

Docket Item:

Community College Approval: Klamath Community College, Associate of Applied Science in Advanced Manufacturing Engineering Technology, within 15.0613 Manufacturing Technology/Technician.

Summary:

Klamath Community College proposes a new AAS degree in Advanced Manufacturing Engineering Technology. 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 Engineering Technology.

Klamath Community College seeks the Oregon Higher Education Coordinating Commission's approval to offer an instructional program leading to a degree in Advanced Manufacturing Engineering Technology.

Program Summary

The AAS AMET curriculum (90 credits) prepares students in the basic knowledge and skills to work in a computer aided design and manufacturing environment. The student will be taught shop safety and best practices starting with conventional machines (milling and lathes), continuing thru conversational machines. The capstone courses will end with the student taking a three dimensional model created in the CAD portion of the study and creating a program from the 3D / solid model. The student will then use their post processed G&M code; taking a product from design, tool design, programming, post processing, machining and finish with post machining processes - ending with the quality assurance / acceptance cycle. The student will create a product using the same process used by all manufacturing entities worldwide. Students who complete these classes will have a strong foundation in planning, design, CNC / conversational programming and fabrication. The curriculum will allow students to acquire hands-on experience working with two, three, four and five axis milling machines. The student will be allowed to design and use programming language to personally create three axis objects in a classroom and then shop setting. Four and five axis programs will be created - Boolean simulation will be the final product of the multi axis manufacturing cycle. The five axis process will be equivalent to what happens prior to machine try out (MTO) at Original Equipment Manufacturers (OEM's) worldwide.

The AMET (AAS) course of study is beneficial for students that are new to design and fabrication technology, and those that are currently in the field but looking to expand their skill base and increase their career opportunities. Students that currently have a non-technology career in another field may find this degree optimum for cross training into the CAD / CAM and manufacturing technology discipline in order to enhance their job resumes

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

On January 16, 2015, a meeting was held at Klamath Community College (KCC) campus to discuss the current environment and need for CAD (Computer Aided Design) and CAM (Computer Aided Manufacturing) skilled employees regarding high skill careers in Klamath and Lake Counties. Local business people, fabricating companies and union representatives attended the meeting.

The participants in that meeting identified areas of technology training that KCC needs to undertake. The first is the need to train engineering design and drafting technicians. All of the business and local government representatives relayed their struggles to maintain a qualified staff capable of all skills needed to design, create and fabricate products in a modern facility using state of the art CAD and CAM tools.

Multiple OEM (Original Equipment Manufacturers) spelled out their ongoing need for highly technically qualified individuals with a working knowledge of CAD and CAM software, hardware and business system computing skills.

Currently, the only training for CAD, CAM and basic machine practice in Klamath County is done at Oregon Institute of Technology (OIT). Most of the graduates of OIT in Manufacturing and Mechanical Engineering Technology continue to complete their Bachelor of Science degrees.

These graduates are in high demand by fortune 500 companies and rarely stay in Klamath County after graduation. The local OEM's in southern Oregon need many more certificate and associate level engineering technologists than bachelors or masters level practitioners.

The local OEM's listed the types of college level skills needed by potential employees. The expertise stipulated by the meeting members all revolved around a college level matrix of skills in technology, mathematics and support sciences. This course of study is meant to meet the "shop floor" and "drafting group" capabilities. The course work is trigonometry based mathematics and science; university students that complete calculus based mathematics and

physics based coursework are destined for research and design work at fortune 500 companies. KCC has developed a curriculum from the input of these local business leaders that will address the need for qualified CAD and CAM technicians with an Associate of Science degree. In the near future a one year certificate program will be added with the same technical core courses. The Advanced Manufacturing Engineering Technology (AMET) degree at KCC will prepare students to be “job ready” for an entry level CAD /CAM and manufacturing employment, with classes that are hands-on focused training for engineering technology skills, and a 10 week internship at one or the participating businesses. This curriculum was developed as a joint effort with KCC faculty, and with the business participants that attended the meeting in January of 2015.

The second need that was identified came from the representatives of OIT. The numbers of local high school students that are enrolling in the technology engineering programs are in single digits in recent years. Last year, no local high school graduates were enrolled in the Manufacturing Engineering Technology program. The demand for graduates from OIT’s Manufacturing Engineering Technology program is great and growing.

