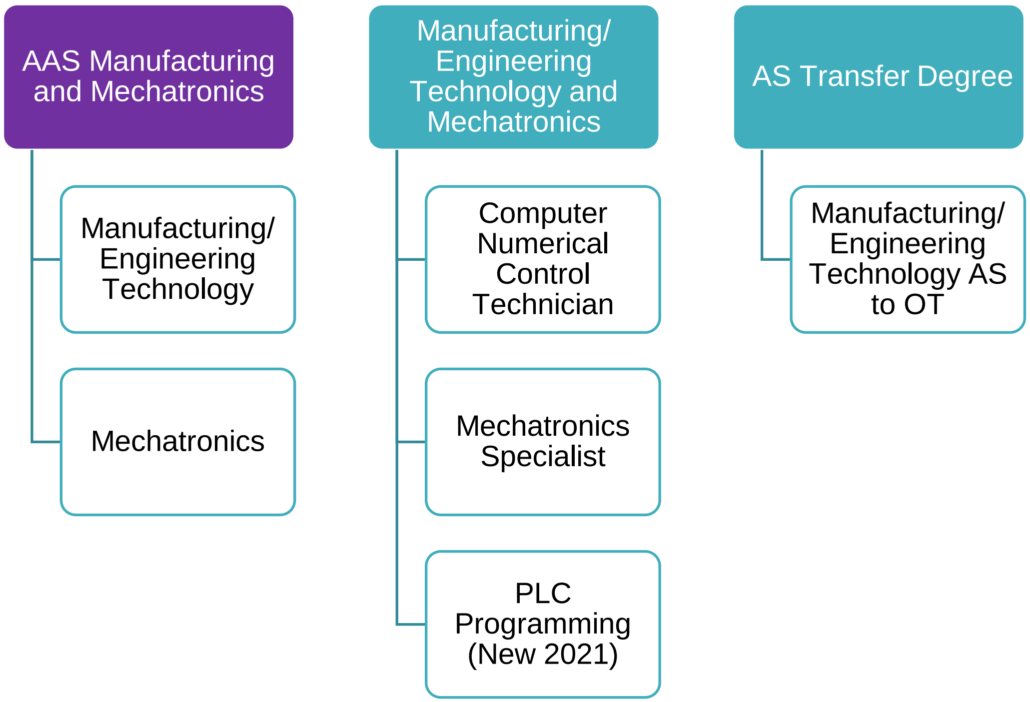
RCC
Rogue Community College

Department Program/Self-Study

Department: Manufacturing Engineering Technology and Mechatronics

http://www.roguecc.edu/ManufacturingEngineering
http://www.roguecc.edu/mechatronics



Degree Programs Reviewed:
AAS Manufacturing Engineering Technology, AAS Mechatronics, Computer Numerical Control Technician Certificate, Mechatronics Specialist Certificate, Manufacturing Engineering AS transfer to OT

Authors or contributors to this report: Steve Foster and Mike Bullard

Department Faculty:
Department Chair: Steve Foster
FT Faculty: Mike Bullard, Mechatronics Coordinator
Adjunct Faculty: James Walker, Charles (Chuck) Thomas, Anthony Knight, William (Randy) Cort

Section One – Mission Alignment

Rogue Community College focuses on four Core Themes:

1. Promote Student Access and Success
2. Advance Student Learning
3. Strengthen Our Diverse Communities
4. Model Stewardship

As part of the larger work of the college, the Manufacturing and Mechatronics Department fulfills the following objectives in the RCC Strategic Plan:

Wildly Important Goal: Access to Educational Opportunities

Objective 2: Increase participation of under-served populations in our programs.

Goal Overview: Increase high school enrollment in Manufacturing Engineering Technology and Mechatronics program courses by 10%. To meet this goal, the program plans to actively market to area high schools.
Steps we propose to achieve this are:

1. Continue to participate in high school career and recruiting events such as Careers in Gears and STEMathathon.
2. Visit local high schools in Jackson and Josephine counties and actively market the courses available to students.
3. Increase our marketing materials for High School Outreach.
4. Continue research on establishing a Career and Technical Education (CTE) Letter of Intent Signing Day.

Measures: Document number of high school students enrolling in Manufacturing Engineering Technology and Mechatronics courses in 2017/18 and compare with students for 2018/19. Additional data could include college now enrollments/comparisons.

Results: Zero high school students enrolled for 2017/18 year. Zero high school students enrolled for 2018/19 as well.

Next Steps: Explore lack of enrollment by local area high school students. This has been a difficult area that we continue to want to work on.

Wildly Important Goal: Student Success

Objective: Decrease student time to completion while maintaining quality education.

Goal Overview: Assist to develop an A.S. Transfer degree articulated with Oregon Institute of Technology in *Mechanical Engineering Technology*. While we currently have an articulated transfer degree for Manufacturing Engineering Technology, we are seeing an ever-growing interest in students wanting to pursue a transfer degree for Mechanical Engineering Technology.

Steps we will take to accomplish this goal are:

1. Meet with faculty at Oregon Tech to establish advising guide for transfer degree.
2. Increase coverage material in related MET transfer courses so students attending RCC do not have as many courses to take for completion at OT.
3. Educate, advise, and track transfer students to keep them on track for completion of their degree in four years.
4. Work with faculty from Science and Academic areas for increasing transferability in their course offering related to the articulations.

Measures: Once articulated degree is established we will document the number of students enrolling in the AS Mechanical Engineering Technology transfer degree. Contact with faculty and advisors in Oregon Tech's Mechanical Engineering Department will be maintained to continue tracking success/completion of students that transferred to OT.

Results: AS Transfer Degree for Mechanical Engineering was established through RCC's science department

Next Steps: None

Wildly Important Goal: Access to Educational Opportunities

Objective 3: Create collaborative learning spaces that connect students to other students, faculty, staff and local employers.

Goal Overview: To create a collaborative lab in the new High-Tech Center such as what is commonly referred to as a "Makerspace". A lab such as this in our new building will allow students, industry partners, entrepreneurs, and other RCC programs a place in which they can have access to high tech equipment that can also serve as a "think tank" where they can cross-collaborate with each other and on-site faculty to design, develop, and manufacture their ideas.

Steps we can (and are) taking to achieve this are

1. Transfer our current inventory of equipment from our current workplace to new building once it is completed.
2. Work with marketing to advertise via web video, social media, and printed materials the processes that people can use in the lab (i.e., 3D printing, 3D laser scanning, laser cutting/engraving, robotics)

3. Monitor latest industry trends for new and emerging high-tech equipment and processes such as metal 3D printing and procure equipment (and training) for that technology.

Measures**:** Document the number of students, entrepreneurs, or industry partners that come to TRC and use or request access to use the Makerspace. To help with the monitoring process, a visit is currently being planned to Portland Community College to discuss with them how they monitor usage of their very popular Makerspace.

Results: The original plan to have a "Makerspace" lab housed inside the newly opened High-Tech Center was altered during planning of the High-Tech Center prior to its opening. Visits to several Makerspaces showed that the High Tech Center itself was in fact a form of a Makerspace, so the decision was made to not have a "dedicated" lab area strictly to label as a Makerspace housed within the HTC. All of the "high tech" Maker-type equipment that was already in the Manufacturing Engineering programs inventory was still transferred to the High Tech Center to allow students, entrepreneurs, or industry partners access to the equipment under one roof. Work has been and is still currently being done to showcase the high-tech equipment such as our four 3D printers, a 3D laser scanner, Scanning Electron Microscope (S.E.M.), state of the art CNC Vertical milling machines, and more. We are currently receiving quotes for a Markforged Metal X 3D metal printer that several local industry partners have shown and sent letters of support for our potential purchase.

Next Steps: Continue to market the high-tech equipment and training available at RCC's High Tech Center and pursue and investigate the latest in industry trends for advanced manufacturing processes.

Our faculty actively participate in multiple college committees and regional community business organizations as part of the mission.

Section Two – Profile

Ahh… The fun part!

RCC's Manufacturing Engineering program dates back to the mid to late 1990s. There is little information readily accessible to verify the exact inception date and history of the program and much of what is known up until 1997 has been passed along verbally from former deans and long-time faculty members. It is believed that the program was brought into being in approximately 1992. The college's gunsmithing program, while nationally recognized and very successful, had recently been closed down due to decreasing enrollment and the cost of completing the program. With the closure of gunsmithing, it is believed that the former department head for gunsmithing, Gary Gilpatrick, suggested that the program should be re-opened as a manufacturing engineering program.

-The decision was made to do so, and somewhere around 1992 the manufacturing engineering program was opened with Dale Carlisle (department head), Louis (Skip) Johnson, and eventually Melvin (Rip) Rapose teaching manual machining, mechanical board drafting, blueprint reading, statistics, metallurgy, CADD (computer aided drafting/design), robotics, basic CNC (computer numerical control) programming, and many other courses. The program continued through 2001, when low enrollment and a poor economy forced its closure and it went into teach-out.

It is unclear when the program was re-opened at Redwood Campus, but records we are able to find show it re-opened in Fall of 2004/05. It was re-opened at that time by Kris Germana (a former RCC graduate), and Bill Jiron who was Director of Workforce Development at that time. The “new” program was modeled after Portland Community College’s “open-lab” format which is a modular system that allows students to fit classes into their schedules. Over the next year as enrollment increased, Jim Walker was hired to teach SolidWorks CAD classes, metallurgy, statistics, and lean manufacturing.

