MECHATRONICS ROADMAP

INFORMATION FOR CURRENT AND POTENTIAL ACADEMIC AND INDUSTRY PARTNERS

Mechatronics is an advanced manufacturing, multidisciplinary field that includes a combination of electronic control, mechanical systems, computing, robotics, and automation as used in preventative and routine machine maintenance.

WHY DO WE NEED MECHATRONICS?

In 2014, the industry need for comprehensive mechatronics skills in Washington state was:

- 12,632 job postings, 59% of those were in King and Snohomish County*
- Projected 21% average growth rate through 2024 in Washington state*

As multiple industries move toward automation, qualified candidates with hands-on experience in Mechatronics, are needed to repair and maintain advanced manufacturing machinery. This need crosses multiple industries, including automotive, aerospace, agriculture, food processing, medical devices, and logistics.

WHAT IS MECHAWA?

MechaWA is a consortium of Washington State Community & Technical Colleges (CTC) and industry partners (including Boeing) assembled by the Center of Excellence for Aerospace and Advanced Manufacturing (COE). The objective of this group is to implement a standard, two-year mechatronics curriculum into state CTCs. The curriculum adopted by the consortium was developed by the Automotive Manufacturing Technical Education Collaborative (AMTEC) in Kentucky. These standardized mechatronics programs will prepare graduates for careers in advanced manufacturing across multiple industries by providing critical hands-on experiences through paid internships, rigorous standardized curriculum, and assessments.

WHY USE THE AMTEC-KY CURRICULUM?

The Automotive Manufacturing Technical Education Collaborative (AMTEC) is a consortium of automotive companies including Toyota, Nissan, Ford, and General Motors. Based in Kentucky, this consortium came together to build a standard two-year mechatronics curriculum for community and technical colleges.

The automotive industry, like so many others, has found it difficult to fill the demand for these highly-skilled workers, and has had to look for potential employees across the country. Although they are finding qualified candidates, they are typically experienced employees who aren’t willing to move for the salary offered.

Facing similar issues in Washington state, MechaWA identified multiple existing mechatronics curricula across the United States. Accordingly, the consortium benchmarked these curricula against industry requirements as provided by subject matter expert input.

As a result of this benchmarking activity, the AMTEC KY curriculum was identified as the front runner. The COE, CTCs, and industry partners visited both the North America Toyota Motor Manufacturing Training Center in Georgetown, KY and Alamo Community College in San Antonio, TX where they have fully implemented the AMTEC curriculum, equipment, assessments, and work experience. All were key elements of the program that the MechaWA Consortium felt made this program successful.

AMTEC is an easy curriculum to incorporate into existing programs. For example: If there isn’t an existing mechatronics curriculum at the school, the AMTEC KY curriculum is modularized and easily implemented. Additionally, there is a recommended list of standard equipment to be purchased. Conversely, if there is existing curriculum, it isn’t necessary to use the AMTEC modules as long as the existing curriculum aligns to the AMTEC KY program outcomes. If the outcomes don’t completely align, there is an option for mixing-and-matching existing curriculum with ATMEC KY modules. This can easily be identified through a curriculum gap analysis activity facilitated by the COE. If there is existing equipment, or if funding is an obstacle, there are several options to accommodate.

In conclusion, our decision to move forward with the AMTEC KY curriculum was an easy one. The standard key elements for success as identified above, the alignment to Washington state-specific industry requirements, and ease of implementation all contributed to this choice.
## WHY SHOULD YOU JOIN MECHAWA?

### SCHOOLS

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<thead>
<tr>
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## HOW TO JOIN MECHAWA

Schools and industry contact the COE Director with the following information:
- Plans to implement Mechatronics and request next steps to join MechaWA
- List of industry partners (minimum of two required)
- Request information on AMTEC KY MOU and how to start the signing process
- Determine what COE needs from you to begin the implementation process
- Ask about grant opportunities
- Ask for viewing access to the partial AMTEC KY modules
- Ask for access to the general mechatronics assessment

There is no cost associated with joining MechaWA. The purpose of the MOU is to define the responsibilities and ensure understanding by all groups in relationship to the partnership and collaboration. The MOU allows access to partial AMTEC KY modules for viewing, assessments, and input on updates to the curriculum and assessments. If you choose not to partner, you will be considered an inactive partner.
HOW TO IMPLEMENT MECHATRONICS AT YOUR SCHOOL