Manufacturing Engineering Technology - AAS Program

The following are the regional, state, and national projections for employment in the occupational profiles associated with the CAD / CAM Manufacturing Engineering Technology AAS:

Occupational Title	Oregon	Eastern Cascades	Nation
Most Recently Published 10-Year Growth Rate			
Manufacturing Engineering Technician (15.0613)			
ONET 17-3029.06	6 %	2.1 %	0 %
CNC Machinist (48.0510)			
ONET 51-4011.00	31 %	18.0 %	18.0 %
Computer Numerically Controlled (CNC) Programmer (48.0510)			
ONET 51-4012.00	33.3%	25.0%	19.0 %

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

The program has been developed through the collaboration of local businesses, local government organizations, and Oregon Institute of Technology. The business and organizations that participated in the program development are some of the largest employers in the Klamath Falls area and have CAD (Computer Aided Design), CAM (Computer Aided Manufacturing) , manufacturing, business and fabrication systems that need next generation engineering technologists. These businesses will be active partners going forward. They will provide students opportunities to work as interns, receiving on the job training as well as collaborating with KCC faculty to make the curriculum is relevant and current.

KCC faculty have met with these local business and organizations to exchange information and ideas on what types of skills are desirable for an entry level support technician.

The key constituents are Jeld-Wen of Oregon, Fremont Wood Products, Lobo Truss, ZCS Engineering and the U.S. Air Force / Oregon Air National Guard. Other partners that contributed to planning and design of curriculum are the KCC and the OIT MMET (Mechanical Manufacturing Engineering Technology) department. OIT’s MMET faculty has also been instrumental in shaping and developing curriculum.

The program will work with local high schools to attract students that are underrepresented in manufacturing, CAD and CAM. OIT’s faculty has helped shaped the curriculum with instruction methods and activities that they have found helpful working with under-represented student populations.

KCC CAD/CAM Department will provide work study positions for students

Advisory committees

An advisory committee is being formed by interested individuals and businesses

Members to date:

- Craig Abbot Senior Product Engineer Jeld-Wen
- Dave Burton Product Manager Jeld-Wen

- Necia Landrum Administration Manager Fremont Millworks
- Steve Edgeman Prof of Mech and Manuf Engrg OIT
- Dr. David Culler BSMET Program Director OIT
- Jacob Clements Manager Columbia Forest Products
- Sean Lenninger Manager Collins Products LLC Part-time faculty from industry
- Jeld-Wen factory and Research and Development department has offered to help train both faculty and students.
- Jeld-Wen design engineer will work as adjunct instructor.
- S & S Manufacturing has also offered on-site machining training opportunities on current conventional machining processes and machines.

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

The participating local businesses and Oregon Institute of Technology (OIT) have been meaningfully and systematically involved in the development of the Advanced Manufacturing Engineering Technology (AMET) and Advanced Manufacturing Technology (AMT) programs. In the case of the local businesses involved, numerous meetings have taken place with the Klamath Community College (KCC) faculty. The first step was to have members of the CAD and manufacturing staffs of the local businesses submit a list of skills and topics that they desire in a qualified employee working in the manufacturing engineering technology role. The KCC faculty then presented a curriculum with course descriptions and activities to the business partners. The business partners offered comments and suggestions on the proposed curriculum. The faculty then readjusted the curriculum accordingly.

In the case of OIT, the OIT faculty submitted to KCC faculty the course descriptions and syllabuses of courses that they feel are the most advantageous for a student to take in a community college setting. Numerous meetings took place between the faculties at both schools to determine how to best use the community college environment to prepare students to successfully transition to OIT's Manufacturing and Mechanical Engineering Technology (MMET) program. These discussions are ongoing and will lead to an articulation agreement between KCC's AMET program and OIT's MMET program. Some of the instruction, (five courses) that university transfer students will study will be at OIT, under a dual enrollment program. Non university bound students will take all instruction at KCC.

Faculty of other programs at KCC have been in discussion with the faculty of the AMET program to determine the best way to share curriculum so that students in these other programs can increase their exposure to CAD, CAM and high tech support training. These discussions are ongoing and will continue.

KCC has both a dual credit agreement and a dual enrollment agreement with the local school districts and the Oregon Institute of Technology. The AMET and AMT programs at KCC will participate in this agreement and offer high school students opportunities to take the AMET and AMT classes for college credit on their respective high school campus and on the KCC campus.

Students in the AMET and AMT programs will have the opportunity to take third party exams to demonstrate the mastery of desired skills. The program will contract with local agents to seat the students for AutoCAD Certified Users Examination (ACUE) and the Solidworks CSWA (Certified SOLIDWORKS Associate) examination.