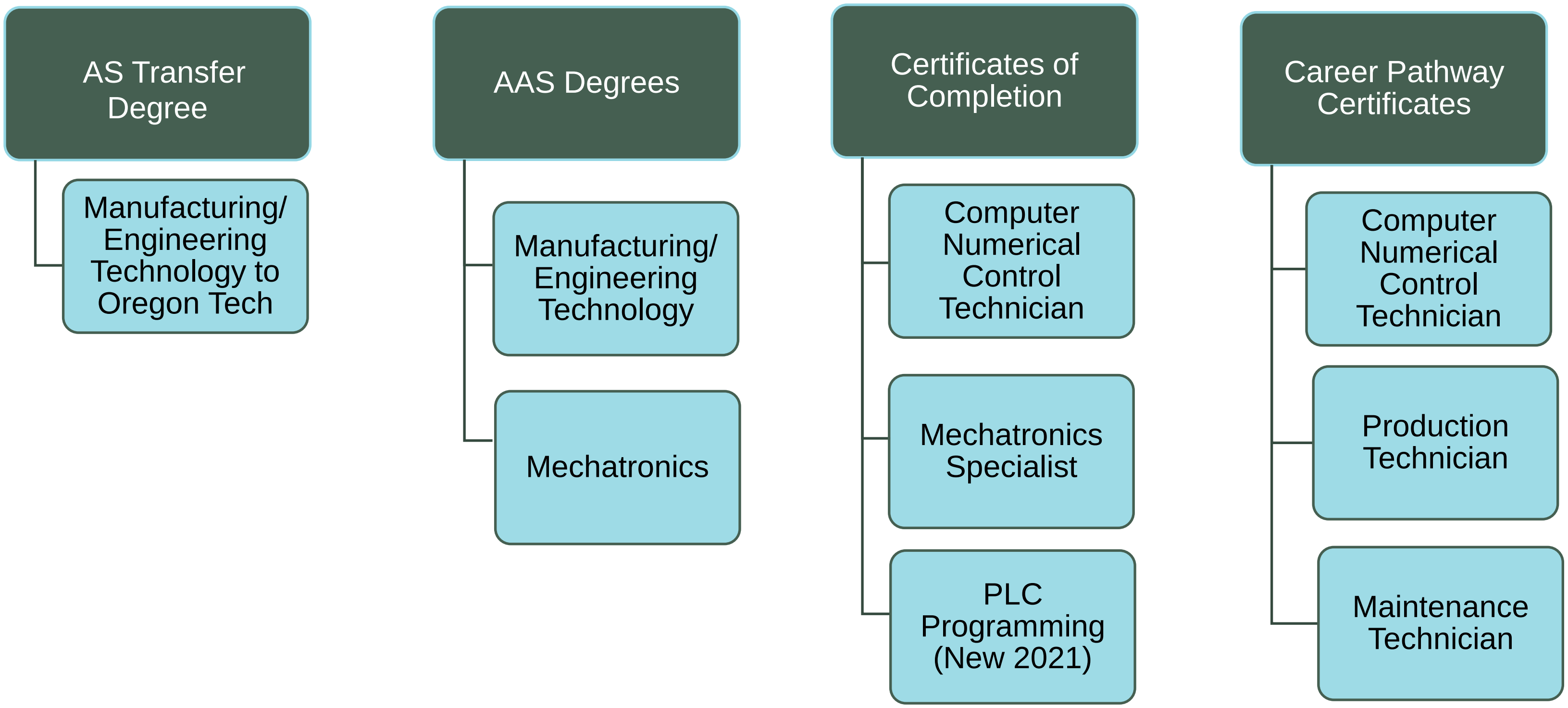
In the summer of 2006 after the Table Rock Campus had been renovated, the program was then moved to its new home at TRC and opened back up in the fall 2006 year with Kris as the department coordinator and Dave McKeen as department chair. With increasing enrollment, two more faculty members were hired in the fall of 2006; Joe McLoughlin, a retired Navy Master Machinist, to take over teaching the three manual machining classes and Steve Foster (former RCC grad and Director of Manufacturing for a local machine shop) to teach the CNC mill and CNC lathe programming classes. Joe continued to teach until the summer of 2009.

With Joe’s leaving, Jim Wilson, the owner/operator of Mesa Tool was hired to take over as the manual machining instructor. Late 2009, was a rather low point for the department faculty and students as Kris was diagnosed with cancer and was initially given only months to survive. Kris managed to put up a good fight, but in the end, cancer won the battle and Kris passed on Wednesday, February 17, 2011. With Kris’ passing, Steve was appointed department coordinator and Chuck Thomas (yet another RCC grad) was hired on. Over the next several years, along with adding another new faculty member, Mike Bullard (yes, he is yet another RCC grad) to teach our Autodesk Inventor courses and staying current with industry requirements for CAD/CAM software (SolidWorks, Autodesk Inventor, and Mastercam), the program added new and emerging technologies such as 3D printing, 3D laser scanning, Scanning Electron Microscopy (SEM), and laser cutting and engraving.

In 2014, discussion began with local industry about RCC developing a new certificate or program geared towards “industrial mechanics”. RCC Dean of Science and Technology at that time, Steve Schilling, had our department as well as the Industrial Welding Department develop classes and a certificate “Plant Systems Technician” certificate. Curriculum was developed, equipment purchased, and the certificate was offered. From feedback from local industry as well as our advisory committee members, a new plan was proposed to build the existing certificate into a full-blown Mechatronics AAS degree program. Mike Bullard and Anthony Knight (RCC welding instructor) were tasked with the development of this new program. After hours, weeks, and months of developing courses for the new program and purchasing numerous training units, the Mechatronics program officially “came to life” in the fall term of 2017/18.

Prior to the new program coming to life, there had also been discussion of the college building a new facility in which the manufacturing engineering and welding programs could be moved. They were currently out of room and the building that welding was housed in at the White City VA Domiciliary was being considered for tear down. A plan was proposed somewhere around 2014/15 but fell through, but a year or so later, the Satex company whose building was next door to TRC, was being closed due to the owners retiring. The college was able to purchase the building, and after many, many months of planning, designing, and developing, ground was broken on the remodel of the build which would become RCC’s High Technology Center (HTC). Currently, the HTC houses the Manufacturing Engineering Technology, Mechatronics, and Industrial Welding Technology programs and has continued to grow.

Manufacturing Engineering Technology and Mechatronics Degrees, Certificates, and Pathways



Departmental Enrollment and Demographics/Profile

Manufacturing Engineering and Mechatronics jobs are traditionally male-dominated professions, and in the Southern Oregon area, these positions are typically filled by white males and this can be seen in data below. Through recruiting, outreach with local high schools, public information efforts, and simple word of mouth, we have been working for years to broaden the diversity of our student population.

Year	2017	2018	2019
% of male students	92.1%	93.4%	86.1%

Race/Ethnicity % by year	2017	2018	2019
White	82.0%	75.2%	71.1%
Hispanic	2.9%	9.1%	13.9%
non-Hispanic people of color	15.1%	15.7%	15.0%

Number of students who graduated for each of last 3 years:

"Information was requested but due to Covid-19, was never received"

Completion rate for each of last 3 years (course, certificate, degree)

Course Name	Sections	Course #	Registered	Dropped	Passed	PASS RATE
Basic Hand Tools	6	MEC102	33	9	18	75%
Industrial Safety	6	MEC103	31	6	23	92%
Hoisting and Rigging I	5	MEC124	9	1	8	100%
Pneumatics I	3	MEC125	11	1	10	100%
Hydraulics I	6	MEC130	30	2	18	64%
Mechanical Drives I	3	MEC135	8	1	7	100%
Mechatronics Special Topics	12	MEC199	72	4	56	82%
Pneumatics II	1	MEC226	1	0	1	100%
Hydraulics II	2	MEC231	3	0	3	100%
Robotics I	1	MEC240	3	0	3	100%
Mechanical Drafting	19	MET101	190	37	107	70%
Applied Shop Practices	9	MET104	29	8	19	91%
Blueprint Reading - Mechanical	14	MET105	111	18	63	68%
CAD I: Mechanical (Autodesk Inventor)	9	MET111	61	10	40	78%
CAD II: Mechanical (Autodesk Inventor)	8	MET112	21	2	15	79%
CAD III: Mechanical (Autodesk Inventor)	8	MET113	17	0	17	100%
CAD I: Mechanical (Intro. to SolidWorks)	16	MET121	101	16	69	81%
CAD II: Mechanical (SolidWorks)	13	MET122	51	5	42	91%
CAD III: Mechanical (SolidWorks)	8	MET123	22	2	19	95%
Materials & Metallurgy	3	MET160	37	5	32	100%
Introduction to Manufacturing	3	MFG101	48	8	36	90%
Metrology	9	MFG116	109	30	62	79%
Manufacturing Processes I	11	MFG121	127	30	74	76%
Manufacturing Processes II	10	MFG122	54	10	40	91%
Manufacturing Processes III	10	MFG123	23	3	17	85%
CNC Controls	9	MFG140	39	5	29	85%
Manufacturing Special Studies	8	MFG199	11	0	9	82%
AC/DC Electrical Systems for Mfg.	5	MFG210	13	2	10	91%
Electrical Control Systems & Sensors	2	MFG215	3	0	2	67%

Research and Development Prototyping	7	MFG220	16	0	14	88%
Statistics and Quality Control	3	MFG230	21	1	20	100%
Electric Motor Control I	4	MFG232	8	1	7	100%
Electric Motor Control II	3	MFG233	6	0	6	100%
CNC Programming - Mill	9	MFG241	31	2	23	79%
CAM I: Mastercam 2D	9	MFG242	31	1	29	97%
CAM I: Mastercam 3D	9	MFG243	30	1	26	90%
CNC Programming - Lathe	7	MFG244	14	0	13	93%
Computer Integrated Manufacturing	7	MFG255	14	1	12	92%
Lean Manufacturing	3	MFG262	17	0	17	100%
CWE/Manufacturing	21	MFG280	23	0	23	100%
Laser Cutting & Engraving Fundamentals	6	MFG291	15	0	15	100%

Sections of dual credit offered and pass rates

Course Number	Name of Course	High Schools Offering
MET101	Mechanical Drafting	GPHS, NMHS, NBHS
MET105	Blueprint Reading - Mechanical	GPHS, NMHS
MET121	CAD I: Mechanical – Intro to SolidWorks	GPHS, NMHS
MET122	CAD II: Mechanical - SolidWorks	NMHS
MET123	CAD III: Mechanical - SolidWorks	NMHS
MFG101	Intro to Manufacturing	GPHS

Although we have dual-credit courses, we do not have students enrolled.

