El Camino Community College

PROGRAM REVIEW 2018

Industry and Technology

Welding Technology

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Welding Technology
2018 Program Review
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SECTION 1
Overview of the Program

A) Provide a brief narrative description of the current program, including the program's mission statement and the students it serves.

The mission of the welding department is to maximize the ability of its students to compete in the 21st century job market. To achieve this goal, the department emphasizes current technology trends in both the welding laboratory and the lecture environment. The El Camino welding program will offer a system of weld theory and hands on technical experience focusing heavily on critical thinking and problem solving. The program prepares students for employment in the field and provides opportunities for currently employed personnel to enhance their skills, troubleshooting strategies, and achieve a certificate in one or more of the welding program offerings.

Troubleshooting strategies, print reading, and working with the Los Angeles Department of Building and Safety (LADBS) for D1.1 certification prepares our students for industry employment. Our programs' direction is to reflect the industry's need for skilled weld technicians and fabricators. Our department is working with other relevant construction technology departments to strengthen the students' in the field experience with structural fabrication. We are continuing to support cohort teaching by working with the Math department and other industry instructors through the successful Career Advancement Academy program. The vision for the welding department is to train weld technicians capable of exceeding minimum entry-level competency requirements for local industries. One goal of the program is to develop a link between the weld program and other programs at ECC to enhance student success through a whole person approach to education.

The El Camino College Welding program has shown significant growth and recognition since the 2014 period of Academic Program Review. The Strong Workforce recently awarded the Welding program with a Silver Star and noted that 100% of students employed are working in the welding industry. Since the 2013-2014 academic year, the Welding Technology program has seen a steady and significant increase in enrollment. The total percentage increase of enrollment over the four years in the data set is approximately 58%. This is a significant increase in students trained, job opportunities achieved and FTES earned for El Camino College. Increasing the number of certificated staff available to teach classes and obtaining enough resources and real estate to accommodate growth, are factors that will facilitate future growth of the Welding program.

To maintain the current growth and facilitate modernization and industry relevance, the Welding department faculty have identified several acquisitions and improvements to achieve these goals. The Welding faculty, with the support of the Administration of the Division of Industry and Technology are working to achieve Los Angeles Department of Building and Safety accredited testing facility status for the El Camino College Welding laboratory. Becoming an LADBS accredited testing facility will allow the Welding faculty to issue welding qualifications in accordance with both the AWS and LADBS requirements.

This will allow our students to enter the workforce with industry relevant qualifications and licensure that they earned during their time at El Camino College. This could potentially lead to industry recognition as local companies send their employees to qualify at the ECC Welding laboratory.

Purchasing a modern guillotine style CNC shear will improve efficiency and safety in the program while exposing students to relevant and modern technology. The department just removed an unsafe, aging shear that had become costly and difficult to maintain. We need to replace this loss with a shear that is capable of shearing plate thicknesses of at least ½" to support our structural steel program. The replacement should incorporate programmability and modern safety features to provide students with the chance to operate equipment that will be present in the welding industry and become familiar with automation. This is an immediate need to replace equipment that was recently marked for surplus. To meet the needs of a changing industry that is focused on efficiency and high quality, the Department needs to expand its gas tungsten arc welding and semi-automatic welding course offerings. These courses have a higher cost in materials due to shielding gas and welding processes with higher deposition rates. The Welding department needs to able to offer our gas tungsten arc welding (GTAW), gas metal arc welding (GMAW) and flux-cored arc welding (FCAW) courses every semester to facilitate student employability when they complete the program. This is an immediate need to increase student success and employability upon Program completion. GMAW/FCAW and GTAW welding courses will require a permanent increase in budget to support the shielding gas and welding wire expenditures needed to meet industry demand.

As the student population has increased, so has the number of courses offered. This directly translates into more students inside the Welding laboratory for longer hours each day**.** As the Welding program grows, more eyes and hands are needed in the Welding laboratory. It is recommended that the Department hire and retain two full-time laboratory assistants to facilitate a more efficient educational environment. This will decrease the amount of time that the Welding faculty spend monitoring and preparing material and increase the amount of time spent providing hands on instruction. This will also increase the safety of the educational environment of the Welding laboratory, which is compartmentalized and difficult to visually monitor with one set of eyes. Once the laboratory obtains LADBS accredited test facility status, this additional help will allow the department to more quickly and efficiently operate as a testing lab. This is an immediate need that will increase safety conditions and increase Program efficiency.

The 2018-19 Catalog includes a stackable certificate program; compartmentalized certificates, which reflect the various specialized weld processes that different industries require. These individualized certificates could satisfy pre-employment work requirements, or combined, represent a trained multi-process welder. The Welding program is in a constant state of change and is adapting to meet industry needs now and into the future. The program will use the stackable certificates to influence students to seek an Associate of Science degree by breaking down the levels of certificates to reflect individual processes and encouraging them to strive for greater success. The department is offering newly developed classes to

build on the idea of what it takes to be a weld technician. A lecture class strictly devoted to print reading, (Weld 29) has been implemented; Weld 1 was divided into two classes offering multi-process training to accommodate the trend of multi-process welders with an overall perspective to all processes. Weld 20A, with its focus on self-shielded flux-cored arc welding, is running for the first time in fall 2018 and will provide the pathway that ECC students need to earn the semi-automatic endorsement on their LA City Structural Steel Welding Licenses. This is an effort to support the programs' more focused career path options and jobs are presently abundant for students seeking a long-term career path in an industry that provides opportunities for growth and prosperity.

B) Describe the degrees and/or certificates offered by the program.

The Welding department has recently re-written it's A.S. and Certificate of Achievement to bring them in alignment with each other. This was done to ensure that whether a student is seeking an A.S. or a certificate, they receive the same welding education. All the Certificates of Accomplishments are recent additions and were approved shortly before the State lowered the unit requirements for Certificates of Achievement. The Welding department faculty are in the process of updating all certificates to Certificates of Achievement.

WELDING

A.S. Degree and Certificates of Achievement and Accomplishment

Industry and Technology Division

www.elcamino.edu/academics/indtech

The welding program prepares students for employment in the field and provides opportunities for currently employed personnel to upgrade their skills. By completing the degree or certificate requirements, students gain proficiency in oxy-acetylene cutting, plasma arc cutting, shielded metal arc welding, gas metal arc welding, gas tungsten arc welding, and flux cored welding. Students develop skills in welding ferrous and non-ferrous alloys in flat, horizontal, vertical, and overhead positions and gain skills in layout, fabrication, reading engineering drawings and pipe welding. The program also provides training for students to prepare for AWS D1.1 certification. Competencies will be assessed regularly in accordance with criteria established by the American Welding Society (AWS), the American Petroleum Institute, the American Society of Mechanical Engineers and the American National Standards Institute.

At least 50% of the major requirements for the Associate in Science degree must be completed at El Camino College.

A.S. Degree Requirements

Course Title

Required Core: 8 units

WELD 1A Introduction to Multi-Process Welding (4)

WELD 1B Advanced Welding for Manufacturing (4)

WELD 10A Introduction to Shielded Metal Arc Welding (SMAW) (4)

WELD 10B Intermediate Shielded Metal Arc Welding (SMAW) (4)

WELD 10C Advanced Certification and Career Preparation Lab (2)

WELD 29 Blueprint Reading (3)

WELD 40A Instruction to Gas Tungsten Arc Welding (GTAW) (3)

8 units from:

WELD 28 American Welding Society (AWS) D1.1

Certification Test Preparation (3)

WELD 40B Intermediate Gas Tungsten Arc Welding (GTAW) (3)

WELD 45 Structural Fabrication (5)

5-6 units from:

WELD 15 Basic Welding for Allied Fields (3)

WELD 20A Flux Core (FCAW) and Gas Metal Arc Welding (GMAW) (4)

WELD 23 Advanced Arc Welding Specialty Lab (2)

WELD 40C Advanced Gas Tungsten Arc Welding (GTAW) Skills Lab (2)

Total Units: 26-28

Recommended Electives:

ACR 5 Electrical Applications (4)

ACR 61 Fundamentals of Automation Systems (3)

BUS 17 Personal Finance (3)

CADD 5 Introduction to Mechanical Drafting (3)

CTEC 100 Building Fundamentals (4)

MTT 10A Introduction to CAD/CAM (3)

MTT 16 General Metals (3)

MTT 101 Introduction to Conventional and CNC Machining (4)

Note: Students granted course credit for Welding 10A or Welding 40A may take an elective to satisfy the unit requirement for the degree and certificate.

