical hrs., Practicum, etc.)	

Please circle: **this is a 1st year course** **this is a 2nd year course**

If this course will be required in a specific academic program(s), indicate below:

Introduction to CNC Manufacturing (ETCI) Certificate

If this course will replace another course in a specific academic program, indicate below:

No

If this course ran on an experimental basis, indicate the course number: _____

Rationale:

An advanced machining course was one of several recommendations made by the Rhode Island Manufacturing Association (RIMA), the state of Rhode Island apprenticeship training board and the Manufacturing Advisory Board that was convened at RIMA assistances. The manufacturing owners, managers and other company's representatives that made up the board, insist that a state approved precision metal working apprenticeship training program is needed. This course will provide students the learning experiences using advanced machine tools and procedures. These companies believe that employees who have the benefit of a formalized apprenticeship program and the related class work at the Community College will be more productive and better employee for the long-term success of Rhode Island precision metal working manufacturing companies.

CATALOG DESCRIPTION (include old and new):

OLD:

NEW:

This course is to design to expose the manufacturing technology certificate and degree students with a broad exposure to as many different computer-controlled machining processes, machine tool set up, and the methods and machining operations as possible. This course will introduce additional machining processes and enhance the technical skills and theories learned in all the other manufacturing certificate courses. The students will acquire the fundamental knowledge and the technical skills needed to become technically proficient. Machining processes include electrical discharge machining, plasma cutting and computer-controlled welding.

PREREQUISITE: ETME-1020, ETCN-1100, ETCN-1200, ETCN-1300, ETCN-2100, ETCN-2200, ENGR-1030

List course number, title and reading level

CO-REQUISITE:

List course number, title and reading level

TRANSFERABILITY: Is this course intended for transfer to the following institutions:

☐ RIC ☐ URI ☐ Other, please specify May flow into CCRI's ETMA Degree.

How does the course align with existing transfer agreements? Please list the specific course(s) at sister institution this proposed course will match.

N/A

<u>Student Learning Outcomes/Educated Person</u>:

The learning outcomes of specific courses foster multiple perspectives which contribute to the acquisition of desired graduate outcomes as well as to inform and deliver discipline related content.

✓ ***On the next page entitled "Student Learning Outcomes"***

- **Please delineate the major learning outcomes for the proposed course. Each learning outcome should be written in a format that follows the statement "as a result of this course, a student will be able to:"**
- **Indicate what techniques/methods will be used to achieve these student learning outcomes?**
- **List how will the student learning outcomes be assessed?**

Community College of Rhode Island

Student Learning Outcomes

Course Title: Advanced Machining Skills

The learning outcomes of specific courses are to foster multiple perspectives that contribute to the acquisition of desired graduate outcomes as well as to inform and deliver discipline related content.

Please delineate below the major learning outcomes for the proposed course. Learning Outcomes should be written in a format that follows the statement: "as a result of this course, a student will be able to…"

Item #	STUDENT LEARNING OUTCOMES	TECHNIQUES/METHODS USED TO ACHIEVE OUTCOMES	TYPE(S) OF ASSESSMENT USED TO DETERMINE THE DEGREE TO WHICH THE OUTCOMES ARE ACHIEVED
1	As a result of this course the student will design and , produces a set of ANSI compliant part drawing files that will be used to manufacture the designed part or assembly	Lab and Class lectures and demonstrations, SolidWorks CAD software, project exercises machinery's handbook and the World Wide Web support material	comparing completed drawing files against ANSI standards
2	As a result of this class the student will be able to safely set up and operate an Electrical Discharge Machine tool (EDM) machining	Lab and Class lectures, lab demonstrations, specifically designed lab exercises machine tool manufacturers operational manual. and the World Wide Web support material	comparing the measurements results of the parts produced to designed lab exercises measurements
3	As a result of this class the student will be able to safely set up and operate a plasma cutter.	Lab and Class lecture, lab demonstrations, specifically designed lab exercises machine tool manufacturers' operational manual. and the World Wide Web support material	comparing the measurements results of the parts produced to designed lab exercises measurements
4	As a result of this class the student will be able to safely set up and operate a computer controlled welder	Lab and Class lecture, lab demonstrations, specifically designed lab exercises machine tool manufacturers' operational manual. and the World Wide Web support material	comparing the measurements results of the parts produced to designed lab exercises measurements
5	As a result of this course the student will develop additional set up procedures and machining skills used on the vertical CNC milling machine	Lab and Class lecture, lab demonstrations, specifically designed lab exercises machine tool manufacturers' operational manual. and the World Wide Web support material	comparing the measurements results of the parts produced to designed lab exercises measurements
6	As a result of this course the student will be able develop additional set up procedures in machining skills used on a CNC lathe	Lab and Class lecture, lab demonstrations, specifically designed lab exercises machine tool manufacturers' operational manual. and the World Wide Web support material	comparing the measurements results of the parts produced to designed lab exercises measurements