Job placement/transfer data (if available) for each of last 3 years

Complete information data is not readily available, but a partial list is presented below…

AGS (American Gas Spring)	Manual Machinist
Cummins	Product Engineer
Diode Laser Concepts	Floor Manager
Eaton	Machinist / Fabricator
Erickson Aircrane	Manufacturing Manager

Executive Ordnance	Owner / Operator
Hassell Fabrication	Fabricator
Lighthouse Solutions	CNC Operator
Met-One Instruments	Product Engineer
MSV Racing	Owner / Operator
Noveske Rifleworks	Barrel Shop Manager
Pacific Tool & Gauge	CNC Operator
Pre-Tec	Automation Project Engineer
South Medford High School	Industrial Metals Instructor
Sweed Machine	Manual / CNC Machinist
Tucker Sno-Cat	R&D Design Engineer

Staffing Narrative:

Full-time Faculty ratio to Part-time Faculty						
	2016-2017		**2017-2018**		**2018-2019**	
	FT	Adj	FT	Adj	FT	Adj
Number of faculty:	1	3	1	4	2	3
Number of sections taught:	46	39	39	51	44	51

Are your staffing levels adequate to support achievement of your student learning outcomes? Why or why not?

Yes, but as our programs have continued to grow, it is becoming necessary to consider the addition of an additional P/T instructor to help cover “open-lab”. It is very challenging to find adjunct faculty that can teach effectively and adequately cover the breadth of all of the coursework that is offered every term in our open-lab format.

Budget Narrative:

The discretionary department budget has been marginally adequate over the past few years. Due to sharply rising costs of raw materials and the cost of new/emerging technology equipment, we have had to ask for a budget increase within the last two years. Computer and Non-Computer Tech Fee dollars have been extremely important in being able to upgrade older machinery/equipment and purchase newer technologies as necessary (3D printers, current industry software's, mechatronics specialized trainers, etc.) Being a Program of Study also allows for purchasing of additional new technologies through Perkin's funding.

Facility Narrative

The facility at the High-Tech Center is only two years old and any maintenance or repairs that have been needed have been addressed and there is no required work needed at this time. The new facility very effectively meets the current needs of the program.

College Resource Narrative:

The majority of the time our program needs are well met in these areas, and staff in these departments make tremendous efforts to serve our students effectively. As the campus with the lowest enrollment however, students at Table Rock have suffered at times, since its opening, from limited and inconsistent hours and staffing for some of these services. In addition, over the past several years we have had a difficult time trying to hire student workers to assist us in our labs. Students quite often have little extra time to do the work. Much effort goes into hiring for these positions and then there is often little gain as the students do not have the time necessary to do the job.

Section Three – Current Program Context

The fields of Manufacturing Engineering Technology and Mechatronics covers hundreds of varying job titles within almost every discipline of the industrial trades. Manufacturing Engineering, CNC Operator/Programmer and Mechatronics careers continue to be available and our graduates are in demand. Most of the graduates are staying in the area and going to work in local industry. Regardless of the economy, graduates of Manufacturing Engineering Technology and now Mechatronics have always had excellent rates of employment. Out of area companies such as Pre-Tec and Intel have recently began recruiting and meeting with students nearing graduation. Intel recently returned for another visit this year and approximately 10 students spoke with the recruiter about job opportunities that may be available.

Discuss local trends or issues in the community or the college that impact your program(s).

The employment market is strong for manufacturing and mechatronics students completing their AAS degree. There are more jobs than there are students to fill them. We regularly receive calls from employers trying to hire. Lighthouse Solutions and Cascade Fire have both announced plans for expanding and opening facilities near the High-Tech Center and have already expressed need for students when they open. Quite simply, a serious issue we face is not having enough students to meet industry needs. One strength of our blended open-lab delivery is that many more students can be enrolled in the program with very little increase in staffing. We have been working very closely with employers since re-opening at Table Rock in 2006, and one of the benefits of this close relationship is that the majority of students that are employed in the field before completing their degree return to RCC to complete their degree requirements. The employers understand the importance of the AAS degree and work with students and their work schedules in order for students to complete.

Advisory Boards Attendees:

(Past and Present)

Jake Austin	Sweed Machine	Dave McKeen	RCC, Electronics Technology, Dept. Chair
Randy Bettis	Croman	Jim Miller	Crater Highschool
David Bonine	Executive Ordnance, Owner	Tom Miller	RCC, Dean, Retired
Dave Brannen	Grants Pass High School	Robert Monson	Erickson AirCrane - Manufacturing Manager
Brenda Bunge	Grants Pass High School	Steve Moore	Eaton Corp Manager
Mike Burgess	Noveske Rifleworks	Kelley Neuschwander	KCI, Inc
Caroline Burns	Eaton	Jim Oberlander	Pro Weld
Bob Butterfield	Nor-Cal	Cathy Pierson	RCC, Apprenticeship Coordinator
Lisa Campbell	Nor-Cal Products Marketing	Kristopher Prusko	Ashland High School
Phillip Cam	RiverHawk Boats, CEO	Travis Raber	Boise Cascade

Galyn Carlile	RCC, Dean, Retired	Tammy Ramirez	Nor-Cal Products
Cheri Chaney	Nor-Cal	Kirby Renfro	Medford Fabrication
Kirstie Christopherson	North Medford High School	Gert Reve	AGS - American Gas Spring
Karla Clark	SOESD/CTE Comm. Outreach Facilitator	Brian Robin	SOESD/CTE
Tommy Deany	Nor-Cal Products	Larry Rux	JB Steel
Jamie Dorsey	Airgas, Sales	Steve Schilling	RCC, Dean Science and Technology
Myron Duke	Industrial Source	Chuck Schmoll Jr	Sweed Machine
Sam Foster	Erickson AirCrane	Jodie Shafer	ESC Composites
Larry Friend	ICW-USA	Lori Sours	RCC Outcomes and Assessment Strategist
Laura Garrett	RCC-Educational Partnerships, Coordinator	James Speelman	Hidden Valley High school, Instructor
Kirk Gibson	RCC, Vice President of Instruction	Jason Storm	Masterbrand
Tracy Glenn	Bay Cities Fabricators, Owner/G Fab, Owner	Jeff Sturgeon	Mazama High school
Mike Griffiths	Western Burner	Charles Thomas	Aviation Associates, Inc/ RCC Adjunct Instructor
Gene Gros	Highway Products	William Thorndike	Med Fab
Warren Helgeson	Newbridge High School	Kelly Tingley	ICW-USA - General Manager
Sam Herringshaw	Rogue River High School	Ken Tocher	Swanson Group
Robert Hodge	Siskiyou Design, President	John Underwood	Timber Products - HR Manager
Todd Hoefft	Biomass One, Maintenance Director	Rocky VanWormer	Prospect High School/College Now
Darren Hoie	Peterson Cat	Gary Varney	Varney Manufacturing

Jeff Hurd	JW Hurd	James Veverka	South Medford High School/ College Now
Joe Ivory	Apex Machine, Owner	Ric Walch	Medford Fabrication, Welding Engineer
Jeremy Kennedy	Phoenix High School	Ken Welburn	RCC, Apprenticeship Instructor
Kay Killian	Eaton, General Manager	John Williams	JB Steel
Jake Leair	Grants Pass High School	Lyn de l'Eau	Amy's Kitchen, Community Relations
Britt Leis	Ashland High School	Richard Britt	College Now
Bill Martin	Aviation Associates, Inc / Owner	Ken Klump	College Now
Greg Martinez	Rogue Truck Body	Jesse Holcomb	College Now
Christine Morris	RCC Educational Partnerships-Director		
Wayne McHugh	Three Rivers High School		

Describe how you gather external stakeholder feedback

We are in regular contact with out Advisory Board through meetings, phone calls, personal visits and emails. We also enjoy a good relationship with the industry in Southern Oregon and value their input.

Showcase highlights and any changes needed or made based upon that feedback.

Two come to mind;

1) The addition of 3D printing technology using “industrial grade” 3D printers for rapid prototype training and production. The addition of this technology has benefitted not only students, but local industry partners as well, several of which have provided files of prototype parts they needed to students in our R&D course to print out in a joint industry – college collaboration.
2) The moving of the Mechatronics program to the High-Tech Center. During the planning stages of the High Tech Center, it was being proposed that the Mechatronics program would remain at TRC in the old manufacturing lab in TRC142/143, and only the Manufacturing Engineering Technology program and the Industrial Welding program (housed at the VA Domiciliary) and would move into the HTC. Members of our joint

Manufacturing/Mechatronics/Welding Advisory Board STRONGLY recommended that the Mechatronics program in no uncertain terms needed to be housed in same building as Manufacturing and Welding. During this time, it was also decided to not have possibly not have dedicated lab space at the HTC for a “Makerspace” area as the HTC itself was in essence a Makerspace. During this time, it was also being decided that space in the HTC would not be used for a dedicated “Makerspace” lab freeing up space for Mechatronics. A follow up discussion with Advisory members solidified the choice to move Mechatronics to the HTC building into what would have been the Makerspace lab area.