Certificate of Achievement

A Certificate of Achievement will be granted upon completion of all program requirements. At least 50% of the courses required for the certificate must be completed at El Camino College.

Welding Certificate of Achievement

Course Title

Required Core: 13-14 units

WELD 1A Introduction to Multi-Process Welding (4)

WELD 1B Advanced Welding for Manufacturing (4)

WELD 10A Introduction to Shielded Metal Arc Welding (SMAW) (4)

WELD 10B Intermediate Shielded Metal Arc Welding (SMAW) (4)

WELD 10C Advanced Certification and Career Preparation Lab (2)

WELD 29 Blueprint Reading (3)

WELD 40A Instruction to Gas Tungsten Arc Welding (GTAW) (3)

8 units from:

WELD 28 American Welding Society (AWS) D1.1 Certification Test Preparation (3)

WELD 40B Intermediate Gas Tungsten Arc Welding (GTAW) (3)

WELD 45 Structural Fabrication (5)

5-6 units from:

WELD 15 Basic Welding for Allied Fields (3)

WELD 20A Flux Core (FCAW) and Gas Metal Arc Welding (GMAW) (4)

WELD 23 Advanced Arc Welding Specialty Lab (2)

WELD 40C Advanced Gas Tungsten Arc Welding (GTAW) Skills Lab (2)

Total Units: 26-28

Certificates of Accomplishment

A Certificate of Accomplishment will be granted upon completion of all program requirements. At least 50% of the courses required for the certificate must be completed at El Camino College.

Gas Tungsten Arc Welding (GTAW) Ferrous and Non-Ferrous Certificate of Accomplishment

Course Title

WELD 15 Basic Welding for Allied Fields (3)

WELD 29 Blueprint Reading (3)

WELD 40A Instruction to Gas Tungsten Arc Welding (GTAW) (3)

WELD 40B Intermediate Gas Tungsten Arc Welding (GTAW) (3)

WELD 40C Advanced Gas Tungsten Arc Welding (GTAW) Skills Lab (2)

Total Units: 14

Semi-Automatic Welding Certificate of Accomplishment

Course Title

WELD 1A Introduction to Multi-Process Welding (4)

Or

WELD 1B Advanced Welding for Manufacturing (4)

WELD 10C Advanced Certification and Career Preparation Lab (2)

WELD 20A Flux Core and Gas Metal Arc Welding (4)

WELD 23 Advanced Arc Welding Specialty Lab (2)

WELD 28 American Welding Society (AWS) D1.1 Certification Test Preparation (3)

Total Units: 15

Shielded Metal Arc Welding (SMAW) Structural Steel Certificate of Accomplishment

Course Title

WELD 10A Introduction to Shielded Metal Arc Welding (SMAW) (4)

Or

WELD 10B Intermediate Shielded Metal Arc Welding (SMAW) (4)

WELD 10C Advanced Certification and Career Preparation Lab (2)

WELD 28 American Welding Society (AWS) D1.1 Certification Test Preparation (3)

WELD 29 Blueprint Reading (3)

Total Units: 16

Structural Steel Fabrication Certificate of Accomplishment

Course Title

WELD 1A Introduction to Multi-Process Welding (4)

Or

WELD 10A Introduction to Shielded Metal Arc Welding (SMAW) (3)

Or

WELD 40A Introduction to Gas Tungsten Arc Welding (GTAW) (4)

WELD 15 Basic Welding for Allied Fields (3)

WELD 29 Blueprint Reading (3)

WELD 45 Structural Fabrication (5)

Total Units: 14-15

C) Explain how the program fulfills the college's mission and aligns with the strategic initiatives.

The mission of El Camino College is to make a positive difference in people's lives by providing a comprehensive educational programs and services that promote student learning and success in collaboration with our diverse communities.

Success as defined by the Welding program is acquiring the skills necessary to obtain and sustain a valuable career in the Welding Industry. The Welding program has a diverse student population that reflects the surrounding communities it serves. Our class offerings of

both day and night programs meet the needs of full-time, part-time and returning students. The training and education Welding student's receive make a tangible difference in their lives. By obtaining a marketable skill that will result in employability in the welding industry, our students are able to pursue a career path, obtain financial stability and serve their community in a real, productive way that benefits students, their families, our community and the environment we all share.

STRATEGIC INITIATIVES

1. **Student Learning:**
   - **A.** The welding program supports student learning through a variety of methods including classroom lecture, welding shop/lab lecture and demonstration, hands-on skillset development, practical application, and hands-on student-skillset proficiency demonstrations.
   - **B.** Educational technologies that the welding program uses to support student learning include whiteboard drawings, demonstrations involving critical thinking and problem solving techniques, in-class overhead projection of blueprints, welding symbols, technical drawings and welding procedure specifications. The program also utilizes instructional videos demonstrating proper technique and troubleshooting tactics as well as PowerPoint based lectures that include visual references.

   - **C.** The El Camino welding department effectively supports student learning utilizing a vast array of college resources such as the welding lab area which supports forty individual welding booths and over sixty welding machines that facilitate the students opportunity to learn four different welding processes. A myriad of hand tool and machine tools used for fabrication in the welding trades including a vertical and horizontal band saw, CNC plasma table, robotic welding arm, Bluco fitting tables, mechanized and manual oxy-acetylene cutting torches, pedestal grinders, equipment for the destructive testing of weld specimens, press brakes, shears, tubing copers and a punch press. The welding tool room, staffed by knowledgeable and helpful classified employees, maintains a supply of tools necessary for the trade and available for the students to access as needed. Other college resources include division specific counseling services located in the ITEC building, the Student Resources Center and Library.

2. **Student Success and Support:**
   The welding department supports student learning, success and self-advocacy by promoting and providing access to strong, quality educational and support services such as I&T division specific counseling services located in the ITEC building and counselors from the START center visiting classes that meet during evening hours. Students utilize Welding Technology faculty office hours for individualized help and receive additional support at the Student Resources Center and Library. Manufacturers, fabricators, inspectors and vendors participate in the Industry Advisory Committee meetings. The department evaluates and implements recommendations from the Advisory committee to increase the number of program completions and expand employment possibilities for the student population. Tool room inventory, staffing and support provides students with an effective laboratory experience. Implementation and enforcement of enhanced safety

procedures provides a semblance of safety conditions and expectations in the field. Safety training is similar across all shop laboratories to promote a consistent learning experience.

3. **Collaboration:**
   Welding Students are required to work in teams (an industry standard) when performing lab and lecture exercises in the welding program. Working co-operatively fosters positive social interaction and dynamic problem solving that encourages teamwork, cooperation and collaborative task completion that fosters a positive learning environment and sense of community. In the sections supported by the Career Advancement Academy welding students work cooperatively with students from ATEC and HVAC in extracurricular training events in conjunction with welding faculty, math faculty and outside specialists. Faculty colleagues meeting regularly throughout the semester in scheduled Welding Department, CAT building and I&T division meetings, make this cooperation effective.

4. **Community Responsiveness:**
   A relatively new and modern shop complex, the opportunity to achieve Los Angeles Department of Building and Safety Accredited Testing Facility status (currently underway) and completely updated welding curriculum gives our program industry recognition and legitimacy as well as making our program more appealing to welding employers. Our advisory committee meeting held in April of 2018 had 3 welding industry attendees from various fields in our industry; one General Contractor, one Pipeline Welding Inspector from SoCal Gas and the owner of a local aerospace fabrication shop. The feedback was enthusiastic, constructive and encouraging as reflected in the advisory committee surveys, which the department will utilize to further our effective process of collaboration and collegial consultation.

