

**Docket Item:**

Community College Approval: Columbia Gorge Community College, Associate of Applied Science in Advanced Manufacturing and Fabrication within 48.0511 Metal Fabricator.

**Summary:**

Columbia Gorge Community College proposes a new Associate of Applied Science in Advanced Manufacturing and Fabrication. Higher Education Coordinating Commission (HECC) staff completed a review of the proposed program. After analysis, HECC staff recommends approval of the degree as proposed.

**Staff Recommendation:**

The HECC recommends the adoption of the following resolution:  
RESOLVED, that the Higher Education Coordinating Commission approve the following degree: AAS in Advanced Manufacturing and Fabrication.



**Columbia Gorge Community College seeks the Oregon Higher Education Coordinating Commission's approval to offer an instructional program leading to an Associate of Applied Science in Advanced Manufacturing and Fabrication.**

### **Program Summary**

By adding in additional skills and learning, reflective of manufacturing using metals in the Columbia Gorge region, this manufacturing AAS seeks to build on the current one-year certificate coursework. Students in this program learn a broad range of skills including the operation of welders, welding common joints to AWS standards, and operating many tools used in modern manufacturing shops, including Computer Numerical Control (CNC) equipment. Students learn practical fabrication of product and quality control along with fitment and fixturing to reproduce product for sale. The second year of courses expands the processes in to reductive CNC machining and the necessary Computer Aided Design (CAD) work to generate product and parts. The curriculum includes integrated math and science concepts that foster critical thinking and problem solving in the manufacturing environment and prepares students for the ever-changing workplace of the modern world. The program addresses manufacturing as a broad spectrum of careers and breaks down the traditional siloed model of training so that future employees have a wide range of employable skills that meet the needs of employers in the local area. Career paths for graduates may include: high tech manufacturing, welding, industrial fabrication, entry level CNC machining, assemblers, fitters, grinders, pipe fitters and parts refinishing.

Learner outcomes:

Students who successfully complete this degree will be able to:

1. Produce welds to AWS standard in fillet and grooves using GMAW, SMAW and GTAW processes
2. Demonstrate knowledge of basic CNC operations and G Code
3. Generate product designs and blueprints using CAD software
4. Manufacture multi-part assembly products from problem solving process, to design and reality including at quantity production run.
5. Apply basic metallurgical concepts and basic materials science as they pertain to metals, creating better production results in manufacturing processes.
6. Demonstrate knowledge of necessary mathematical concepts as they apply to manufacturing.
7. Use critical thinking and problem-solving skills to create more efficient systems of manufacturing.

Career opportunities for students as a result of this education:

Students completing the Advanced Manufacturing and Fabrication AAS can go in a variety of directions with their training, including, but not limited to: metal fabricators and assemblers; cutting, punching and press machine operators; lathe and turning machine operators; welders, cutters, solderers and brazers; grinding and polishing workers; computer-controlled tool operators and programmers.

Alignment and articulation of these knowledge and skills with secondary and other post-secondary educational opportunities:

For the last five years, CGCC has aligned and articulated with The Dalles High School's welding program and Hood River Valley High School's metals program. Students are also concurrently enrolled in articulated classes with Riverbend Community School. The same 16 credit Manufacturing certificate offered at CGCC was available for dual credit at the high schools. New articulations are in process this year with Dufur High School and Arlington High School. In the future articulations are planned at additional regional high schools. Now, as CGCC grows their program to more advanced learning and training, the college will continue to work with the high schools to articulate the foundational skills and allow high school students to earn dual credits that will transfer to CGCC's program.

How the program "fits" within a career pathway design:

Students completing the 43 credit Advanced Manufacturing Certificate at CGCC now have the opportunity to complete a full two-year AAS degree in Advanced Manufacturing and Fabrication with the addition of this second year of classes. All courses in the one-year certificate apply to the AAS degree. The degree adds new skills and processes focusing on higher-technology applications in the Manufacturing spectrum.

1. ***Describe the need for this program by providing clear evidence.***

The Manufacturing AAS will train students for employment in the welding, fabrication, design and basic CNC machining fields using a production manufacturing environment. Career opportunities include repair welding, production welding, cutting parts, blueprint reading and fitting, tacking, fabrication, polishing and operation of CNC equipment.