CCRI Definition of an Educated Person: Four Abilities

The Community College of Rhode Island recognizes four critical areas that define the learning outcomes of a CCRI graduate. These four abilities can be applied in many contexts and are critical skills that must be developed not only at CCRI, but over the course of a lifetime. These core abilities guide students, faculty and staff in establishing educational goals and assessing learning within and across the primary domains of knowledge: arts and humanities, science and mathematics, and the social sciences.

Since individual courses provide the opportunity to gain knowledge in these four critical areas, it is essential to understand which areas are to be covered in each course. In each of the four areas below, please indicate in the Item(s) # box next to each critical element, the Item #(s) from the previous page (Student Learning Outcomes) which supports the Educated Person Ability that is covered.

	Item(s) #
1. Effective Communication	
a. Use standard English grammar and mechanics	
b. Create work that addresses a given purpose and context and responds to the target audience	**1,2,3,4,5, 6**
c. Present a central idea, supported by concrete, relevant details	**1**
d. Establish a clear and consistent sequence of ideas	**1,2,3,4,5, 6**
2. Critical Thinking	
a. Identify and analyze complex ideas	**1**
b. Determine a research focus and the nature and scope of information needed	
c. Locate, evaluate, and use information effectively	**1,2,3,4,5, 6 ,**
d. Draw logical conclusions from information	**1,2,3,4,5, 6**
e. Express well-reasoned or innovative perspectives	
3. Quantitative, Mathematical and Scientific Reasoning	
a. Demonstrate an understanding of mathematical, quantitative or scientific principles.	**1,2,3,4,5, 6**
b. Apply a scientific approach in asking questions	**x1,2,3,4, 5 , 6**
Apply mathematical, quantitative, or scientific principles in solving problems	**x1,2,3,4, 5 , 6**
d. Interpret numeric information in graphical forms	**1,2,3,4,5, 6**
4. Social Interaction	
a. Evaluate ethical dimensions of decisions	
b. Use teamwork to accomplish tasks in groups	**1,2,3,4,5, 6**
c. Demonstrate an understanding of global, cultural and historical perspectives.	

Note: With respect to the four abilities listed above, the level of attainment achieved should reflect the needs of the specific program. **It is not necessary that individual courses address each outcome, yet, in total, all courses required by a program of study must together meet these goals.**

ADMINISTRATIVE PLANNING

Indicate the campus(es) where the course will be offered: **Knight** X **Flanagan** ____ **Liston** ____ **Newport** ____

Indicate: **Days** X **Evenings** X **TV** ____ **Internet** ____ **Satellites** ____ **Specify:** _____

Indicate semester(s) the course will be offered: **Fall** ____ **Spring** ____ **Summer** ____

Indicate the course scheduling format: **15 weeks** X **5 week module** ____ **Other** _____

Requested start date: 08 / 30 / 2016

FINANCIAL:

Will this course necessitate purchasing new capital equipment? **Yes** [ ] **No** [x]

If yes, type and source of funding for purchase:

Specify amount and type of additional operating funds required to support this course, including any software:

$2000 per semester

Will students be required to use a lab as part of the course? **Yes** [x] **No** [ ]

If yes, specify lab characteristics and lab preference (e.g., public computer lab, electronic classrooms, specific science lab, etc.):

this course can only be delivered in the Integrated Manufacturing Lab located in room 0100 at the Knight Campus

Will course require a lab fee? **Yes** [x] **No** [ ]

Explain the reasons for requesting a lab fee. List specific items requiring replacement each semester/year.