5. **Institutional Effectiveness:**
   Since the inception of Student Learning Outcomes, all Welding SLO and PLO reports are complete and submitted in a timely manner. The Welding department performs Course and Program Reviews regularly and conscientiously with the best interests of students in mind. Both full-time faculty members of the Welding Department represent the Division of Industry and Technology on the Academic Senate and regularly attend Division Council meetings. LADBS facility accreditation, creation of new curriculum to meet the needs of the community and industry, and further allocation of resources to modernize our tools, equipment, and expand our laboratory space will greatly help to improve our program and services. Assessment, program review, planning, resource allocation, and self-reflection are in a state of continuous improvement. Considerations and dialog are ongoing to improve these processes and help the Welding program review, SLO development, and plan builder to continue to evolve.

6. **Modernization:**
   The Welding program has a new facility, which opened in the spring of 2015. The process involved and standards that are required for LADBS testing facility accreditation and keeping pace with the equipment and trends of industry are a great impetus to modernize and update the resources, tools and equipment required to meet the needs of

welding students, staff and the community we serve. The move towards modernization is present in the purchase of new model multi-process welding power sources, an aerospace quality gas tungsten arc welding power source, a column style cold saw with CNC controls and a corner shear for sheet metal application. Updated curriculum for the fabrication class includes the use of the program's CNC plasma-cutting table and the requisite CAD software needed for part design and table operation. Much of our machine tool equipment is outdated and leaning towards obsolescence and the process to update, improve and replace is ongoing.

D) Discuss the status of recommendations from your previous program review.

1. **Recommendation:** New upgraded equipment that meets industry guidelines for the lab
   Status: Active
   Notes/Comments: The Welding department added many pieces of modern equipment to the welding laboratory, such as a CNC Plasma-table, Column style cold saw, sheet metal corner shear, and destructive testing equipment, but several others still require replacement. One of our aging sheet metal shears still needs replacement, it is becoming increasingly difficult to find replacement parts and the safety of the machine is becoming questionable. New equipment has vastly improved safety features providing a safer educational experience for students.
2. **Recommendation:** Safe tools and adequate supplies.
   Status: Active
   Notes/Comments: The Welding department has replaced aging and unsafe hand tools with newer models and this process is persistent and ongoing. We still need to replace one of our aging sheet metal shears that was recently removed as surplus with a newer model to improve safety and efficiency.
3. **Recommendation:** Each student is now required to use approved safety equipment for each class
   Status: Completed
   Notes/Comments: Safety procedures, equipment and enforcement has been updated and enhanced. Safety training is consistent between faculty members and lab sessions.
4. **Recommendation:** Instructors have attended OSHA 10 training and will be offering classes to our students.
   Status: Active
   Notes/Comments: The Welding department faculty are working towards taking the classes and acquiring the certification necessary to offer OSHA 10 training to students.
5. **Recommendation:** Instructor training.
   Status: Completed
   Notes/Comments: Welding instructors participated in robotic/automation training with Lincoln Electric (6/2016), CNC plasma table training with Torchmate/Lincoln Electric (7/2017) and CWI training with the American Welding Society (8/2018).
6. **Recommendation:** Instructors have attended teacher-training events.
   Status: Completed

Notes/Comments: Both full-time welding instructors attended a "train the trainers" seminar through Weld-Ed covering automation and joint construction for fabrication (6/2017).

7. **Recommendation:** Instructor(s) hiring search (Immediate need: Part-time, Long term: Full-time)
   Status: Active
   Notes/Comments: A full-time instructor has been hired (8/2018) but the department lost one of its adjunct faculty over the same time span and no replacement has been secured.

SECTION 2
Analysis of Research Data

A) Head count of students in the program
Welding Program headcount 2013-2017

	Spring Term				ECC Student Population	District Boundary Population
	2014	2015	2016	2017	Spring 2017	2010 Census
Term Headcount	117	129	161	171	22,208	556,400

	Fall Term				ECC Student Population	District Boundary Population
	2013	2014	2015	2016	Fall 2016	2010 Census
Term Headcount	136	109	138	136	24,000	556,400

B) Course grade distribution

The grade distribution in the Welding Technology program leans heavily towards "A's" and "B's" due to the interest level of the students and the type of learners we attract. The hands on curriculum and the contextualization of concepts is a highly successful model for people who thrive in an active, dynamic learning environment with a lot of tactile stimulus. The distribution of "D's" and "F's" are significantly lower because the welding program sparks significant interest for the students who enroll as well as providing tangible rewards such as skill attainment, licensure and employment within a relatively short time span. Students also quickly decide whether welding is something they are interested in pursuing and the department generally sees a higher percentage of withdrawals than we do non-passing grades. The department's high success and retention rates illustrates these facts.

Grade Distribution, Success, and Retention

Welding
Fall

Preliminary Success Standard *80.5%*
5 year Success Average *83.5%*
5 year Success Minimum *77.6%*

Year	COURSE	Method	Weeks	'A'	'B'	'C'	'P'	'D'	'F'	'NP'	Inc P	Inc NP	'DR'	'W'	*Total*	Succ.	Reten.
2013	WELD-15	Lecture	16	9	6	3	-	6	4	-	-	-	-	2	*30*	60.0%	93.3%
	WELD-23	Laboratory	16	9	2	2	-	-	3	-	-	-	-	2	*18*	72.2%	88.9%
	WELD-40	Lecture	16	15	22	4	-	2	4	-	-	-	-	4	*51*	80.4%	92.2%
	WELD-45	Lecture	16	15	2	3	-	-	-	-	-	-	-	-	*20*	100.0%	100.0%
	WELD-5	Lecture	16	8	14	6	-	-	-	-	-	-	-	1	*29*	96.6%	96.6%
	WELD-99ABC	Independent	16	2	1	-	-	-	-	-	-	-	-	-	*3*	100.0%	100.0%
2013 Total				58	47	18	-	8	11	-	-	-	-	9	*151*	81.5%	94.0%
2014	WELD-10A	Lecture	8	16	2	4	-	2	2	-	-	-	-	4	*30*	73.3%	86.7%
			16	7	5	1	-	3	3	-	-	-	-	6	*25*	52.0%	76.0%
	WELD-10B	Lecture	8	18	4	3	-	-	-	-	-	-	-	1	*26*	96.2%	96.2%
	WELD-23	Laboratory	16	-	-	-	-	-	-	-	-	-	-	5	*5*	0.0%	0.0%
	WELD-40B	Lecture	16	7	5	3	-	-	2	-	-	-	-	5	*22*	68.2%	77.3%
	WELD-40C	Laboratory	16	4	5	4	-	1	-	-	-	-	-	-	*14*	92.9%	100.0%
	WELD-45	Lecture	16	14	10	2	-	-	-	-	-	-	-	3	*29*	89.7%	89.7%
	WELD-99ABC	Independent	16	1	1	-	-	-	1	-	-	-	-	-	*3*	66.7%	100.0%
2014 Total				67	32	17	-	6	8	-	-	-	-	24	*154*	75.3%	84.4%
2015	WELD-10A	Lecture	8	21	11	3	-	3	1	-	-	-	-	2	*41*	85.4%	95.1%
			16	11	5	4	-	2	-	-	-	-	-	3	*25*	80.0%	88.0%
	WELD-10B	Lecture	8	18	16	1	-	-	-	-	5	-	-	1	*41*	97.6%	97.6%
	WELD-23	Laboratory	16	14	1	1	-	-	-	-	2	-	-	2	*20*	90.0%	90.0%
	WELD-40B	Lecture	16	8	11	3	-	-	2	-	-	-	-	1	*25*	88.0%	96.0%
	WELD-40C	Laboratory	16	6	3	2	-	2	-	-	-	-	-	2	*15*	73.3%	86.7%
	WELD-45	Lecture	16	18	2	4	-	-	-	-	-	-	-	1	*25*	96.0%	96.0%
2015 Total				96	49	18	-	7	3	-	7	-	-	12	*192*	88.5%	93.8%
2016	WELD-10A	Lecture	8	22	14	4	-	-	2	-	-	-	-	1	*43*	93.0%	97.7%
			16	8	10	3	-	-	-	-	-	-	-	3	*24*	87.5%	87.5%
	WELD-10B	Lecture	8	23	11	3	-	-	4	-	-	-	-	4	*45*	82.2%	91.1%
	WELD-10C	Laboratory	16	15	5	1	-	-	1	-	2	-	-	1	*25*	92.0%	96.0%
	WELD-40B	Lecture	16	8	9	3	-	-	-	-	-	-	-	-	*20*	100.0%	100.0%
	WELD-40C	Laboratory	16	15	-	-	-	-	-	-	-	-	-	-	*15*	100.0%	100.0%
	WELD-45	Lecture	16	14	4	-	-	-	-	-	1	-	-	-	*19*	100.0%	100.0%
	WELD-99	Independent	16	2	-	-	-	-	1	-	-	-	-	1	*4*	50.0%	75.0%
2016 Total				107	53	14	-	-	8	-	3	-	-	10	*195*	90.8%	94.9%