Section Four – Program Learning Outcomes (PLOs) and Assessment

Management of course offerings and course outline updates:

Number of courses "owned" by this department:

- MFG Courses – 23
- MET Courses – 10
- MEC Courses – 43

- What is the department's schedule and process for updating official course outlines?

Course	2020	2021	2022
FG101 Introduction to Manufacturing		X	
MFG116 Metrology			X
MFG121 Manufacturing Process I	X		
MFG122 Manufacturing Processes II		X	
MFG123 Manufacturing Process III	X		
MFG140 CNC Controls	X		
MFG199 Special Studies in Manufacturing Wood Lathes			X
MFG199 Special Studies Mastercam 4th Axis Programming			X
MFG199 AC-DC Electrical Systems for Manufacturing			X
MFG199 Electrical Control Systems			X

Sensors for Manufacturing			
MFG199C Spec Studies Electric Motor Control I			X
MFG199D Spec Studies Electric Motor Control II - edited			X
MFG199D Spec Studies Electric Motor Control II			X
MFG199G Spec Studies Hydraulics I			X
MFG199H Spec Studies Basic Pneumatics			X
MFG199J Spec Studies Manufacturing Power and Control Electronics	X		
MFG199LSpec Studies Laser Cutting and Engraving Fundamentals			X
MFG199M Spec Studies Mechanical Drives I Course Outline			X
MFG199P Spec Studies CNC Plasma Cutting			X
MFG210 MEC110 AC-DC Electrical Systems for Manufacturing		X	
MFG211 Manufacturing Power and Control Electronics		X	
MFG215 MEC115 Elect Control Sys Sensors for Manufacturing		X	

MFG220 Research and Development Prototyping		X	
MFG230 Statistics and Quality Control		X	
MFG232 Electric Motor Control I	X		
MFG233 Electric Motor Control II	X		
MFG241 Computer Numerical Control Programming - Mill		X	
MFG242 Computer Aided Manufacturing I-Mastercam		X	
MFG243 Computer Aided Manufacturing II-Mastercam		X	
MFG244 Computer Numerical Control Programming - Lathe		X	
MFG255 Computer Integrated Manufacturing		X	
MFG262 Lean Manufacturing		X	
MFG280 CWE - Manufacturing			X
MFG280S Cooperative Work Experience - Manufacturing			X
MFG291 Laser Cutting and Engraving Fundamentals			X
MET101 Mechanical Drafting		X	
MET104 Applied Shop Practices	X		

MET105-WLD104 Blueprint Reading - Mechanical	X		
MET111 Computer Aided Drafting I- Autodesk Inventor	X		
MET112 Computer Aided Drafting II- Autodesk Inventor	X		
MET113 Computer Aided Drafting III- Autodesk Inventor		X	
MET121 Computer Aided Drafting I - SolidWorks		X	
MET122 Computer Aided Drafting II- SolidWorks		X	
MET123 Computer Aided Drafting III- SolidWorks		X	
MET160 Materials and Metallurgy		X	
MEC102 Basic Hand Tools	X		
MEC103 Industrial Safety	X		
MEC110/MFG210 AC-DC Electrical Systems for Manufacturing	X		
MEC114 Safety for Industry		X	
MEC115/MFG215 Elect Control Sys Sensors for Manufacturing		X	
MEC116 Quality Practices and Measurement		X	

MEC118 Manufacturing Processes and Production		X	
MEC120 Maintenance Awareness		X	
MEC124 Hoisting and Rigging I		X	
MEC125 Pneumatics I		X	
MEC130 Hydraulics I		X	
MEC135 Mechanical Drives I		X	
MEC140 Green Production		X	
MEC149 Electric Motor Control		X	
MEC150 PLC Motor Control	X		
MEC151 Programming PLC's I	X		
MEC152 Programming PLC's II	X		
MEC199 Special Studies in Mechatronics	X		
MEC199A Safety for Industry			X
MEC199B Quality Practices and Measures			X
MEC199C Manufacturing Processes and Production	X		
MEC199D Maintenance Awareness	X		
MEC226 Pneumatics II	X		

MEC228 Pneumatic Fittings and Troubleshooting	X		
MEC231 Hydraulics II	X		
MEC233 Hydraulic Troubleshooting	X		
MEC236 Mechanical Drives II	X		
MEC238 Mechanical Drives III	X		
MEC240 Robotics I	X		
MEC 260A Selected Topics	X		
MEC 260B Selected Topics	X		
MEC 260B Selected Topics	X		
MEC 260C Selected Topics	X		
MEC 260D Selected Topics	X		
MEC 260E Selected Topics	X		
MEC 260F Selected Topics	X		
MEC 260G Selected Topics	X		
MEC 260H Selected Topics	X		
MEC 260I Selected Topics	X		
MEC 260J Selected Topics	X		
MEC 260K Selected Topics	X		

What is the department's process for reviewing and updating Program Learning Outcomes (PLOs)?

Industry partners were included in the process to identify the program's learning outcomes. The advisory committee reviews the PLO's annually. The program specific outcomes are very broad statements that encompass what students need to be able to do out there that we are responsible for here.

List your stakeholders (internal and external) and describe how they are involved in the development and review of your PLOs.

Internally, the college to oversee and assess that we do what we are saying we do. Companies that hire our graduates, including our advisory committee partners, are our primary external stakeholder. Their input is critical in ensuring our programs prepare students to work and progress in the field. We make changes to curriculum and assessment every year based on their input to keep our program up to date and relevant.

PLO assessment plan:

Manufacturing/Engineering Technology - Associate of Applied Science Degree (AAS)
Program Outcomes Curriculum Map and Plan[1]

Program outcomes: *Graduates should be able to…*	MET 101	MET 105	MFG 101	MFG 121	MFG 116	MET 104	MET 121	MET 160	MFG 122	MFG 140	MET 122	MFG 123	MFG 241
1. Operate, set up, and program manual and CNC mills and lathes to print specifications.										I			R/A[2] (2018-19)
2. Interpret and create mechanical blueprints to industry standards.	I/A[3] (2020-21	R		R	R		R		R	R	R	R	R
3. Follow, develop, and troubleshoot manufacturing processes and procedures.			I	R/A[4] (2019-20)					R	R		R	R
4. Demonstrate the ability to adhere to personal and industry safety standards to protect personnel and equipment.			I	R	R			R	R	R		R	R/A[5] (2018-19)

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[1] I, R, and A indicate the main core requirement courses in which each outcome is introduced, reinforced, and formally assessed. Core requirement courses that are not a part of this certificate are excluded from the list of courses. This document was created and reviewed by S. Foster.
[2] Program outcome 1 assessed in MFG 241 (CNC Programming-Mill) in the final exam.
[3] Program outcome 2 is assessed in MET 101 (Mechanical Drafting) in the final assignment.
[4] Program outcome 3 is assessed in MFG 121Manufacturing Processes I) in the final project.
[5]Program outcome 4 assessed in MFG 241 (CNC Programming-Mill) in lab participation.

Manufacturing/Engineering Technology: CNC Technician – Certificate of Completion
Program Outcomes Curriculum Map and Plan[1]

Program outcomes: *Graduates should be able to…*	MET 101	MET 105	MFG 101	MFG 116	MFG 121	MET 104	MET 121	MET 160	MFG 122	MFG 140	MET 122	MFG 123	MFG 241
1. Operate, set up, and program manual and CNC mills and lathes to print specifications.										I			R/A[2] (2018-19)
2. Interpret and create mechanical blueprints to industry standards.	I/A[3] (2020-21)	R		R	R		R		R	R	R	R	R
3. Follow, develop, and troubleshoot manufacturing processes and procedures.			I		R/A[4] (2019-20)				R	R		R	R
4. Demonstrate the ability to adhere to personal and industry safety standards to protect personnel and equipment.			I/R	R	R			R	R	R		R	A[5] (2018-19)

[1] I, R, and A indicate the main core requirement courses in which each outcome is introduced, reinforced, and formally assessed. Core requirement courses that are not a part of this certificate are excluded from the list of courses. This document was created and reviewed by S. Foster.
[2] Program outcome assessed in MFG 241 (CNC Programming-Mill) in the final exam.
[3] Program outcome 2 is assessed in MET 101 (Mechanical Drafting) in the final assignment.
[4] Program outcome 3 is assessed in MFG 121 (Manufacturing Processes) in the final project.
[5] Program outcome assessed in MFG 241 (CNC Programming-Mill) in lab participation.

Mechatronics - Associate of Applied Science Degree (AAS)
Program Outcomes Curriculum Map and Plan[1]

Program outcomes: *Graduates should be able to…*	MEC 103	MEC 110	MEC 125	MET 105	MFG 116	MEC 115	MEC 124	MFG 121	MEC 130	MEC 135	MEC 149	MEC 150	MEC 231	MEC 236	MEC 151	MEC 152	MFG 280	MEC 114 E
1. Install, troubleshoot, maintain and repair mechatronic systems using industry-standard tools, practices and procedures.	I	R	R			R	R		A[2] (2018-19)	R	R	R	R	R	R	R		
2. Organize, interpret, and use technical information and documentation.			I/A[3] (2020-21)						R						R	R		
3. Demonstrate the ability to adhere to personal and industry safety standards.	I	R	R		R	R			A[4] (2018-19)	R	R	R	R	R	R	R		

[1] I, R, and A indicate the main core requirement courses in which each outcome is introduced, reinforced, and formally assessed. Core requirement courses that are not a part of this certificate are excluded from the list of courses. This document was created and reviewed by M. Bullard

[2] Program outcome 1 is assessed in MEC 130 (Hydraulics I) in final quiz.

[3] Program outcome 2 is assessed in MEC 125 (Pneumatics I) in the final project.

[4] Program outcome 3 is assessed in MEC 130 (Hydraulics I) in the quiz 6.