In Oregon, welders, solderers and brazers work in many types of industries but a majority are concentrated in manufacturing. While there are many areas of metals-based manufacturing in Oregon, this program prepares students for employment in structural metal fabrication, specifically assembly and fabrication; grinding, lapping, polishing and buffing machine tenders and operators; lathe and turning machine tool setters; hand grinding and polishing workers; and computer numerically controlled tool operators sub categories. In the Gorge most of these jobs fall under welders, cutters, solderers, and brazers, a sector employing 5,120 people in 2019. In the next 10 years, growth in this industry is expected to be 12.4% statewide and 7% in the Columbia Gorge, including replacement employment. Compared to nationwide growth of 3%, this growth is faster locally and statewide, as

well as faster than average of all occupations indexed. Nationwide, 438,900 people are employed as welders, cutters, solderers and brazers.

The expected employment gap including replacement is estimated at 2,001 statewide, 1,342 for assemblers and fitters and 659 for welders, solderers and brazers. Locally, annual openings are estimated at 25; 18 assemblers and fitters and 7 welders, solderers and brazers.

Because these skills are in demand in a wide array of occupations, it is difficult to capture in a discrete data set the different job descriptions that students may be able fill after completing this program. Since the AAS offers broad scale training to prepare students for entry into the work force, instead of the narrower, more specific training that many programs focus on, it can be expected that the above numbers would be minimums. The numbers above also do not capture the computer-based skill sets and hybrid machining skill sets that are included in the AAS, or the basic 3 dimensional computer aided design aspects.

Using a broader set of data from the Bureau of Labor Statistics, wage outcomes are anticipated to be from \$34,000 to \$62,000 for production-based occupations under code 51. Using the specific data outcomes listed above, wage outcomes can be expected to be somewhere between \$36,000 and \$52,000 in the Columbia River Gorge, slightly higher than the statewide expected wage outcomes of \$37,000 to \$49,000.

This program seeks to meet the needs of employers seeking a more well-rounded employee, both locally and throughout the broader central Oregon region. Many employers have expressed an interest in hiring workers with basic science and math knowledge as well as skills in fitment and modern technology, an employee to whom the employer would be willing to provide additional training to fine tune the skillset to the specifics of the individual production facility. While the new AAS does expand on some welding skills, it is not primarily focused on them like many of the other programs in the region. Its outcomes offer a unique combination of traditional welding, manufacturing and even many elements of machining programs. By including this broad range of skills, the Advanced Manufacturing and Fabrication AAS gives a competitive advantage to its graduates when entering the workforce. Mixing CNC and many other processes into a product-focused manufacturing and fabrication degree, allows graduates and employers to capitalize on skillsets normally only taught in the earlier years of four- to six-year engineering programs, resulting in a lower cost utilization rate for the employer and a higher wage for the potential employee when compared to graduates of other certificate and AAS programs.

2. ***Does the community college utilize systemic methods for meaningful and ongoing involvement of the appropriate constituencies?***

The initial less than one-year certificate was adopted in cooperation with numerous local businesses. Since that time and as the program has grown, information and advice has been continually gathered to change and tweak program outcomes and student learning. That process involved many industry partners as well as several advisory committees.

The expansion to an AAS from the certificate and the new courses added to it, developed through conversations with the several advisory committees. First, input was given by the college's program Advisory Board regarding the addition of pipe welding and tube fitting courses as well as courses on Geometric Design and Tolerancing. Further feedback fleshed out the development of the CNC track and the machining processes to be taught, as well as the 3d Computer Aided Design curriculum. Another advisory committee that was influential in the creation of the courses was the High Desert ESD Program of Study (POS) group that meets two times per year. Partially focused around Perkins alignment, the POS meetings are influential in helping instructors meet and coordinate on industry needs locally but also with a broader regional focus. In addition, they promote coordination and articulation between high school and community college programs. Finally, additional feedback was received from part-time faculty active in the industry, including the current instructor and the community education instructor, both of which own and operate their own successful local businesses.

The program is designed to expand on and work closely with secondary partners as feeders as well. Already articulated at The Dalles High School, Riverbend Community School, Hood River Valley High School, and Arlington High School, partnerships are also being fostered at Stevenson High School, Dufur High School and Sherman County High School. Columbia High School is also on the list for potential collaboration. As of the time of writing, a cohort of The Dalles High and Riverbend Community School students is being enrolled for winter term in the newly built lab space, to be taught by the current instructor.

Internally, the Manufacturing program will be working on alignment and crossover with the Electro-Mechanical Technology program at CGCC. Complete alignment of skillsets and courses is currently being worked on.