Grade Distribution, Success, and Retention

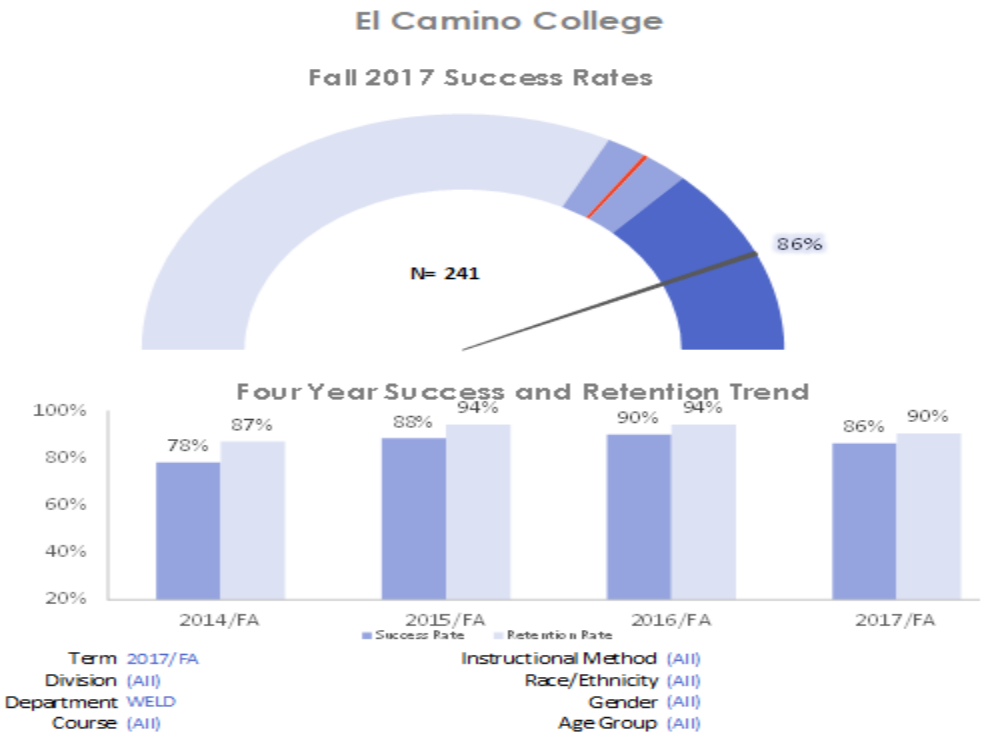
Welding
Spring

Preliminary Success Standard	80.5%
5 year Success Average	83.5%
5 year Success Minimum	77.6%

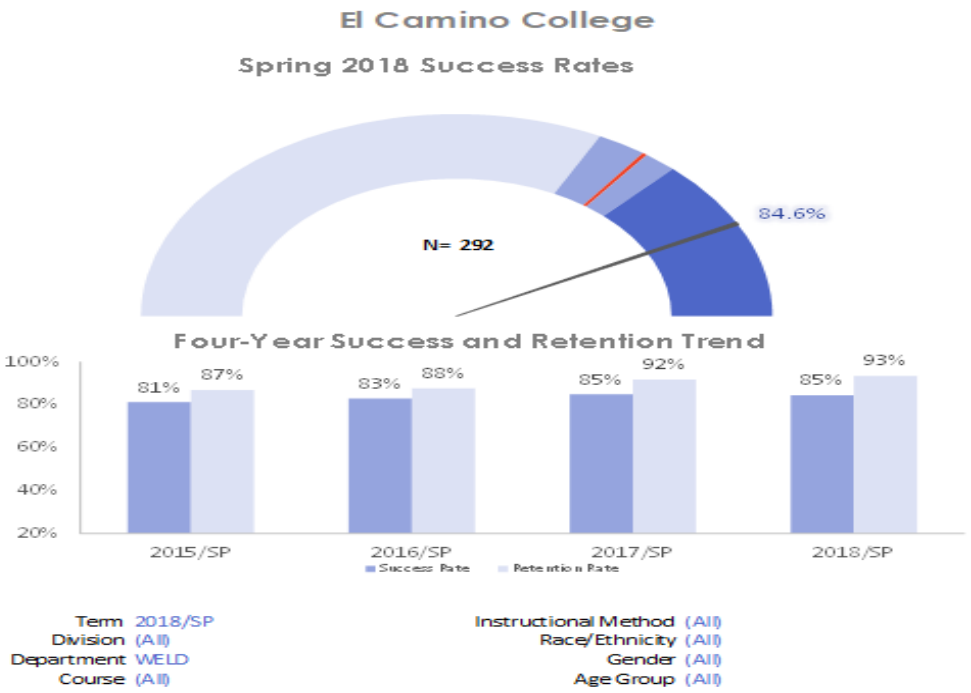
Year	COURSE	Method	Weeks	'A'	'B'	'C'	'P'	'D'	'F'	'NP'	Inc P	Inc NP	'DR'	'W'	Total	Succ.	Reten.
2014	WELD-1	Lecture	16	23	5	7	-	-	-	-	-	-	-	2	37	94.6%	94.6%
	WELD-21	Lecture	16	15	5	2	-	-	4	-	-	-	-	4	30	73.3%	86.7%
	WELD-28	Lecture	16	9	4	5	-	-	-	-	-	-	-	1	19	94.7%	94.7%
	WELD-40	Lecture	16	14	11	4	-	5	1	-	-	-	-	6	41	70.7%	85.4%
	WELD-99ABC	Independent	16	3	2	-	-	-	-	-	1	-	-	1	7	85.7%	85.7%
2014 Total				64	27	18	-	5	5	-	1	-	-	14	134	82.1%	89.6%
2015	WELD-10A	Lecture	8	14	-	-	-	-	-	-	-	-	-	3	17	82.4%	82.4%
	WELD-10B	Lecture	8	10	3	2	-	-	-	-	-	-	-	1	16	93.8%	93.8%
			16	11	5	6	-	1	1	-	-	-	-	-	24	91.7%	100.0%
	WELD-10C	Laboratory	8	16	5	-	-	-	-	-	-	-	-	2	23	91.3%	91.3%
	WELD-28	Lecture	16	14	4	3	-	-	-	-	-	-	-	-	21	100.0%	100.0%
	WELD-40A	Lecture	16	27	8	3	-	1	4	-	-	-	-	14	57	66.7%	75.4%
	WELD-40B	Lecture	16	9	2	1	-	-	3	-	-	-	-	3	18	66.7%	83.3%
	WELD-99ABC	Independent	16	-	-	-	-	-	-	-	-	-	-	3	3	0.0%	0.0%
2015 Total				101	27	15	-	2	8	-	-	-	-	26	179	79.9%	85.5%
2016	WELD-10A	Lecture	8	17	4	1	-	-	-	-	-	-	-	3	25	88.0%	88.0%
			16	15	6	-	-	-	2	-	-	-	-	4	27	77.8%	85.2%
	WELD-10B	Lecture	8	10	6	1	-	-	1	-	-	-	-	3	21	81.0%	85.7%
			16	9	8	1	-	2	1	-	1	-	-	2	24	79.2%	91.7%
	WELD-10C	Laboratory	16	21	1	1	-	-	-	-	1	-	-	5	29	82.8%	82.8%
	WELD-15	Lecture	16	16	3	1	-	-	-	-	-	-	-	4	24	83.3%	83.3%
	WELD-23	Laboratory	16	9	3	1	-	-	-	-	1	-	-	-	14	100.0%	100.0%
	WELD-28	Lecture	16	21	3	3	-	-	-	-	-	-	-	2	29	93.1%	93.1%
	WELD-40B	Lecture	16	4	6	3	-	1	3	-	-	-	-	4	21	61.9%	81.0%
	WELD-40C	Laboratory	16	10	6	-	-	-	1	-	-	-	-	1	18	88.9%	94.4%
	WELD-99	Independent	16	2	-	-	-	-	-	-	-	-	-	1	3	66.7%	66.7%
2016 Total				134	46	12	-	3	8	-	3	-	-	29	235	83.0%	87.7%
2017	WELD-10A	Lecture	8	10	5	6	-	-	-	-	-	-	-	1	22	95.5%	95.5%
			16	10	6	1	-	-	1	-	-	-	-	4	22	77.3%	81.8%
	WELD-10B	Lecture	8	10	7	1	-	-	4	-	-	-	-	-	22	81.8%	100.0%
			16	13	14	5	-	-	4	-	-	-	-	3	39	82.1%	92.3%
	WELD-10C	Laboratory	16	16	5	3	-	3	1	-	1	-	-	2	31	80.6%	93.5%
	WELD-15	Lecture	16	6	6	1	-	1	1	-	-	-	-	2	17	76.5%	88.2%
	WELD-23	Laboratory	16	16	5	-	-	-	-	-	-	-	-	1	22	95.5%	95.5%
	WELD-28	Lecture	16	12	8	6	-	-	-	-	4	-	-	2	32	93.8%	93.8%
	WELD-40A	Lecture	16	8	13	3	-	1	1	-	-	-	-	1	27	88.9%	96.3%
	WELD-40C	Laboratory	16	10	3	-	-	-	-	-	-	-	-	-	13	100.0%	100.0%
	WELD-99	Independent	16	5	-	-	-	-	-	-	-	-	-	3	8	62.5%	62.5%
2017 Total				116	72	26	-	5	12	-	5	-	-	19	255	85.9%	92.5%