Mechatronics Specialist – Certificate of Completion
Program Outcomes Curriculum Map and Plan[1]
Updated 2020-04-27

Program outcomes: *Graduates should be able to…*	MEC 103	MEC 110	MEC 125	MET 105	MFG 116	MEC 115	MEC 124	MFG 121	MEC 130	MEC 135	MEC 149
1. Install, troubleshoot, maintain and repair mechatronic systems using industry-standard tools, practices and procedures.									A[2] (2018-19)		
2. Organize, interpret, and use technical information and documentation.			I/R[3] (2020-21)				R		R		R
3. Demonstrate the ability to adhere to personal and industry safety standards.	I	R	R				R		A[4] (2018-19)	R	R

[1] I, R, and A indicate the main core requirement courses in which each outcome is introduced, reinforced, and formally assessed. Core requirement courses that are not a part of this certificate are excluded from the list of courses. This document was created and reviewed by M. Bullard
[2] Program outcome 1 is assessed in MEC 130 (Hydraulics I) in the final quiz.
[3] Program outcome 2 is assessed in MEC 125 (Pneumatics I) in the final project.
[4] Program outcome 3 is assessed in MEC 130 (Hydraulics I) in quiz 6.

PLO assessment data collection and analysis:

Manufacturing/Engineering Technology AAS Degree-CNC Certificate of Completion- Associate of Science Degree Transfer to OT

Program Outcome Report (2018-19)

Date report submitted	5/28/19
Program faculty who contributed to this report	S. Foster
Program outcome	PLO # 1 – Operate, setup, and program manual and CNC mills and lathes to print specification.
Course(s) that formally assesses this program outcome (at its highest level, see program outcome curriculum map and plan)	MFG 241
Number of students assessed for this program outcome	15
Quarter students were assessed (e.g., fall 2018)	Fall 2018

II. Assessment of indicators for the program outcome (add more rows if necessary)

Indicators (taken from rubric) Students will be able to…	List the most significant **teaching and learning activities** used by faculty to facilitate the learning of <u>each indicator</u> in their class(es)	List the **graded assignment(s) that formally assesses** <u>each indicator</u> at its highest level	**Performance expectations:** Identify the percentage range for each level of performance by replacing the "xx's" below	**Average score for the indicator (%)**	**How well did the students perform?**
Operate lathe	Weekly course lectures, quizzes, assignments, demonstrate in labs, assigned readings and assignment	Final Exam	Below expected levels: 0 – 65 % At expected levels: 65 – 90 % Above expected levels: 90 – 100%	89%	☐ below expected levels ☒ at expected levels ☐ above expected levels
Print to Specification	Labs, assigned readings, exams, assignment feedback	Capstone Project	Below expected levels: 0 – 65 % At expected levels: 65 – 90 % Above expected levels: 90 – 100%	93%	☐ below expected levels ☐ at expected levels ☒ above expected levels

Indirect Evidence	Describe the Indirect Evidence (Signs students are probably learning, but the evidence of exactly what they are learning is less clear and less convincing
Hours reported	Number of hours students spend in labs

III. Overall assessment of this program outcome (please be thorough in all responses)

<table>
<tr><td>Overall, how well did the students perform on this program outcome? (to checkmark a box, right-click on the checkbox and select 'properties' and 'checked')</td><td>☐ below expected levels
☐ at expected levels
☒ above expected levels</td></tr>
<tr><td>Analyze assessment of indicator results in section II: What does the information in section II suggest to you about the performance expectations, the teaching strategies, and student learning?</td><td>PLO 1 is formally assessed in MFG 241

<table><tr><td>MFG241 CNC Programming - MILL
Grade information taken from module assignment scores, project scores, and final exam/project</td><td>Student Achievement Level September-2014 to June-2019 (56 individual records)</td></tr><tr><td>69% or less</td><td>26%</td></tr><tr><td>70% – 79%</td><td>11%</td></tr><tr><td>80% - 89%</td><td>14%</td></tr><tr><td>90% - 98%</td><td>40%</td></tr><tr><td>99% - 100%</td><td>9%</td></tr></table></td></tr>
<tr><td>Next steps: Plans for reinforcing effective teaching and learning strategies and for improving student learning (clearly identify what will be done, by whom, by when, and how you will assess the impact of the changes)</td><td>We are currently looking into aligning PLO#1 with industry certification which focuses on Hass CNC Mill programming.

Several certification options we will look into are those currently available through Tooling U-SME, NIMS (National Institute for Metalworking Standards, and Amatrol/NIMS.</td></tr>
</table>

	Will also be working on achieving 60% or greater in 90% - 98% category and 10% or greater in 99% - 100% category
Projected quarter of implementing "next steps"	Fall 2020
Results of "next steps" implementation – this section is to be completed the following year (describe how the implementation of the above "next steps" impacted teaching and learning in the program)	
Date the "results of 'next steps' implementation" section above was submitted	
Suggestions for improving this report or process (if any)	

Mechatronics AAS Degree and Certificate of Completion
Program Outcome Report (2018-19)

I. General information

Date report submitted	5/28/19
Program faculty who contributed to this report	M. Bullard S. Foster
Program outcome	PLO # 1 – Install, troubleshoot, maintain and repair mechatronic systems using industry-standard tools, practices and procedures. PLO #6- Demonstrate the ability to adhere to personal and industry safety standards.
Course(s) that formally assesses this program outcome (at its highest level, see program outcome curriculum map and plan)	MEC 130
Number of students assessed for this program outcome	16
Quarter students were assessed (e.g., fall 2018)	Fall 2018

II. Assessment of indicators for the program outcome (add more rows if necessary)

Indicators (taken from rubric) Students will be able to…	List the most significant **teaching and learning activities** used by faculty to facilitate the learning of each indicator in their class(es)	List the **graded assignment(s) that formally assesses** each indicator at its highest level	**Performance expectations:** Identify the percentage range for each level of performance by replacing the "xx's" below	**Average score for the indicator (%)**	**How well did the students perform?**
Operate mechatronic system	Weekly course lectures, quizzes, assignments, demonstrate in labs, assigned readings and assignment feedback	Final quiz	Below expected levels: 0 – 65 % At expected levels: 65 – 90 % Above expected levels: 90 – 100%	89%	☐ below expected levels ☒ at expected levels ☐ above expected levels
Demonstrate Safety Standards	Labs, assigned readings, assignment feedback	Quiz 6	Below expected levels: 0 – 65 % At expected levels: 65 – 90 % Above expected levels: 90 – 100%	93%	☐ below expected levels ☐ at expected levels ☒ above expected levels

Indirect Evidence	Describe the Indirect Evidence (Signs students are probably learning, but the evidence of exactly what they are learning is less clear and less convincing
Hours reported	Number of hours students spend in labs and Blackboard
Observation	Observations from adjunct faculty, and feedback from students who have worked through the curriculum. These students who have a working knowledge of the processes will assist other students in their understanding.

Indirect Evidence	Describe the Indirect Evidence (Signs students are probably learning, but the evidence of exactly what they are learning is less clear and less convincing
	Evidence of this compared to the quiz information gathered shows these students have a better hands-on learning experience than online instructional.

III. Overall assessment of this program outcome (please be thorough in all responses)

Overall, how well did the students perform on this program outcome? (to checkmark a box, right-click on the checkbox and select 'properties' and 'checked')	☐ below expected levels ☐ at expected levels ☒ above expected levels

<table>
<tr>
<td>Analyze assessment of indicator results in section II: What does the information in section II suggest to you about the performance expectations, the teaching strategies, and student learning?</td>
<td>PLO 1 & 6 are assessed in MEC 130

<table>
<tr><th>MEC130
Basic Hydraulics
Information taken from quiz scores only</th><th>Student Achievement level September-2016 to March-2019</th></tr>
<tr><td>Not met</td><td>17%</td></tr>
<tr><td>Emerging understanding</td><td>11%</td></tr>
<tr><td>Proficient</td><td>20%</td></tr>
<tr><td>Approaching mastery</td><td>16%</td></tr>
<tr><td>Exemplary</td><td>42%</td></tr>
</table>

PLO 6

<table>
<tr><th>MEC130
Basic Hydraulics</th><th>Student Achievement level September-2016 to March-2019</th></tr>
<tr><td>Not met</td><td>14%</td></tr>
<tr><td>Emerging understanding</td><td>15%</td></tr>
<tr><td>Proficient</td><td>13%</td></tr>
<tr><td>Approaching mastery</td><td>26%</td></tr>
<tr><td>Exemplary</td><td>42%</td></tr>
</table>
</td>
</tr>
</table>

Next steps: Plans for reinforcing effective teaching and learning strategies and for improving student learning (clearly identify what will be done, by whom, by when, and how you will assess the impact of the changes)	I will focus on making an adjustment to the minimum test score along with curriculum locked until the student shows competency before moving on. Time will be well spent creating videos and possibly extending or adding lecture time to the curriculum. I will be working toward 60% in the exemplary category
Projected quarter of implementing "next steps"	January 2020
Results of "next steps" implementation – this section is to be completed the following year (describe how the implementation of the above "next steps" impacted teaching and learning in the program)	
Date the "results of 'next steps' implementation" section above was submitted	
Suggestions for improving this report or process (if any)	

Faculty Development:

- Instructor Qualifications. In 2018, RCC adopted new/updated guidelines for instructor qualifications as follows;
    - For Career and Technical Education (CTE) instructors shall meet one of the following sets of criteria as recommended by the appropriate department:
        - Hold a master's degree in the subject area and have a minimum of three years of relevant full-time non-teaching experience or
        - Hold a master's degree in a related area and have completed at least 24-30 quarter hours or equivalent semester hours or equivalent semester hours of upper division credit in the subject area) and have a minimum of three years of relevant full-time non-teaching experience, or
        - Hold a bachelor's degree in the subject area and have a minimum of four years of relevant full-time non-teaching experience or
        - Hold a bachelor's degree in a related area and have completed at least 24-30 quarter hours or equivalent semester hours of upper division credit in the subject area) and have a minimum of four years of relevant full-time non-teaching experience, or
        - Hold an associates degree in a career or technical field or in the subject area, whichever is more appropriate, and have a minimum of five years of relevant full-time non-teaching experience, or
        - Have a high level of demonstrable competency, hold appropriate industry-based certifications and have a minimum of five years of relevant full-time experience. (Competency can be gained through a combination of study, teaching experience, professional performance in the subject area, or qualifications set by the licensing or accrediting organization for the subject area.)