1 PREREQUISITES
- AMTEC KY MOU signed with at least one industry partner
- Shop space availability
- Capital budget or partnerships to acquire required tools
- At least one qualified instructor that can attend AMTEC KY webinar
- Ability to cultivate industry partnerships

2 CROSSWALK EXISTING CURRICULUM TO AMTEC KY
- Not all schools will have a complete, existing Mechatronics program. However, most will be able to leverage courses where applicable skills are already taught. This is what will be cross-walked to the AMTEC KY curriculum
- Schedule crosswalk through the COE
- Outcome: identify skill gaps not covered by your current courses. Develop a 2-year program outline that works within your model. If there are gaps, the AMTEC KY modules are available and recommended to fill these

3 IDENTIFY INDUSTRY NEED
- IMPORTANT: Ensure curriculum meets industry partners’ requirements
- Present the AMTEC KY program and curriculum to your school’s general advisory board and/or your manufacturing advisory board
- Collaborate with existing MechaWA industry partners in your area to partner with your school (see the COE website for details)
- NOTE: Mechatronics skills are needed across multiple industries including automotive, aerospace, agriculture, food processing, medical devices, and logistics

4 DETERMINE FUNDING NEEDS
Acquire required tools and materials through in-kind donations, surplus, or purchases (see AMTEC KY equipment and resources list: http://autoworkforce.org/curriculum-resources/instructor-resources/)
Create curriculum framework and submit to internal instructional council, SBCTC, and the NWCCU (http://www.nwccu.org/)
Review “Best Practices for Implementation” on next page

5 INDUSTRY PROGRAM VALIDATION (RECOMMENDED)
- IMPORTANT: Prompt your industry partners to implement validation, see validation section for more details, and http://www.coeaerospace.com
- Program validation is necessary to ensure your program is fully aligned to your local industry’s requirements.
- Subject matter experts will provide feedback to instructors and COE
- Subject matter experts will provide feedback to internal recruiting groups
# BEST PRACTICES FOR IMPLEMENTATION

**Collaborating with other local CTCs and high schools** is a necessity for cross-training your instructors and implementing best practices. Work together to breakdown barriers and produce the most qualified candidates possible. Develop direct pathways for graduating high school students to move seamlessly into CTC mechatronics programs.

**Develop multiple exit points for your students.**

**Request information on grant opportunities.** Reach out to the COE for information on mechatronics grant opportunities. Keep in mind that grants may be time sensitive.

**Send faculty to professional development opportunities** that the COE provides frequently throughout the year. Ask your industry partners for support in professional development.

**Implement nationally recognized certifications into your program.** For example: ACT National Career Readiness Certificate (NCRC), Manufacturing Skill Standards Council (MSSC), National Institute of Metalworking Skills (NIMS), Packaging Machinery Manufacturing Institute (PMMI) Mechatronics, National Coalition of Certification Centers (NC3). See the CoE website for more details [http://www.coeaerospace.com/](http://www.coeaerospace.com/).

**Hire a navigator or career coach,** someone who is focused on making this program as successful as possible. Recommend that this person develop industry partnerships that are key to the success of your students.

**Set facilities up in the most cost effective way.** You may already have equipment available that can be used for mechatronics. Remember that new, used, refurbished, and donated equipment are all great options.

**Implement project-based learning.** Collaborate with your students to lead hands-on activities where they research, troubleshoot and then implement the project in the classroom. This enhances skill-set learning and develops critical thinking and troubleshooting skills.

## EQUIPMENT & TOOLS

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<td>Remember this is a reoccurring cost. This is a variable price based on what you have already and what you decide you need to align to the AMTEC KY outcomes. <strong>Please see the tool list here:</strong> <a href="http://www.autoworkforce.org/">http://www.autoworkforce.org/</a></td>
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<td>Each module costs $15 per student, there is a discount for bulk orders. This gives the students access to the labs and the module content. Contact AMTEC KY to purchase modules.</td>
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ASSESSMENT IMPLEMENTATION INSTRUCTIONS

TYPES OF AMTEC KY ASSESSMENTS

GENERAL MAINTENANCE – MECHATRONICS CERTIFICATION TEST
The AMTEC KY Certification in General Maintenance – Mechatronics recognizes individuals who demonstrate mastery of the core competencies in multi-skilled maintenance. The certification test is based on AMTEC KY’s industry-certified, nationally validated skills standards. The assessment is delivered online and contains 186 multiple-choice questions and provides sub-scores in 19 major content areas. The certification test can be used to document competencies of potential and current workers in the multi-skilled content.