A major focus of this program is to work closely with the local STEM hub in creating enrollment, and ultimately, a workforce that is more reflective of overall demographics at CGCC and its district. By breaking down the traditional skillsets and casting a broader net, the hope is that some of the more technical and technology based skills will attract more females and underserved minorities to the program. With guidance from and collaboration with the STEM hub, there is hope for making progress

on this goal through grant work and additional outreach. Initial results are promising, with 43% of currently enrolled full-time Manufacturing certificate students identified as female.

The key constituency is first and foremost our students, and ensuring that we serve them in the best way possible, ensuring positive outcomes based on their goals and advising them appropriately to guide them toward a successful career. Beyond that, the goal is to provide a resource for local industry through equipping the current and future workforce with skills that reflect the direction that production is taking in the Gorge, integrating the appropriate technology into the program as it grows and adapts. Currently, the biggest resource constituents are providing is guidance in what types of systems and processes they use so that the Manufacturing program closely reflects those systems. In the past, partners have provided cast-off equipment and extra materials resources to the program. Those contributions are expected to continue as well.

3. ***Is the community college program aligned with appropriate education, workforce development, and economic development programs?***

CGCC is in a unique position to offer this program in a new lab, and in a time when the field of manufacturing is rapidly changing. As local manufacturing becomes higher tech and further blurs the line between product-based and development-based, it is important that the employment needs of growing local businesses be met. The new Manufacturing AAS will help the community be ready to meet this workforce need.

The skills being offered in this degree are not traditionally offered in combination. While elements similar to many programs, including COCC, PCC, BMCC and LBCC, are included, none of these programs offers a program as broad in scope within one AAS. There are currently no articulation agreements in place, beyond those from the initial less than one-year certificate with COCC.

The articulation at the secondary level is very promising however, with three local schools already on board and articulating this year, while several others are waiting or developing programs that will later be articulated. These articulations should provide an excellent source of students for the program and help with the problems of rural-flight that often times plague the Columbia River Gorge when developing the local workforce. The career pathway for this AAS can be clearly and easily seen in high schools throughout the gorge and simple and effective testing ensures aligned outcomes.

The expanded program as a whole, as well as many of its individual classes, offers further alignment with MCED's "Workforce Skills Basic Training." Many of the courses in this sequence provide ample opportunity for entry-level positions in a variety of fields, and with the expansion of the certificate to an AAS, higher wage entry-level positions are unlocked for students to apply to. Furthering that, many employees potentially "plateaued" in their current positions, may see the AAS as an opportunity to

retrain or learn new skills. This model of breaking down the silos between the different parts of manufacturing, provides greater economic opportunity for students and employers: students have much greater growth potential than if they had come from a program that focuses solely on welding or solely on machining, and employers will have a more versatile worker, potentially freeing up capital to invest in building a more efficient and flexible workplace.

4. ***Does the community college program lead to student achievement of academic and technical knowledge, skills, and related proficiencies?***

The Manufacturing AAS will offer students a concrete and sequential learning opportunity. Many of the skills taught in the program, particularly the certification preparation segments, build upon each other. This allows for a straightforward test out process for students who would like to advance or enter the program further along the pathway.

Currently, the program offers classes at times that are designed to work with its target clientele. By having later classes and classes that are hybrid-flexible or Hy-Flex in nature, workers currently employed may use the program for retraining purposes, and students in full-time secondary education programs are able to access program content through digital resources and online access. This opens the doors to many who might not be able to accommodate a 9 am to 3 pm schedule.

Being a program that is full of lab/lecture mix courses, with a focus on experiential learning designed into the outcomes, access to ELL/LEP students is greatly improved. Nontraditional students are targeted for enrollment through both curriculum design and environment. Currently there are plans being formed within CGCC for students in the Pre-College / English for Speakers of Other Languages Department to concurrently enroll in both the Advanced Manufacturing and Fabrication AAS or the Construction Technology AAS program. These opportunities will greatly benefit students fitting demographics not currently well represented regionally in these fields.

Data will be gathered regularly around 5-year employment and wage outcomes, location of placements, and number of students going into the field at large. Using this information, we can be proactive in curriculum revision and future design, as well as informing the Advisory Board and their recommendations.