In addition to the instructor qualifications, it is very important for our faculty to keep up with industry trends and standards. All of our instructors have worked or still currently work in the manufacturing and/or mechatronics fields. Along with their work experience, they all hold various industry recognized certifications as well as degrees and/or certificates in manufacturing engineering technology and mechatronics fields of study.

To help in stay current with industry trends faculty members also continue to use Professional Development funds to attend trainings and courses for new emerging machinery technology and industry used software. Additionally, the Manufacturing Engineering technology program would like to take up the conversation around NIMS (National Industry Machining Standards) to see if the training and certification for NIMS would be useful as a professional development standard for faculty members. No decision on this has been made to date.

Section Five – Evidence-Based Changes

Based on the evidence from your learning outcomes assessment and other information related to student success (such as graduation rates); describe recent or anticipated changes:

- Complete a study on time on all course offerings through student survey or other means to confirm direct relationship between time required to complete/master respective courses and credit offered. Doing so will enable the Manufacturing Engineering and Mechatronics programs to determine whether courses are right-sized and which need adjusting. This data will also help "free up" redundant credit if such instances exist.
- Continue to move towards offering more project based curriculum. The evidence clearly shows that assigning engaging and challenging projects leads to a more intrinsically motivated model of learning.
- Develop additional content and possibly new courses bridging identified learning gaps between CNC programming, Mastercam CAD/CAM and CNC machine operations.
- Add new courses specifically focusing on;
  - Electric Motor Controls
  - Fixturing and work-holding
- Add content in our CNC Programming course in production efficiency and tool life.
- Continue and complete development of a one year CADD Certificate of Completion
- Develop stackable "Micro Certificates" for both programs
- Develop a comprehensive and streamlined, evidence based approach to the evaluation of student learning and pedagogical improvement.
- Explore more intuitive connections to the Rogue Innovation Hub and new curriculum for RCC's Manufacturing Engineering Technology and Mechatronics programs. Anecdotally, there is considerable community interest in the tools, techniques and capabilities of the machining trade. In accordance with Theme 1 / Objective 1 (Access to Educational Opportunities / Improve access to educational and support systems for current and prospective students), we plan to explore the development of a comprehensive introductory survey class for non-majors such as ENGR, ART, as well as members of the community.

Section Six - Institutional Learning Outcomes (ILOs)

Mechatronics - Associate of Applied Science (AAS)

ILO Curriculum Map

Institutional Learning Outcomes	MEC 103	MEC 110	MEC 125	MET 105	MFG 116	MEC 115	MEC 124	MFG 121	MEC 130	MEC 135	MEC 149	MEC 150	MEC 231	MEC 236	MEC 151	MEC 152	MFG 280	EET 104	BT 101	HE 112	GS 104	LIB 127	WLD 111	WR 121 OR BT 114
1. Application of Knowledge		A	A	A	A	A		A	A	A	A	A	A	A	A	A	A	A				A	A	
2. Approach to Learning	A							A				A			A	A	A					A		A
3. Communication								A									A	A	A		A			A
4. Critical Thinking		A	A			A	A	A	A	A	A		A	A	A	A	A						A	

Manufacturing/Engineering Technology - Associate of Applied Science (AAS)
ILO Curriculum Map

Institutional Learning Outcomes	MET 101	MET 105	MFG 101	MFG 121	MET 104	MET 121	MET 160	MFG 122	MFG 140	MET 122	MFG 123	MFG 241	MFG 230	MFG 242	MFG 220	MFG 243	MET 111	MFG 255 or MFG 280	MFG 262	EET 101	HE 112	PSY 101	LIB 127	MTH 63	WR 115	WR 121 OR BT 114	WLD 101	WLD 102
2. Application of Knowledge	A	A	A	A	A	A	A	A	A	A	A	A	A	A		A	A	A	A	A		A	A	A			A	A
5. Approach to Learning			A	A		A		A		A	A	A	A		A		A	A	A	A			A		A	A		
6. Communication			A	A				A			A				A			A		A				A	A	A		
7. Critical Thinking				A	A		A	A			A							A				A					A	A

Manufacturing/Engineering Technology Transfer to OT – Associate of Science (AS)
ILO Curriculum Map

Institutional Learning Outcomes	MET 101	MFG 121	MET 121	MET 160	MET 122	MFG 140	MFG 241	LIB 127	MTH 111	MTH 112	MTH 243	WR 121	WR 122	PSY 101	WLD 101	CIS 125 SS or BA 285
3. Application of Knowledge	A	A	A	A	A	A	A	A	A	A	A			A	A	A
8. Approach to Learning		A	A		A		A	A	A	A		A	A			
9. Communication		A									A	A	A			A
10. Critical Thinking		A		A					A	A	A		A	A	A	

Manufacturing/Engineering Technology: Computer Numerical Control Technician - Certificate
ILO Curriculum Map

Institutional Learning Outcomes	MET 101	MET 105	MFG 101	MFG 121	MFG 116	MET 104	MET 121	MET 160	MFG 122	MFG 140	MET 122	MFG 123	MFG 241	MTH 63	WR 115	PSY 101
4. Application of Knowledge	A	A	A	A		A	A	A	A	A	A	A	A	A		A
11. Approach to Learning			A	A			A		A		A	A	A		A	
12. Communication			A	A					A			A		A	A	
13. Critical Thinking				A		A		A	A			A				A

Mechatronics Specialist – Certificate of Completion
ILO Curriculum Map

Institutional Learning Outcomes	MEC 103	MEC 110	MEC 125	MET 105	MFG 116	MEC 115	MEC 124	MFG 121	MEC 130	MEC 135	MEC 149	EET 104	BT 101	HE 112	WLD 111
5. Application of Knowledge		A	A	A	A	A		A	A	A	A	A			A
14. Approach to Learning	A							A							
15. Communication								A				A	A		
16. Critical Thinking		A	A			A	A	A	A	A	A				A

This year we focused on updating our course outlines and making sure we were assessing the right ILO in the best course. We are working on aligning an assessment point in designated courses and our first ILO assessment will occur in 2020-2021 school year.

Section Seven - Summary

The Manufacturing Engineering Technology and Mechatronics programs are very effective in meeting the needs of our students and local industry partners. As such, we are integral components of the manufacturing and mechatronics systems located in Southern Oregon and a vital resource for the Jackson and Josephine county communities.

We have enjoyed and continue to enjoy strong and highly collaborative partnerships with the local companies who hire our students, sharing resources and planning for the training needs of the future. Those organizations benefit from the quality of training and education we provide and also support us through donations of equipment and supplies, and coordination of new courses and training for emerging technologies in our trades.

A clear strength of our programs is our incredibly dedicated staff who consistently strive to meet or exceed industry standards for job skills, improve their own knowledge and skills as educators, and seek out creative ways to engage students and improve our courses.

One of the challenges we face is keeping pace with the constant change with processes and technology that is ever present in the manufacturing and mechatronics fields. A continued focus on the importance of professional development for our faculty is critical in this effort. Also important for student learning is the ability to continue to purchase and provide current equipment and industry software(s) being used by industry. This equipment and software can at times be very expensive and we believe that a fee structure to support these costs is essential in order to provide appropriate training for our current and future students.

At the time of this writing, our program review is incomplete due to Covid-19 and we are missing relevant data that was needed which would have allowed for a thorough and complete program review. With that said, we are seeing that to this point the program review process has not uncovered any glaring problems or weaknesses, but does seem to reinforce the good work we are doing and has helped us begin to identify areas we can continue to grow and improve.

Section Eight - Attachments

Link to Department Website

https://www.roguecc.edu/landing/manufacturingEngineering.html

https://www.roguecc.edu/landing/mechatronics.html

Syllabus

MEC102-R1 Basic Hand Tools
Winter 2020

Day/Time/Location: Tues. – Friday 11am-7pm HTC-08

Instructor: Michael Bullard

Email: MBullard@Roguecc.edu

Contact: 541-245-7832

Course Description

Introduces learners to the basic knowledge needed for assembly. Learners focus on the proper and safe application of hand tools. Coursework builds knowledge in the many types of bolts, wrenches, and other fittings commonly used in industry and how to properly apply them, including pneumatic fabrication fittings. Focuses on proper techniques for checking connections and testing fittings with an emphasis on safety. Proper tool use helps in many ways, including injury avoidance, fewer product quality issues, and lower tool breakage costs.

Prerequisites

CS120 or documented proficiency, MTH20, RD90

Course Materials and Required Texts

Mechanical Fabrication Student Reference, 1st Ed. Indiana, Amatrol, Inc. 2014 (Required)

Pen, Pencil, Notebook, 8gig minimum thumb drive.

Institutional Learning Outcomes (ILO)

Institutional Learning Outcomes (ILOs) are skills that will contribute to your success in life beyond RCC***.*** Rogue's ILOs are: Application of Knowledge (AK), Approach to Learning (AL), Communication (COM) and Critical Thinking (CT).

Why are they important?