C) Success rates (Discuss your program's rates, demographic success characteristics and set a success standard for your program.)

Welding student success rates have markedly improved since 2014 (78%) and remained stable in the 85-90% range since then. The overall success rate in the welding program exceeds the college goal of 74% and our department standard is to maintain an overall success rate of 80% or greater. The four-year average success rate for the Welding program was 84.5% from 2013 -2017. The Welding program will address any known performance gaps or equity issues by upgrading shop equipment and tools that better represent the rapid pace of technological advancement in our industry. Actively support and encourage less skill proficient students through repeated welding skill development drills and facilitate a collaborative learning environment through team lab projects that ensures the supportive, equitable, cooperative learning environment necessary to acquire welding skills. These strategies should help with maintaining and improving current student success rates. Students will be able to see the relevance of the equipment they are using in class and its application in the field. The new Welding Technology laboratory opened in the spring of 2015 and this new facility has excited and inspired the faculty and students with continued focus on the process of improvement occurring in the Welding program with the modernization of tools and equipment. This has had a significant impact on students remaining motivated to complete the degree and certificate programs.



Welding Technology
2018 Program Review
Dylan Meek &Renee Newell



The success rate in the Welding program is consistent throughout the demographics categories with a couple of atypical exceptions. In the Fall of 2013 and Spring 2014 we experienced a decline in the success rate of our African-American students (58.3% and 66.7% respectively), but the numbers jumped back up the next year and have since stayed within the range of the goal set by the college (74%). The four-year average success rate for African-American students in the Welding program from 2013-2017 was 75%. We will continue to monitor the needs of our African-American student population to ensure that the success rate does not drop and to determine if any equity gap issues are present. Pacific Islanders had two terms where success rates were 50%, but the four-year average success rate for Pacific Islander students in the Welding program from 2013-2017 was 75%. The number of Pacific Islanders in the program is so low that it is hard to assess where equity gaps may exist or if instruction needs correction to meet their needs.

Asian, Latino and White students are present in the program and their numbers generally coincide with demographics studies of the overall population of El Camino College. All three groups have achieved and maintained success rates that satisfy the goal set by the college as well as the standard set by the Welding program. The four-year average success rate in the Welding program from 2013-2017 for Asian students was 75%, Latino students 84.7% and White students 83.6%. We will continue to monitor the success rates of these groups to ensure that they stay within the normal range for the college and any change will signify a need for the program to assess instructional methods and equity gap issues.

Women comprise a small but growing percentage of the student population in the Welding program. With the national skills gap crises in full force, more and more industries are searching for female applicants to help close an ever-widening gap between the number of

jobs and how many welders are available to fill them. In the Fall of 2017 and Spring of 2018, we experienced some classes in the Welding program with a female population as high as 25% of the class total. The success rates of these female students is in line with and often higher than that of the male students with the one notable anomaly being a success rate of only 68.8% among female welding students during the Spring of 2015. The four-year average success rate for female students in the Welding program from 2013-2017 was 83.5%. The Welding program will continue to monitor the success rates of our female students and address any decline in their success.

The Welding department maintains a strong commitment to our diverse student population to provide quality education and training to all students regardless of ethnicity, gender, sexual orientation, religion, or age. We live in a nation that is experiencing a chronic shortage of skilled labor and technicians and we are doing our part here in the El Camino Welding Technology department to train the next group of individuals that will build the products, buildings and infrastructure of the future.

Demographic Success Characteristics

Welding
Fall: 2013-2016

		Fall 2013		Fall 2014		Fall 2015		Fall 2016	
		Success	N	Success	N	Success	N	Success	N
Ethnicity	African-American	*58.3%*	12	71.4%	14	85.7%	21	87.5%	24
	Amer. Ind. or Alask. Native	100.0%	-	*0.0%*	-	*0.0%*	-	100.0%	-
	Asian	100.0%	-	75.0%	-	100.0%	-	*50.0%*	-
	Latino	84.9%	73	74.7%	79	88.3%	103	89.6%	115
	Pacific Islander	*50.0%*	-	*50.0%*	-	100.0%	-	100.0%	-
	Two or More	100.0%	-	77.8%	-	92.3%	13	100.0%	-
	Unknown or Decline	100.0%	-	*0.0%*	-	*0.0%*	-	100.0%	-
	White	77.8%	45	78.3%	46	88.4%	43	95.0%	40
Gender	M	81.3%	144	72.8%	136	88.1%	176	90.4%	178
	F	85.7%	-	94.4%	18	93.8%	16	94.1%	17
	X	*0.0%*	-	*0.0%*	-	*0.0%*	-	*0.0%*	-
Age Group	19 or less	0.0%	-	0.0%	-	0.0%	-	0.0%	-
	20 to 24	0.0%	-	0.0%	-	0.0%	-	0.0%	-
	25 to 49	0.0%	-	0.0%	-	0.0%	-	0.0%	-
	Over 49	0.0%	-	0.0%	-	0.0%	-	0.0%	-

Counts are suppressed for groups with less than 10 students.
Shaded cells indicate groups achieving at a rate less than 80% of the reference group, respectively.
Reference groups are White, male, and 20 to 24 years old.