Without lab fees, the Department of Engineering and Technology will be unable to support the equipment listed.

ADMINISTRATIVE PLANNING continued:

Do current full-time or adjunct faculty possess requisite education/experience? Specify additional/unique training that may be required.

There will be time required for faculty and company representatives to meet and receive training on this new technology.

Will additional staff hiring be required to implement this course proposal? **Yes** [x] **No** [ ]

If yes, specify requirements/skills:

As the Department of Engineering and Technology acquires more sophisticated machine tools and accessories, additional total product maintenance will be required.

What *additional* books, periodicals, data bases or other resources are needed in the Library to support the course?

The newest edition of the Machinery's Handbook (Industrial Press)

If another department(s) will be impacted by this course offering, indicate the department(s) involved, the potential impact, and the principals involved in these discussions.

N/A

Engineering & Technology Department
Advanced Machining Skills
ETCN-2000
Class Syllabus
INSTRUCTOR: Ed Hanrahan

Email ehanrahan@ccri.edu - Only your CCRI.edu e-mail account will be used for this class. Black board will be used extensively during this semester. It is your responsibility to check blackboard for class assignments and related work.

*All e-mails **must include:** ETCN-2000 and the section number of this class on the subject line of the e-mail. Do not e-mail me lab assignments unless otherwise directed)*

Required Class Materials flash drive, a scientific calculator with sine cosine and tangent functions and access to the Internet.

TEXTBOOK: Machinery's Handbook

Office Hour: TBA

Cell Phone and other electronic devices: see the Department Of Engineering And Technology's website regarding cell phone policies. The policy in this class will be all cell phones and other electronic devices must be turned off and put away for the entire class. Photographing video or audio recording and/or distribution of this material is prohibited. If you fail to adhere to this policy you will be asked to leave the class.

Computer Policy: see the Department of Engineering And Technology's website regarding the use of the class computers. The policy in this class will be Web surfing , social networking or any non-academic work will not be permitted during the scheduled class time Any student abusing this class policy will be asked to leave for the remainder of that class, (big brother is watching)

- **OBJECTIVE:** This course is designed to develop advanced machining skills for those students enrolled in the manufacturing technology certificates, degree program or involved with a precision metal apprenticeship program. Using computer numerically controlled (CNC) machine tools each student will be required to produce specifically designed lab projects and design, manufacture and measure an approved individual lab project. Machining processes, machine tool set up, and methods will be studied and practiced. Students will design a project using computer aided design software (CAD). Produce drawing files' using ANSI standards. Those drawing files will then be used to produce the class project. Machining operations including EDM, plasma cutting and CNC welding are processes available. In addition CNC machining operations requiring both the use of computer aided Manufacturing (CAM) programs, and conversational programming will be required. This course is intended to enhance the theories and technical machining and measuring skills and learned in the other manufacturing courses.
- **Class Structure:** This 2-hour lecture and 3-hour lab format. The lecture is used to demonstrate theories of, CNC machine tool setup and operations. Measuring tools and techniques required in the inspection of lab projects will be demonstrated. The lecture will also be used to discuss the sequence of events and scheduling machine availability for the individual lab projects. Time will also be used to discuss difficulties with Lab projects, ANSI standards.

Lab safety
All students must conform to the dress code required. (See dress code PDF file on blackboard)
As in any manufacturing environment **safety is a prime concern**. There for any deviation from safe practices will be dealt with immediately and severely. See safety guidelines PDF file on blackboard.

GRADING: 25% there will designated lab projects required. These projects will include EDM machining, plasma cutting, CNC welding, turning and milling. These projects will be graded on a percentage value.