- *Employers call these soft skills or employability skills. They may help you get and keep a job.*
- *These are skills that will help you complete a 4-year degree.*
- *They are skills for success in your life as a family member, worker, citizen, life-long learner, and more.*

Application of Knowledge (AK)	Students will synthesize and use knowledge in familiar and unfamiliar situations to effectively solve problems and complete tasks.
Approach to Learning (AL)	Students will engage in and take responsibility for intentional learning, seek new knowledge and skills to guide their continuous and independent development, and adapt to new situations.
Communication (COM)	Students will engage in quality communication using active listening and reading skills and expressing ideas appropriately in oral, written, and visual work.
Critical Thinking (CT)	Students can recognize own and others' assumptions and cultural contexts, raise significant and relevant questions, demonstrate an ability to seek, organize, analyze, and interpret data, foresee consequences of actions, and engage in behaviors that support sustainability.

Course Learning Outcomes

In the left-hand column below, you will find the expected learning outcomes for this course. The outcomes are assessed by the methods described in the middle column. In the right-hand column you will see “ILO Key Indicators.”

Course Outcomes, ILO (Institutional Learning Outcomes) Indicators and Assessment

On successful completion of this course, students will be able to:

Course Learning Outcomes:	Assessment Methods:	ILO Key Indicators:
1. Apply the basics of threaded fasteners. Identify assembly concepts, bolt types, bolts sizes and bolt grades. Apply the use of fixed and adjustable wrenches.	Completion of written assignments and lab projects. Assignments and projects will be assessed with scoring rubric. Instructor observation.	**AK** - Students will synthesize and use knowledge in familiar and unfamiliar situations to effectively solve problems and complete tasks.
2. List eight wrench safety rules. Practice how to tighten a threaded fastener with a fixed wrench. Identify Allen and ratchet wrenches.	Completion of written assignments and lab projects. Assignments and projects will be assessed with scoring rubric. Instructor observation.	
3. Describe the basic components of a pneumatic system. Describe three types of pipe threads. Describe three types of pneumatic fittings. Describe four types of pneumatic tubing.	Completion of written assignments and lab projects. Assignments and projects will be assessed with scoring rubric. Instructor observation.	**CT** - Students can recognize own and others’ assumptions and cultural contexts, raise significant and relevant questions, demonstrate an ability to seek, organize, analyze, and interpret data, foresee consequences of actions, and engage in

Course Learning Outcomes:	Assessment Methods:	ILO Key Indicators:
		behaviors that support sustainability.
4. Describe the function of the four types of screws and screwdrivers: flathead, Phillips head and nut drivers. Describe the function of pliers and locking devices.	Completion of written assignments and lab projects. Assignments and projects will be assessed with scoring rubric. Instructor observation.	
5. Apply the usage of clamps, vises, pliers, locking nut devices and rings. Practice the use of mallets and non-threaded fasteners and locking pins.	Completion of written assignments and lab projects. Assignments and projects will be assessed with scoring rubric. Instructor observation.	
6. Define torque and explain its importance, how it's calculated and the formula to use it. Describe how to safely use portable hand tools.	Completion of written assignments and lab projects. Assignments and projects will be assessed with scoring rubric. Instructor observation.	

Schedule of Assignments

COURSE CONTENT:

1. **Threaded Fasteners**
    a. Assembly Concepts
        i. Objective 1 - Describe Two Categories of Assembly
        ii. Objective 2 - Define Threaded and Non-Threaded Fasteners
        iii. Objective 3 - Define Four Categories of Threaded Fasteners
        iv. Self Review 1
    b. Bolt Types
        i. Objective 4 - Describe the Construction and Operation of a Bolt
        ii. Objective 5 - Describe How Bolts Are Specified
        iii. Objective 6 - Describe Five Types of Bolts Heads and Give an Application of Each
        iv. Skill 1 - Identify Bolt Type Given a Sample
        v. Self Review 2
    c. Bolt Sizes
        i. Objective 7 - Explain How Metric Bolts Are Sized
        ii. Skill 2 - Identify Metric Bolt Size Given a Sample
        iii. Objective 8 - Explain How US Customary Bolts Are Sized
        iv. Skill 3 - Identify US Customary Bolt Size Given a Sample
        v. Self Review 3
    d. Bolt Grades
        i. Objective 9 - Explain How Metric Bolts Are Graded
        ii. Skill 4 - Identify Metric Bolt Grade Given a Sample
        iii. Objective 10 - Explain How US Customary Bolts Are Graded
        iv. Skill 5 - Identify US Customary Bolt Grade Given a Sample
        v. Self Review 4
    e. Washers
        i. Objective 11 - Describe the Operation of Four Types of Washers
        ii. Objective 12 - Explain How Washers Are Designated
        iii. Skill 6 - Identify Washer Type Given a Sample
        iv. Self Review 5

2. **Wrenches**
   a. Installation
      i. Objective 1 - Describe How to Inspect a Threaded Fastener and Explain Its Importance
      ii. Objective 2 - Describe Three Types of Fastener Compounds
      iii. Objective 3 - Explain How to Install a Threaded Fastener
      iv. Skill 1 - Inspect and Install a Threaded Fastener
      v. Self Review 1
   b. Fixed Wrenches
      i. Objective 4 - Describe the Construction of Four Types of Fixed Wrenches
      ii. Objective 5 - Describe Eight Wrench Safety Rules
      iii. Objective 6 - Describe How to Use a Fixed Wrench to Tighten a Threaded Fastener
      iv. Objective 7 - Describe the Function of a Backup Wrench
      v. Skill 2 - Use a Fixed Wrench to Tighten a Threaded Fastener
      vi. Self Review 2
   c. Adjustable Wrenches
      i. Objective 8 - Describe the Construction of an Adjustable Wrench
      ii. Objective 9 - Describe How to Use an Adjustable Wrench to Tighten a Threaded Fastener
      iii. Skill 3 - Use an Adjustable Wrench to Tighten a Threaded Fastener
      iv. Self Review 3
   d. Allen Wrenches
      i. Objective 10 - Describe the Construction of Two Types of Allen Wrenches
      ii. Objective 11 - Describe How to Use an Allen Wrench to Tighten a Threaded Fastener
      iii. Skill 4 - Use an Allen Wrench to Tighten a Threaded Fastener
      iv. Self Review 4
   e. Ratchet Wrenches
      i. Objective 12 - Describe the Operation of a Ratchet Wrench
      ii. Objective 13 - Describe Three Types of Ratchet Wrench Attachments
      iii. Objective 14 - Describe How to Use a Ratchet Wrench to Tighten a Threaded Fastener
      iv. Objective 15 - Describe the Sequence Used to Tighten Bolts Arranged in a Pattern
      v. Skill 5 - Use a Ratchet Wrench to Tighten a Threaded Fastener
      vi. Self Review 5

3. **Pneumatic Systems Fabrication**

a. Fluid Circuit Components

i. Objective 1 - Describe the Basic Components of a Pneumatic System
ii. Objective 2 - Describe Three Types of Pneumatic System Conductors
iii. Objective 3 - Describe the Construction of a Rubber Air Hose
iv. Objective 4 - Describe Three Methods of Connecting Rubber Hose to a Fitting
v. Objective 5 - Describe How to Install a Barb Fitting onto a Rubber Hose
vi. Skill 1 - Install a Barb Fitting onto a Rubber Hose
vii. Self Review 1

b. Pipe Thread Components

i. Objective 6 - Describe Three Types of Fitting Threads
ii. Objective 7 - Describe How Pipe Threads Are Designated
iii. Skill 2 - Identify Pipe Thread Size Given a Sample
iv. Objective 8 - Describe How to Install Pipe Thread Fittings
v. Skill 3 - Install Pipe Thread Pneumatic Fittings
vi. Self Review 2

c. Pneumatic Fittings

i. Objective 9 - Describe Three Types of Pneumatic Fittings
ii. Objective 10 - Describe Six Styles of Pneumatic Fittings
iii. Skill 4 - Identify Fitting Type and Style Given an Example
iv. Objective 11 - Describe How Straight Thread Fittings Are Designated
v. Objective 12 - Describe How to Install Straight Thread Fittings
vi. Skill 5 - Install Straight Thread Pneumatic Fittings
vii. Objective 13 - Describe How to Install a Bulkhead Fitting
viii. Skill 6 - Install a Bulkhead Fitting
ix. Self Review 3

d. Pneumatic Tubing

i. Objective 14 - Describe Four Types of Pneumatic Tubing
ii. Objective 15 - Describe How Pneumatic Tubing Is Designated
iii. Objective 16 - Describe How to Install Three Types of Pneumatic Tubing Fittings
iv. Skill 7 - Install a Barb Fitting onto Pneumatic Tubing
v. Skill 8 - Install a Ferrule-Type Fitting onto Pneumatic Tubing
vi. Skill 9 - Install a Push-On Type Fitting onto Pneumatic Tubing
vii. Self Review 4

4. **Screwdrivers**

a. Screws

i. Objective 1 - Describe the Construction and Operation of a Machine Screw
ii. Objective 2 - Explain How Machine Screws Are Designated
iii. Objective 3 - Describe the Construction and Operation of a Set Screw
iv. Skill 1 - Identify a Screw Type and Size Given a Sample
v. Self Review 1

b. Flathead Screwdrivers

i. Objective 4 - Describe the Construction of a Flat Head Screwdriver
ii. Objective 5 - Describe Eight Screwdriver Safety Rules
iii. Objective 6 - Describe How to Use a Flat Head Screwdriver to Tighten a Threaded Fastener
iv. Skill 2 - Use a Flat Head Screwdriver to Tighten a Threaded Fastener
v. Self Review 2

c. Phillips Head Screwdrivers

i. Objective 7 - Describe the Construction of a Phillips Head Screwdriver
ii. Objective 8 - Describe How to Use a Phillips Head Screwdriver to Tighten a Threaded Fastener
iii. Skill 3 - Use a Phillips Head Screwdriver to Tighten a Threaded Fastener
iv. Self Review 3

d. Nut Drivers

i. Objective 9 - Describe the Construction of a Nut Driver
ii. Objective 10 - Describe How to Use a Nut Driver to Tighten a Threaded Fastener
iii. Skill 4 - Use a Nut Driver to Tighten a Threaded Fastener
iv. Self Review 4