Demographic Success Characteristics

Welding
Spring: 2014-2017

		Spring 2014		Spring 2015		Spring 2016		Spring 2017	
		Success	N	Success	N	Success	N	Success	N
Ethnicity	African-American	66.7%	15	80.0%	15	77.3%	22	73.9%	23
	Amer. Ind. or Alask. Native	*0.0%*	-	*0.0%*	-	*0.0%*	-	100.0%	-
	Asian	83.3%	-	81.8%	11	100.0%	-	75.0%	-
	Latino	87.7%	65	79.6%	98	78.9%	123	88.2%	153
	Pacific Islander	*0.0%*	-	100.0%	-	100.0%	-	100.0%	-
	Two or More	85.7%	-	80.0%	-	91.7%	12	81.3%	16
	Unknown or Decline	66.7%	-	*0.0%*	-	100.0%	-	100.0%	-
	White	78.9%	38	79.5%	44	87.7%	65	83.3%	54
Gender	M	82.5%	126	81.0%	163	83.1%	219	86.4%	236
	F	75.0%	-	68.8%	16	81.3%	16	75.0%	20
	X	*0.0%*	-	*0.0%*	-	*0.0%*	-	*0.0%*	-
Age Group	19 or less	0.0%	-	0.0%	-	0.0%	-	0.0%	-
	20 to 24	0.0%	-	0.0%	-	0.0%	-	0.0%	-
	25 to 49	0.0%	-	0.0%	-	0.0%	-	0.0%	-
	Over 49	0.0%	-	0.0%	-	0.0%	-	0.0%	-

Counts are suppressed for groups with less than 10 students.
Shaded cells indicate groups achieving at a rate less than 80% of the reference group, respectively.
Reference groups are White, male, and 20 to 24 years old.

D) Retention rates (if applicable, include retention based on placement method)

The average retention rate for the Welding Technology department from Fall 2014 to Spring 2018 is 90.625%. Students drawn to the welding program generally persist and finish classes in order to achieve a higher earnings or new career opportunities. The data set presented in the success and retention rate graphs supports these observations.

See success and retention rate graphs above.

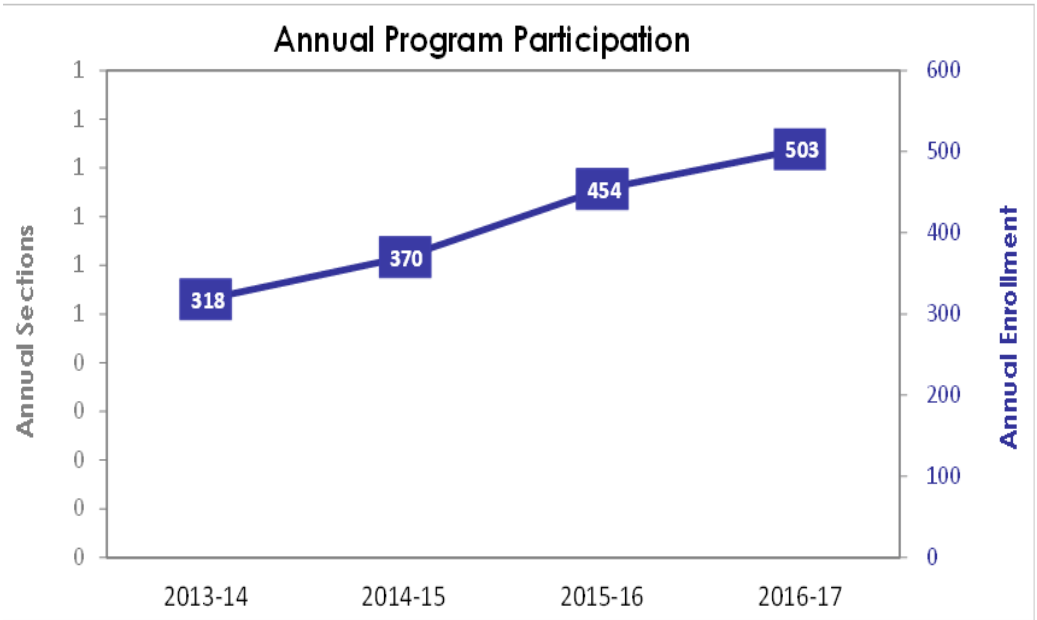
E) A comparison of success and retention rates in face-to-face classes with distance education classes

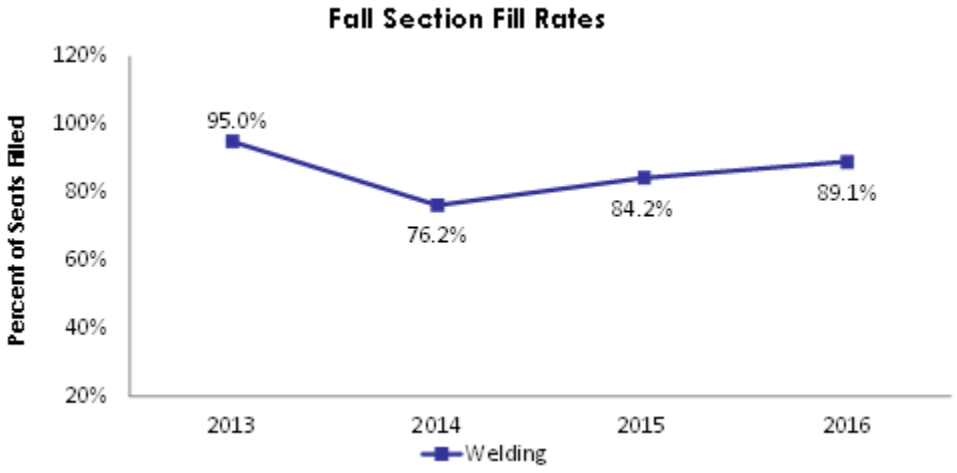
The Welding department is currently looking at the possibility of hybrid and online courses for sections that do not have lab components.

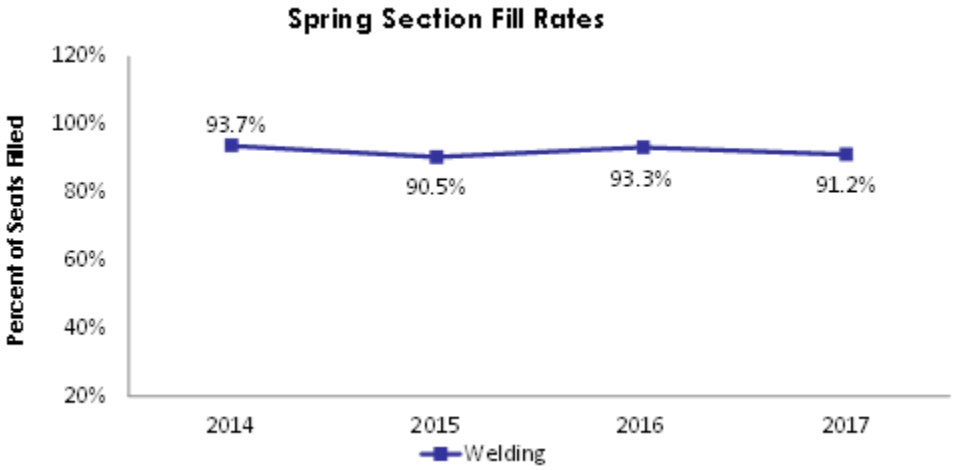
F) Enrollment statistics with section and seat counts and fill rates

Program Participation (4-year Trend)
Welding
Years: 2013-14 to 2016-17

	2013-14	2014-15	2015-16	2016-17	4 Yr Average
Annual Enrollment	318	370	454	503	411







Since the 2013-2014 academic year, the Welding Technology program has seen a steady and significant increase in enrollment. The total percentage increase of enrollment over the four years in the data set is approximately 58%. This is a significant increase in students trained, job opportunities achieved and FTES earned for El Camino College. Increasing the number of certificated staff available to teach classes and obtaining sufficient resources and real estate to accommodate growth are factors that will facilitate future growth of the Welding program. With our current staffing and available lab space, we are at the departments limit for accommodating students and enrollment will begin to plateau.

There was a noticeable drop in section fill rates in the fall of 2014. This resulted from an increase in the number of sections offered, combined with the piloting of new courses. As the Department replaced old curriculum with the new offerings, section fill rates have steadily increased.

G) Scheduling of courses (day vs. night, days offered, and sequence)

Enrollment by Time of Day

Spring Term	2014	2015	2016	2017
Day	41.0%	65.2%	60.4%	63.2%
Night	53.7%	31.5%	38.3%	32.9%
Weekend/Unknown	5.2%	3.3%	1.3%	3.9%

Since 2014, the Welding Technology department has been offering a large number of new and re-written courses. The course sequence is effectively rotated during our day program to allow students to achieve degrees and certificates within a two-year period.

The Welding department continues to offer a significant number of courses during evening hours. We are constantly adjusting our night schedule to find the best rotation available to serve our evening students and provide them with the same opportunities for success and completion.