15% all completed projects must be accompanied with the assigned inspection sheet. Labs will not be considered complete without the inspection sheet. All CAM programs must be submitted with the projects listed above. A CAD drawing using ANSI standards must be submitted with the completed project for each detail including the assembly view.

50% of grade the class grade is: the individual manufacturing project As you can see project is a large percent of your finial grade. Each student will be responsible for defined tasks listed below.

10% Individual student rubric

Project Requirements

Objective: This project is intended, to provide an opportunity for the Manufacturing Technology, Engineering Technology, Mechanical Engineering and the Mechanical Engineering Technology student to employ all of the skills, experiences and knowledge gained throughout certificate courses taken.
Project Outline: The student will be solely responsible for the selection, design, manufacturing, cam, CAD programs and inspection of the final project. All projects will be evaluated on the number of machining operations, machine tools that are used in building the project, the complexity of the project, the number of components that are needed to build the project / unit, the types / kinds of measuring tools used to evaluate the project and an inspection sheet.
The student will not be able to proceed through the sequences of steps listed below until the previous phase has been completed, and evaluated by me. Scheduling dates will be set, during the lecture.

The sequence for the final project are as follows
Set Dead Lines: Each student will be responsible for the completion of the total project. Therefore, it is critical that project, complexity be clearly defined regarding time machine tool availability and skill. (Start dates, end dates, part assignments-machining assignments, drawing assignments, inspection assignments)

Select a Project: This can be a modification of an existing tool or component found in the Integrated Manufacturing Lab (IML), or something brand new, or a modification of something from home. All projects must be approved, by me before any work can start, all machining must be in the IML.

Sketched Ideas: This will include the number of details for total projects that will be produced. the type of material being used, the stock size ,types of fasteners used and all other pertinent information regarding the project.

Working Blueprints: The American National Standards Institute (ANSI) format. *Draw with cad Program*
Each part drawing will use or have

- Orthographic projection (third angle projection)
- The parts finish sizes (decimal, fractions)
- Tolerance (limits, General and Local, Form, Bilateral,)
- Surface finish requirements (General and Local)
- Kinds and stock sizes of material needed
- Heat Treat requirements (small amounts of Oil Hardened /O1 steels only)
- Drawing Notes, general and local
- Drawing Change System (if necessary)

Building the Project: All of the components and details of the project must be made using the machine tools and other related equipment that are available **in this lab only**. Each student will be responsibly for the project.

Methods / Process Sheets: A methods sheet will be included for each of the details that are manufactured.

- a sequence of machining operations
- a list of machine tools
- a list of all cutting tools
- RPMs for all machining operations.

A Final Inspection Sheet. Included will be all part dimension and part tolerances, the sheet format will be left up to you .The sheet must included a;

- list of all measuring tools used
- the project name
- the names that are doing the final inspection project completion date
- All part dimensions & tolerances listed on the part print
- **(NO DIAL CALIPERS ALLOWED FOR FINAL INSPECTION)**

GRADING: Each phase of the final project will be evaluated, as the project progresses through the steps listed above. As stated above, **NO** one or team will be permitted to continue from one phase to the next, until the previous portion as been completed, or the student has spoken to me and as received permission to do so.

Due Dates:

Review project ideas

Sketched ideas

Process / Methods Sheets Due

CAD drawings

Cam Files

Inspection Sheet Final draft Due

Project Due

Course outcomes

- As a result of this course the student will design and, produces a set of ANSI compliant part drawing files that will be used to manufacture the designed part or assembly
- As a result of this class the student will be able to safely set up and operate an Electrical Discharge Machine tool (EDM) machining
- As a result of this class the student will be able to safely set up and operate a plasma cutter.
- As a result of this class the student will be able to safely set up and operate a computer controlled welder
- As a result of this course the student will develop additional set up procedures and machining skills used on the vertical CNC milling machine
- As a result of this course the student will be able develop additional set up procedures in machining skills used on a CNC lathe