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

Advanced Manufacturing Engineering Technology (AMET)

Transfer to Bachelors of Science Engineering Technology Programs

The Advanced Manufacturing Engineering Technology (AMET) AAS is designed to produce high quality graduates that are "job ready" and prepared to either work in the CAD (Computer Aided Design) and CAM (Computer Aided Manufacturing) technology field or continue education and training at the Oregon Institute of Technology, or other Manufacturing Engineering

programs on the West Coast.

Advanced Manufacturing Engineering Technology (AMET)

Two-Year Associate of Applied Science Degree

The AMET AAS degree is offered to students seeking to acquire technical training in CAD, CAM, manufacturing, engineering technology to transfer to the baccalaureate degree program in Manufacturing Engineering Technology at Oregon Institute of Technology (OIT) or Oregon State University. Klamath Community College is finishing discussion on an articulation agreement with OIT's Manufacturing and Mechanical and Technology (MMET) Department. This agreement includes a reverse transfer with OIT. Students that graduate will have most of the first two years of lower division course work for transfer to OIT.

Students that pursue this degree will have a strong foundation in CAD, CAM, engineering, business and design principles while also acquiring a solid background in general education courses in mathematics, basic science, writing, social science, and communication. The curriculum will expose the student to the theory and application of CAD, CAM and manufacturing engineering technology, while offering an intensive, hands-on experience working with computer based design, conventional and numerically controlled machines. A degree holder will have the additional benefit of being "job ready" to apply for entry level jobs in CAD, CAM and manufacturing engineering. The program will include an internship with a local company's computer design and manufacturing departments, and the chance to earn industry recognized third party certifications in CAD.

Work in the field of manufacturing engineering technology includes: Computer Aided Design, Computer Aided Manufacture, Computer / Numerical Controlled (NC/CNC) Programming, conventional machining and Design and Manufacturing simulation. Work opportunities for students that wish to enter the work force immediately upon completing the AMET AAS includes: manufacturing and industrial engineering technologist, CAD drafter, NC / CNC programmer and NC / CNC machine operator.

Candidates for this AAS degree must satisfactorily complete all the requirements of the degree including a minimum of 90 required credits, 56 of which are in the General Education Component. The General Education requirement allows the flexibility to continue professional development later, by applying the basic skills gained to more in-depth study.

One of the requirements for degree completion is for the student to complete one term of a cooperative internship with a local employer that utilizes a CAD, CAM and business system during the normal course of conducting operations. These arrangements will be made on an individual basis and the student is under no obligation to accept permanent employment.

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

Klamath Community College is a well-established community college -- for over 19 years. Klamath Community College (KCC) is accredited through the Northwest Commission of Colleges and Universities (NWCCU). Klamath Community College has an approximate \$13 million annual operating budget. Klamath Community College provides accessible quality education and service in response to the diverse needs of their students, business partners, and community. The college supports student success in workforce training, academic transfer, and foundational skills development.

KCC's Advanced Manufacturing Engineering Technology (AMET) AAS degree will have an academic articulation agreement with Oregon Institute of Technology's Manufacturing and Mechanical and Technology (MMET) program. The faculty at OIT has participated in the development of KCC's AMET program. The faculty at OIT will help, assist and share curriculum with KCC as required to keep the courses at KCC relevant and up to date.

OIT instructors have expressed interest in working with KCC students in the classroom as teaching assistants and adjunct faculty to ensure that there is an adequate pool of qualified instructors available. Advanced OIT students in upper division courses will be available to work as on campus tutors to insure that there is adequate academic support for KCC students.

KCC has approved a program budget for lab equipment and instructor's salaries for the coming

school year 2017-2018. Building space has already been identified -- classroom instruction at KCC and manufacturing laboratory at OIT; planning is currently be undertaken to develop the required lab facilities within the approved budget.

To date, the local businesses that have been contacted to provide internships, and are willing provide an opportunity of an internship to all qualified students that complete the required classes. More local businesses will be contacted going forward to insure that all future students have an internship opportunity as the program grows and that there is an adequate variety of internships that matches a variety of student interests and technical specialties.

The local high schools have been contacted to gauge interest in high school faculty willing to undergo training provided by KCC and OIT faculty in order for classes to be taught through the synchronous classroom facility used for dual credit classes. Dual enrollment agreements with local high schools will allow high school students to take classes on the KCC campus during school hours and to do course work in KCC's lab facilities. There will be a separate dual enrollment program with OIT for KCC students wishing to continue on to university level classes; five classes will be taught at OIT for university bound student.

Assurances

Klamath 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.