DIAGNOSTIC ASSESSMENTS
AMTEC KY also provides 12 standardized diagnostic assessments (multiple choice format) aligned to the industry standards as allocated in 12 major content areas. These assessments were developed and validated by industry experts and can be used to diagnose the training needs of students and incumbent workers. The results of these assessments align directly to the award-winning instructional modules for targeted remediation.

- Fluid Power and Electrohydraulics/Pneumatics
- General PM and Predictive Maintenance
- PLC [Allen Bradley/Rockwell]
- Blueprint Reading/Schematics
- Robotics – FANUC
- Controls & Instrumentation
- Basic Electricity and Electronics
- Mechanical Systems/Mechanical Drives/Power Transmissions
- Safety
- Computer Literacy
- Welding and Fabrication
- Machine Tool Operations

MODULE ASSESSMENTS
Fifty Seven end-of-module assessments are aligned to the student learning outcomes developed by the faculty experts. Students or workers who pass the pre-test will be eligible to take the post-test and may receive credit for the module.

WHAT ABOUT HANDS ON APTITUDE ASSESSMENTS?
This is covered by the hands-on labs, troubleshooting and breaking down and rebuilding machinery and equipment in class, and capstone projects.
Which assessments does MechaWA use and how?

**General Maintenance – Mechatronics Certification Test**
For MechaWA school partners, the General Maintenance test is required, and is referred to as the pre- and post-assessment. Students will take these assessments at the beginning of the program and again at the end of the program. Please be aware that this is a very difficult test and that an individual taking this test for the first time without industry experience will most likely score a 0-30% and an individual with industry background and no schooling will most likely get a 50-70%. Final scores do not affect graduation. Students will need to give permission to release scores to industry.

**Diagnostic Assessments**
Diagnostic assessments are not a requirement, but can be used to assess whether or not a student can receive credit in any of the 12 major content areas, which allows for an incumbent worker or a student with industry experience to potentially move through the program faster.

**How do I access the assessments?**
Please see the AMTEC KY website instructions. Remember to let the COE know you are ordering assessments as there may be funding assistance available.


**What is the cost?**

**General Maintenance – Mechatronics Certification Test**
Each assessment is $15/ per test, however, buying in bulk decreases the overall price. This should be negotiated with AMTEC.

**Diagnostic Assessments**
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INDUSTRY PROGRAM VALIDATION

1. Each school will administer the pre-assessment to their students at the beginning of the program. These scores will be released to the COE to be shared with the MechaWA Consortium industry partners during the validation process.

2. At the end of the first year of the program there is a check point where the COE will review what each program has completed, confidence level of instructor, and to identify any help needed. In addition, the schools and the subject matter experts will work together to schedule a date and time between September and November where all of the schools’ industry partners will come to see the program, see the students doing hands-on work, and speak to the students and instructors. This is a chance for industry partners to learn what skills students have obtained and for instructors to ask questions of the subject matter experts. It is the schools’ responsibility to make sure their industry partners know about the validation visit.

3. Industry partners will be looking to see skill demonstration and alignment in the 12 core competency areas, hands-on aptitude, student knowledge and ability-to-speak skills, shop space set-up, and equipment alignment. This validation is to identify gaps, offer additional support where needed, and to ensure industry knows the capabilities of the students.

4. The data collected at the validation visit will be shared with the MechaWA Consortium so that all industry partners will know that the different programs are aligned and are held to the same standards.

5. At the end of the program each school will administer the post-assessment. It is expected that the data will show great improvement for most students. These scores will be released to the COE to be shared with the MechaWA Consortium industry partners during the validation process.
Is there funding available for Mechatronics? These colleges received funding in 2016 to implement Washington state AMTEC Mechatronics programs: Centralia College, Clover Park Technical College, Everett Community College, North Seattle College, South Seattle College and Renton Technical College.

How do I implement the AMTEC KY General Mechatronics Assessment? For more in-depth info visit the website, or see the “Assessment Implementation Instructions” page.

Are students guaranteed a job when they complete the program? There is no guarantee that a student will automatically be hired. The ideal candidate for a mid-level entry point position should have a moderate-level (2 years) of experience or education with technical classes around mechatronics.