H) Improvement Rates (Course success by placement method, if applicable)

N/A

I) Additional data compiled by faculty.

The welding field does not require an Associates of Science to gain employment. In the last year, four students have gained employment through the Ironworkers Union (Local 433), four students have successfully entered the apprenticeship program with the Pipefitters/Steamfitters Union (Local 250), six students have entered the aerospace field by obtaining employment at Ace Clearwater, Honeywell, Robinson Helicopter and SpaceX and one student transitioned from El Camino to employment with TTX Railroad. One student has taken the entrepreneurial route and has opened his own off-road fabrication shop with steady work and other students have gone on to pass their pipe certification and are taking contract jobs, earning $15,000/month. The Department is attempting to establish a format to document our student's rate of employment due to the experience they have received in the program. The Welding department faculty actively share information regarding job opportunities and the successfulness of this protocol received recognition in May, when the El Camino Welding Technology program earned a Strong Workforce Silver Star for, "**96%** increase in earnings and **100%** of students are employed in a job similar to their field of study."

Acquiring the AWS D1.1 LA City certification would be another standard to rate our student success. Currently in the job market, there is no reason someone with this qualification would not have multiple opportunities for employment. The Iron Workers Union, Local 433, has so many contracts with new and retrofit bridgework, the football stadium, new LAX terminal and a multitude of contracts with downtown upgrades and new skyscraper construction that is it foregoing the required sponsorship needed to enter and is giving boot camps to get their new recruits on the job site. Students that have the skill obtaining employment at Ace Clearwater, Aero Arc, Triumph Vought, Terminal Island, Local 250, Local 433, Honeywell, SpaceX, Art Metal Inc., BETKO, INC., and small welding production shops.

There is an intrinsic link between the Success of the ECC Weld program and our ability to provide students with the skills necessary to fill employers' needs and direct students to a meaningful career. The Weld program at ECC does more than offer training and development; we offer opportunities for personal and professional success.

J) List any related recommendations.

1.) **The Welding department has rapidly outgrown the facilities in the CAT building due to increased enrollment and ample job opportunities in the welding field. It is our recommendation that we explore options for the program to acquire more lab space to facilitate more welding booths and expand class offerings to accommodate the changing needs of industry and the high number of students that we are unable to accommodate every semester.**
2.) **Expand recruitment activity to the school districts to the south and west of El Camino College to access the part of our district that does not come into competition with other college districts.**

3.) **Create and work a program of attraction and promotion to enroll more female students in the welding program. Without encouraging women to join the welding workforce, we will not be able to close the skills gap that is currently present in U.S. Industry.**
4.) **Continue to coordinate our evening offerings to ensure students who take class at night get access to the same courses as daytime students and have the ability to achieve a degree, certificate or license without having to modify their work schedules.**

SECTION 3
Curriculum

Review and discuss the curriculum work done in the program during the past four years, including the following:

A) Provide the curriculum course review timeline to ensure all courses are reviewed at least once every 6 years.

WELDING CURRICULUM – 2015-2020					
COURSE	**2015-2016**	**2016-2017**	**2017-2018**	**2018-2019**	**2019-2020**
Welding 1	2 Year CTE Review			Inactivation	
Welding 1A		NEW		2 Year CTE Review	
Welding 1B			NEW		
Welding 5	Inactivation				
Welding 10A	2 Year CTE Review		2 Year CTE Review		2 Year CTE Review
Welding 10B	2 Year CTE Review		2 Year CTE Review		2 Year CTE Review
Welding 10C	2 Year CTE Review		2 Year CTE Review		2 Year CTE Review
Welding 15	2 Year CTE Review			2 Year CTE Review	
Welding 20A		NEW		2 Year CTE Review	
Welding 23		Course Review Prerequisite Change		2 Year CTE Review	
Welding 28		Course Review Prerequisite Change		2 Year CTE Review	
Welding 29		NEW		2 Year CTE Review	
Welding 40A	2 Year CTE Review			2 Year CTE Review	
Welding 40B	2 Year CTE Review			2 Year CTE Review	
Welding 40C	2 Year CTE Review			2 Year CTE Review	
Welding 45				Separate into 2 courses	
Welding 95					
Welding 99					

ASSOCIATE IN SCIENCE - DEGREES AND CERTIFICATES	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
Associate in Science Degree *Welding* *Adding Welding 1A, 1B, 15, 20A, 29 Removing Welding 1*			Approved		
Certificate of Achievement *Welding* *Adding Welding 1A, 1B, 15, 20A, 29 Removing Welding 1*			Approved		
Certificate of Achievement *Structural Steel Fabrication*				In Progress	
Certificate of Achievement *Semi-Automatic Welding*				In Progress	
Certificate of Achievement *Gas Tungsten Arc Welding (GTAW) Ferrous and Non-Ferrous Metals*				In Progress	
Certificate of Achievement *Shielded Metal Arc Welding (SMAW) Structural Steel*				In Progress	
Certificate of Accomplishment *Structural Steel Fabrication*			Approved		
Certificate of Accomplishment *Semi-Automatic Welding*			Approved		
Certificate of Accomplishment *Gas Tungsten Arc Welding (GTAW) Ferrous and Non-Ferrous Metals*			Approved		
Certificate of Accomplishment *Shielded Metal Arc Welding (SMAW) Structural Steel*			Approved		

B) Explain any course additions to current course offerings.

The welding industry continues to go through many changes and the ECC Weld program is changing to meet the evolution of industry needs. Since 2014, the program has updated every course and created four new certificates. The weld program has moved into a new complex and invested heavily in new computer operated equipment. Success is a matter of differentiation, this program is in the process of redefining program direction, and the term success in ways never imagined.

The Welding department faculty had written four Certificates of Accomplishment shortly before the State lowered the unit requirements for Certificates of Achievement. The certificates for **Structural Steel Fabrication, Semi-Automatic Welding, Gas Tungsten Arc Welding – Ferrous and Non-Ferrous Metals** and **Shielded Metal Arc Welding – Structural Steel** are currently being rewritten and prepared for submission as Certificates of Achievement.

In the Fall of 2014 the Welding department began to offer its new course sequence of **Weld 10A, 10B and 10C**. These courses offer an in depth and specialized education and training regimen for shielded metal arc welding (SMAW). To obtain a structural steel welding license through the LADBS, applicants have to pass an AWS qualification in manual welding

(SMAW) before they can obtain the endorsement for semi-automatic (FCAW). This sequence in conjunction with **Weld 28** ensure that our students are prepared to pass the qualification test and the code book exam before they graduate from El Camino College, allowing them to gain valuable licensure before entering the work force.

Weld 1 has been split into **Weld 1A** and **Weld 1B** to reduce the unit impact on students and create courses that we can offer in compact eight-week sessions that allow for rapid training and skill acquisition. **Weld 1A** became active in the 2017-2017 year and **Weld 1B** became active during the 2017-2018 academic year. There are plans to begin offering **Weld 1A** during the Spring 2019 semester.

Weld 29 activated in the 2016-2017 academic year and filled a necessary niche in the Welding program by providing students with an in depth exploration of blueprints and how they relate to weldments. **Weld 29** has been offered every fall and one winter since its inception and the section has filled and retained students every time it has been offered. Student feedback has been overwhelmingly positive, especially from students who have immediately gone to work in the field of fabrication after graduation.

Weld 20A became active in the 2016-2017 academic year and the Welding Technology program is offering it for the first time in Fall 2018. This course offers the training and theory necessary for students to successfully perform the AWS qualification per the D1.1 code for structural steel with flux cored arc welding. This qualification is required for students to obtain the semi-automatic endorsement for the structural steel welding license provided by the LADBS. This final structural steel endorsement is industry relevant. Applicants possessing this endorsement are highly sought after by unions and structural steel contractors.

Weld 45 is being split into two four-unit classes titled **Weld 45A** and **Weld 45B.** The amount of content that the department wants to include has grown as we have acquired new machines and technology. The split is necessary to incorporate automation in fabrication as curriculum has been developed to include robotics, CNC plasma tables, cold saws and Weld Watch technology. **Weld 45A** will include traditional fabrication techniques using oxy-fuel flame cutting, dry fitting by hand, using a specialized fitting table and designing using manual production of blueprints. **Weld 45B** will incorporate the advanced automation techniques and blueprint design using CAD programs. The two courses together will provide a good synthesis of current design and fabrication techniques.