Learning outcomes for each course and the AAS overall are concrete and measurable due to the applied nature of the coursework, certifications and degree itself. Similarly, tracking the outcomes becomes easier as many of them are skill-based outcomes. Based on pass rates, student and faculty feedback and input from industry, these outcomes and the manner by which they are assessed are adaptable to meet changes that may occur in the industry. The POS and Advisory Board will play a large role in recognizing those changes and ensuring that the program stays current.

Training and testing follow accepted testing practices of the AWS, preparing students for taking future certification examinations. Program rigor is ensured because of the testing that is required. With tolerance and specific pass / no-pass in place, as well as rubric- based grading, students are assessed as they would be in industry, by the successful completion of a product for sale. If the product is not ready, incorrect, or out of specification, students will retake and retry until successful. The use of rubrics allows for scaled implementation of stricter tolerance for machining and appearance of products and allows for a growth process model to be used as students learn and improve their skillsets.

Using a cohort model with 15 students, there is a built-in learning community. Students need to work together to produce products in order to be successful. In the current certificate program, students have built several projects for local businesses that required teamwork, including: signage, a skid steer bucket and a trailer. These group projects provide students with an authentic workplace experience and a built-in check and balance on skillsets being mastered.

As local industry connections build, an internship and placement program is being developed. Facilitating placements will rely on industry connections and the Advisory Board finding appropriate positions. Currently there are three students participating in work experience through CGCC's Compass program. These students have been given the opportunity to earn a wage while getting additional training.

5. ***Does the community college identify and have the resources to develop, implement, and sustain the program?***

The college has already made a very significant investment in growing its manufacturing courses through the building of the new space in the Columbia Gorge Regional Technical Center, opened fall 2021. This evidence of support as well as successes in numerous recent grant cycles, has seen the program already begin to gear up for the transition from certificate to AAS. The new facility is one of the big keys for expanding the program and beginning to make it more economically feasible as well. With the potential for growth and increased class sizes, sustainability should be less of an issue.

One concern is with the establishment of new equipment for the new courses. The currently adopted budget constraints due to COVID-19 may limit planned Year-Two curriculum (planned for initial offering in fall 2023), but numerous grants are also in place to help offset or fully alleviate this initial start-up cost. The college is currently developing a plan to fund the needed CNC equipment to support the courses and if previous success is an indicator, obtaining the equipment shouldn't be an issue. Ongoing maintenance and a supplies budget are in place, and will be scaled with the additional classes and students that enroll in the program. Some partners provide support in terms of materials

and old equipment, and that support is expected to continue moving forward.

Personnel is currently stable and sufficient. As the program begins to expand, it may become necessary to add one adjunct instructor to help with the course load. Bringing in an additional instructor with a different experience in the spectrum of manufacturing also ensures instructional excellence in a program that is designed to be as broad as the AAS is designed to be. The current student:faculty ratio is 15:1; however, an expansion to up to 25:1 is possible in the new lab. With anticipated enrollment, course and lab fees will offset the cost of instruction.

Recent example of funding to support students include: A Roundhouse Foundation grant which supplied every student enrolled in the current certificate courses with a set of tools to take with them into the workforce. This grant also provided access to additional PPE equipment. The college also secured a Metallica grant which made available scholarships to 15 students in the Advanced Manufacturing Technology certificate program. These students may potentially continue on into the AAS program. Finally, the manufacturing certificates currently offered by CGCC are included on the Eligible Training Provider List (ETPL), making it possible for students declared for these programs to receive federal funding support. We anticipate that the AAS degree will be approved for the ETPL as well.

### ***Assurances***

Columbia Gorge Community College has met or will meet the four institutional assurances required for program application.

1. *Access.* The college and program will affirmatively provide access, accommodations, flexibility, and additional/supplemental services for special populations and protected classes of students.
2. *Continuous Improvement.* The college has assessment, evaluation, feedback, and continuous improvement processes or systems in place. For the proposed program, there will be opportunities for input from and concerning the instructor(s), students, employers, and other partners/stakeholders. Program need and labor market information will be periodically re-evaluated and changes will be requested as needed.
3. *Adverse impact and detrimental duplication.* The college will follow all current laws, rules, and procedures and has made good faith efforts to avoid or resolve adverse *intersegmental* and *intra-segmental* impact and detrimental duplication problems with other relevant programs or institutions.
4. *Program records maintenance and congruence.* The college acknowledges that the records concerning the program title, curriculum, CIP code, credit hours, etc. maintained by the Office are the official records and it is the college's responsibility to keep their records aligned with those of the Office. The college will not make changes to the program without informing and/or receiving approval from the Office.