6. Mallets and Non-Threaded Fasteners

a. Mallets and Hammers
   i. Objective 1 - Describe the Construction of Three Types of Hammers
   ii. Objective 2 - Describe the Construction of Three Types of Mallets
   iii. Objective 3 - Describe Hammer and Mallet Safety Rules
   iv. Objective 4 - Describe How to Use a Hammer to Perform an Assembly Task
   v. Skill 1 - Use a Hammer to Perform an Assembly Task
   vi. Self Review 1

b. Key Fasteners
   i. Objective 5 - Describe the Operation of Four Types of Key Fasteners
   ii. Objective 6 - Describe How Keys and Keyseats Are Sized
   iii. Objective 7 - Describe How to Install a Key Fastener
   iv. Skill 2 - Assemble Two Parts Using a Key Fastener
   v. Self Review 2

c. Press Fit Assembly
   i. Objective 8 - Define a Press Fit Assembly
   ii. Objective 9 - Describe the Operation of a Dowel Pin
   iii. Objective 10 - Describe How to Press Fit a Pin Using a Hammer
   iv. Objective 11 - Describe the Function of a Pin Punch
   v. Skill 3 - Press Fit a Pin Using a Hammer
   vi. Self Review 3

d. Pins
   i. Objective 12 - Describe the Operation of a Clevis Pin
   ii. Objective 13 - Describe the Operation of a Taper Pin
   iii. Objective 14 - Describe the Operation of a Shear Pin
   iv. Objective 15 - Describe the Operation of a Slotted Spring Pin
   v. Skill 4 - Identify a Pin Type Given a Sample
   vi. Self Review 4

7. **Torque Wrench**
    a. Process Control Concepts
        i. Objective 1 - Define Torque and Explain Its Importance
        ii. Objective 2 - Define How Torque Is Calculated
        iii. Skill 1 - Calculate Torque Using the Torque Formula
        iv. Self Review 1
    b. Torque-Controlled Tool Identification
        i. Objective 3 - Describe Six Categories of Torque-Controlled Tools
        ii. Objective 4 - Describe the Operation of a Click-Type Torque Wrench
        iii. Objective 5 - Describe the Effect of Torque on Fasteners
        iv. Objective 6 - Describe How to Adjust the Torque on an Adjustable Click-Type
        v. Objective 7 - Describe How to Use a Click-Type Torque Wrench
        vi. Skill 2 - Use a Manual Torque Wrench to Tighten a Fastener to a Specified Torque
        vii. Self Review 2
    c. Torque Wrench Application
        i. Objective 8 - Describe How to Use a Backup Wrench with a Torque Wrench
        ii. Objective 9 - Describe Common Errors That Result in Improper Fastener Torque
        iii. Skill 3 - Use a Torque Wrench and Backup Wrench to Tighten Fasteners
        iv. Self Review 3

8. **Portable Power Tools**
    a. Power Tool Safety
        i. Objective 1 - Describe Two Categories of Portable Power Tools
        ii. Objective 2 - Describe Ten Safety Rules for Use of Portable Power Tools
        iii. Objective 3 - Describe Safe Dress Rules for Use of Portable Power Tools
        iv. Skill 1 - Identify Portable Power Tool Hazards
        v. Self Review 1
    b. Power Tool Operations
        i. Objective 4 - Describe Five Types of Battery-Operated Tools
        ii. Objective 5 - Describe How to Charge a Battery-Operated Power Tool
        iii. Skill 2 - Charge a Battery-Operated Drill/Driver
        iv. Objective 6 - Describe How to Operate a Battery-Operated Drill/Driver
        v. Skill 3 - Operate a Battery-Operated Drill/Driver
        vi. Self Review 2
    c. Portable Drill/Drivers

i. Objective 7 - Describe Four Types of Drill/Driver Tooling
ii. Objective 8 - Describe How to Install Tooling in a Drill/Driver
iii. Skill 4 - Install Tooling in a Portable Drill/Driver
iv. Objective 9 - Describe How to Use a Portable Drill/Driver to Install a Fastener
v. Skill 5 - Use a Portable Drill/Driver to Tighten Fasteners
vi. Self Review 3

Final Exam will be available then module 8 is completed.

Grading Information

Grading Criteria: Based on Amatrol quizzes, labs and skills checks.

Grade Scale:

A = 90 – 100%

B = 80 – 89%

C = 70 – 79%

D = 60 – 69%

F = 0 – 59%

- As this course is web base/online, students may work ahead on labs/modules if they so choose.
- Lab assignments will have 10% of total points possible deducted from score for that assignment if turned in on the last week of the term.

Expectations for Students

- Administrative Drop: Students who do not attend at least 50% of the class sessions during the first week of term, or who do not log in to Rogue Online and complete required first week assignments (if appropriate) and who do not contact the instructor will be automatically dropped from the class during the 2nd week of the term. (Exception: students who register during the first week of the term will NOT be administratively dropped.)
- Refund Policy: Students dropping a class by 5:00 p.m. on Thursday of the second week of the term get a full refund. Students withdrawing after 5:00 p.m. on Thursday of the second week of the term through 5:00 p.m. on the Friday before the last week of the term receive no refund and a grade of W will be assigned for the course."

Attendance

Absence: It is the students responsibility to notify the instructor if they are going to be absent for a class. Email is the best way to provide this notification, but a phone message is also acceptable. Missed work from an excused absence can be made up with no point loss if assignment is turned in at the beginning of the next scheduled class after students return. Unexcused absences will result in loss of points for class participation.

If you are unable to attend a class, please notify me via email or phone.

- **Administrative Drop:** students who do not attend at least 50% of the class sessions during the first week of school and who do not contact the instructor to indicate a plan to attend will be automatically dropped from the class during the 2nd week of the term.
- **Refund policy:** Students dropping a class by 11:59 p.m. on Wednesday of the second week of the term get a full refund. After that there is no refund.
- **Withdrawal from class:** A student may withdraw from a class between the Thursday of Week 2 and the Friday of Week 8 at 11:59 pm. (Week 5 during summer term). A grade of W will be assigned.

Academic Honesty

Cheating, plagiarism, and other acts of academic dishonesty are regarded as serious offenses. Instructors have the right to take-action on any suspected acts of academic dishonesty. Depending on the nature of the offense, serious penalties may be imposed, ranging from loss of points to expulsion from the class or college.

Classroom Behavior

Expectations for classroom behavior are outlined in the Student Code of Conduct, available in the catalog, schedule, and online. Students may not engage in any activity which the instructor deems disruptive or counterproductive to the goals of the class. Instructors have the right to remove students from class for not following the Code of Conduct or other specified classroom rules. Expectations for behavior in online classes are similar to what is required in the classroom.

Tutoring Center

Tutoring Centers provide free tutoring service if you are registered in credit courses at Rogue Community College. The primary areas of tutoring are math, writing and science; however, tutors are prepared to cover most subjects. There is also online tutoring available. Please visit the tutoring center webpage for more details: http://www.roguecc.edu/AcademicSkills/Tutoring.asp

Student Evaluations of this Course: "What Do You Think?"

Students enrolled in all credit (and some non-credit) courses will receive an RCC email around the 8th week of each term to complete online evaluations on each course they are enrolled in. Full instructions for accessing and completing the evaluations will be in the reminder email. These evaluations are anonymous and will not be released to the teachers until after the term is over. They provide valuable feedback to faculty about your experiences in and impressions of the course.

Disability Services

Any student who feels that he or she may need academic accommodations for a disability, such as vision, hearing, orthopedic, learning disabilities, psychological or other medical conditions, should make an appointment with the Disability Services Office.

Redwood Campus (Wiseman Tutoring Center):

Phone: 541-956-7337; Fax: 541-471-3550; Oregon Relay Service: 7-1-1

Riverside and Table Rock Campuses (main office: Riverside Campus B-9):

Phone: 541-245-7537; Fax: 541-245-7649; Oregon Relay Service: 7-1-1

For more information, go to http://www.roguecc.edu/disabilityservices/.

Discrimination, Harassment and Sexual Violence Policies

Rogue Community College does not discriminate in any programs, activities or employment practices on the basis of race, color, religion, ethnicity, use of native language, national origin, sex, sexual orientation, gender identity, marital status, veteran status, disability, age, pregnancy or any other status protected under applicable federal, state or local laws.

The following person has been designated to handle inquiries regarding the non-discrimination policies:
Jamee Harrington, Director of Human Resources
541-956-7017
jharrington@roguecc.edu
Redwood Campus, M-2.

In addition, RCC has a zero tolerance for sexual assault, stalking, intimate partner or domestic violence, dating violence and workplace violence. Anyone found participating in any of these activities will be subject to disciplinary action and prosecuted in accordance with RCC policies and procedures and Oregon state laws. For more information, go to http://web.roguecc.edu/title-ix-and-sexual-misconduct

Smoking restrictions (Board policy)

Smoking is not permitted on the premises of Rogue Community College except in designated areas. For more information go to: http://web.roguecc.edu/board-policies

Safety

The College assists in keeping the campus safe, but a safe campus can only be achieved through the efforts and cooperation of all students, faculty, and staff. For information on safety services, go to https://www.roguecc.edu/safety/