How much can a student make if they get hired in a mechatronics type position? Manufacturing jobs offer competitive wages with the potential for rapid growth.

Why is industry-partner support important? The main focus of any program is ensuring your students are fully prepared for a manufacturing position and that they have the opportunity for employment after graduation. In order for this to be even more successful, industry-required skills must be taught. Industry involvement allows schools to develop a program specific to their local needs.

What might be asked of industry partners? Advisory board participation, classroom presentations, parent presentations, in-kind donations (materials and equipment), career fair participation, tours, curriculum alignment and validation support.

What about high school alignment to the community college programs? See the “High School to CTC Pathway Alignment” page.

Do internship opportunities need to be paid? Is there funding to help with this? The MechaWA Consortium asks that all internship opportunities be paid. If an industry partner has questions, please direct them to the COE where there may be some funding available to help with this cost.
CONTACT INFORMATION

COE EXECUTIVE DIRECTOR
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## MECHAWA PARTNERS

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<tr>
<th>COMPANY/ORGANIZATION</th>
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<tbody>
<tr>
<td>Everett Community College</td>
<td>2000 Tower St Everett, WA 98201</td>
<td>Associate Dean of Aerospace and Advanced Manufacturing Open Position 425-388-9570</td>
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<tr>
<td>Centralia College</td>
<td>600 Centralia College Blvd Centralia, WA 98531</td>
<td>Mechatronics Instructor David Peterson 360-623-8578, <a href="mailto:dpeterson@centralia.edu">dpeterson@centralia.edu</a></td>
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<td>Clover Park Technical College</td>
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<td>Director of Bachelor Degrees and New Program Development Claire Korschinowski 253-589-5516, <a href="mailto:claire.korschinowski@cptc.edu">claire.korschinowski@cptc.edu</a></td>
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<td>North Seattle College</td>
<td>9600 College Way N Seattle, WA 98103</td>
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<td>Shoreline Community College</td>
<td>16101 Greenwood Ave N Shoreline, WA 98133</td>
<td>Manager-TAACCCT Grant Lauren Hadley 206-533-6725, <a href="mailto:lhadley@shoreline.edu">lhadley@shoreline.edu</a></td>
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<td>South Seattle College</td>
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<td>Renton Technical College</td>
<td>3000 NE 4th St Renton, WA 98056</td>
<td>Mechatronics Program Manager Claude Holmes 425-235-2352 Ext. 5319, <a href="mailto:cholmes@rtc.edu">cholmes@rtc.edu</a></td>
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<td>Green River College</td>
<td>12401 SE 320th St Auburn, WA 98092</td>
<td>Mechatronics Instructor Pat Prichard 253-457-0411, <a href="mailto:ppritchard@greenriver.edu">ppritchard@greenriver.edu</a></td>
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<td>Lake Washington Institute of Technology</td>
<td>11605 132nd Ave NE Kirkland, WA 98034</td>
<td>Dean of Instruction Kenneth Young 425-739-8146, <a href="mailto:kenneth.young@lwtech.edu">kenneth.young@lwtech.edu</a></td>
</tr>
<tr>
<td>AMT Senior Aerospace</td>
<td>20100 71st AVE NE Arlington, WA 98223</td>
<td>Partnered with Everett CC</td>
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<tr>
<td>AvtechTyee</td>
<td>6500 Merrill Creek Pkwy Everett, WA 98203</td>
<td>Partnered with Everett CC</td>
</tr>
<tr>
<td>The Boeing Company</td>
<td>535 Garden Ave N Renton, WA 98057</td>
<td>Partnered with all schools</td>
</tr>
<tr>
<td>Cascade Coffee, Inc.</td>
<td>1525 75th St SW #100 Everett, WA 98203</td>
<td>Partnered with Everett CC</td>
</tr>
<tr>
<td>Darigold</td>
<td>67 SW Chehalis Ave, Chehalis, WA 98532</td>
<td>Open for partnership, contact CoE if interested</td>
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<tr>
<td>Umbra Cuscinetti, Inc.</td>
<td>6707 Hardeson Rd Everett, WA 98203</td>
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<td>Universal Aerospace, Inc.</td>
<td>18640 59th Dr NE Arlington, WA 98223</td>
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<tr>
<td>Mobile Tool Management, Inc. (MTM)</td>
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