C) Explain any course deletions and inactivations from current course offerings.

Weld 5 was made inactivated in the 2015-2016 academic year. The welding program is moving away from eight-unit classes and following a model that supports four-unit classes that can be easily adapted to an eight-week format to facilitate rapid training and skill attainment. The curriculum of **Weld 5** is also being covered in more process specific curriculum like the Weld 10 and Weld 40 series of classes. As such its content has been redistributed to these classes and the newly split Weld 1A and Weld 1B.

In the 2018-2019 academic year the Welding program is making **Weld 1** inactive. The course and its massive eight-unit load is now redundant with the creation of Weld 1A and Weld 1B. The new classes will cover the same material and can be offered in the accelerated eight-week format.

D) Describe the courses and number of sections offered in distance education. (Distance education includes hybrid classes.)

N/A - Currently there are no offerings for distance education in the Welding program.

E) Discuss how well the courses, degrees, or certificates meet students' transfer or career training needs.

1. **Have all courses that are required for your program's degrees and certificates been offered during the last two years? If not, has the program established a course offering cycle?**

   Each course in the Welding Technology program is in a revolving cycle. Students have the opportunity to complete the program offerings within a year and a half or two year period. Courses offered during the day provide students with a reduced cycle time because of the accelerated eight-week courses that offered during the day. While the night program will require a longer cycle because eight-week courses are not offered during evening hours. Program completion periods for each student will vary depending on the student's level of commitment and availability. Each course in the Welding program provides students with an evolving degree of competency. Each course builds on the skills and knowledge the student brings to the course and includes aspects of proceeding courses and builds on program specifics.

   Discussions between Welding faculty and the Division office is ongoing as we constantly strive to streamline and improve this process. With the department routinely offering new courses to maintain pace with changing industry trends the course cycle routinely needs to be updated and managed.

2. **Are there any concerns regarding program courses and their articulation to courses at other educational institutions?**

   Currently there are no articulation concerns with our courses. As new courses are developed and launched, concerns may arise and the Welding faculty will address these issues if they manifest.

3. **How many students earn degrees and/or certificates in your program? Set an attainable, measurable goal related to student completion of the program's degrees/certificates.**

   The Welding Technology program at ECC is not centered on transfer, however, that is a supported option. The primary program focus is on jobs. The El Camino College Welding program is in line with technical training programs in comparable colleges and career education centers. The Welding program is moving toward a more progressive

technology based approach to student success. The department offers several certificates and a degree option for continuing students, which supports career success. The Welding program launched four new certificates of accomplishment in the 2017-2018 academic year that support industry demand and student success. The current degree and certificates numbers are listed below.

El Camino College
Degree and Certificate Awarded
Welding
2012-13 to 2016-17

Five-Year Associate Degree Trend: Welding

Major	2012-13	2013-14	2014-15	2015-16	2016-17	5-Year Trend
Welding	2	2	4	5	8	400%
Welding Evening Program	1	1				-100%
Welding Day Program	1	1		1		-100%

Five-Year Certificate of Achievement Trends: Welding

Major	2012-13	2013-14	2014-15	2015-16	2016-17	5-Year Trend
Welding I - Day Option	1					-100%
Welding-Achievement		6	6	7	12	1200%

As the courses in the Welding program were updated, new certificates and updated degree requirements were created to support this change in curriculum and direction. The Day Program and Evening Program degree and certificates are no longer offered. The data set reflects a large increase in completions and overall success related to the new curriculum and the accompanying degree and certificates.

The Welding department's current completion goal is to achieve twenty certificates and twelve associate degrees awarded per academic year. In the 2018-2019 academic year we are attempting to convert four Certificates of Accomplishment that are currently offered into Certificates of Achievement as the unit requirements for them have

significantly dropped. This may result in a sharp increase in the number of certificates awarded over the next four years. Since the certificates are stackable and build on each other, this may also result in an increase in degrees awarded.

4. **Are any licensure/certification exams required for program completion or career entry? If so, what is the pass rate among graduates? Set an attainable, measurable goal for pass rates and identify any applicable performance benchmarks set by regulatory agencies.**

   In Los Angeles, structural welders are required to be licensed through the Los Angeles Department of Building and Safety (LADBS). This involves successfully obtaining an AWS qualification per the requirements of AWS D1.1 Code for Structural Steel at an LADBS accredited test facility in addition to passing a written test comprised of general welding knowledge and D1.1 code specific questions administered by the LADBS. To achieve the endorsements for both manual and semi-automatic processes, the welder must complete the AWS qualification with both the shielded metal arc welding (SMAW) process and the flux cored arc welding (FCAW) process.

   We have a long history of success in the El Camino College Welding department enabling students to pass both the written test and the AWS qualification for SMAW. Approximately 75% of the welding students that persist through the SMAW courses to the Weld 10C and Weld 23 level earn their AWS qualification for structural steel with SMAW. Weld 28 is focused on supporting and enabling our students to navigate the AWS D1.1 codebook. Of the students who take and complete Weld 28, 75-100% of them pass their code book test through the LADBS. The results of the written test success vary year by year but the number is consistently above 75%.

   In the Fall of 2018, the Welding program is offering Weld 20A for the first time, which covers the theory and practical application of constant voltage, wire fed welding processes with a focus on FCAW. This course will allow the students to develop the FCAW skills necessary to obtain the semi-automatic endorsement on their LADBS structural steel welding licenses. The success rate of this new component of our program that supports licensure will be evaluated as the data set grows.

   We are working to create a data base of all students that have achieved licensure through the LADBS. This can be difficult to manage as we do not administer the test or record results and we must rely on student reporting to get accurate numbers. This is a work in progress that should be fully developed by the 2022 Academic Program Review.

F) List any related recommendations.

1.) Achieve Los Angeles Department of Building and Safety (LADBS) accredited test facility status to allow for American Welding Society (AWS) qualifications to be performed at El Camino College in compliance with the requirements necessary for students to obtain LA city welding licenses.

2.) **Increase the supply budget to allow for the material and consumables necessary to run Weld 20A every semester.**
3.) **Convert current Certificates of Accomplishment to Certificates of Achievement.**
4.) **Continue to update and improve courses to reflect the ever-shifting needs of industry. Including the possibility of incorporating technical writing courses for the welding industry.**
5.) **Improve and streamline the evening course offerings to better support completions amongst our night time students.**

SECTION 4
Assessment of Student and Program Learning Outcomes (SLOs & PLOs)

A) Provide a copy of your alignment grid, which shows how course, program, and institutional learning outcomes are aligned. (This will be Appendix A.)

See Appendix A; FA 2014 is the most current grid available. The Welding department is working to update the alignment grid to reflect current course offerings.

B) Provide a timeline for your course and program level SLO assessments. (This will be Appendix B.)

See Appendix B

C) State the percent of course and program SLO statements that have been assessed.

As of September 2018, there are no outstanding SLO's. 100% of all course and program SLO's have been assessed.

D) Summarize the SLO and PLO assessment results over the past four years and describe how those results led to improved student learning. Analyze and describe those changes. Provide specific examples.

Students reported positive academic and personal growth through Welding program courses. They see themselves as active learners who can demonstrate critical thinking and personal responsibility in determining outcomes for success in college and in preparation for their future careers. These Welding department SLO assessment results confirm that the Welding Technology program courses are powerful factors for improving student success at the collegiate and occupational levels.

PLO #1 Assessment Results

- *Success in the Welding Industry* – Upon completion of the Welding program, students will be able to demonstrate knowledge of skills needed for success in the welding industry.

The assessment method used to quantify this PLO is student success rates when taking the LADBS written examination for the D1.1 Welding Code for structural steel. This test contains a section on welding fundamentals and a code book specific portion. To pass this examination, students need to show considerable depth of knowledge regarding fit-up, electrode classification, standards, specifications, welding symbols, print reading, and welding procedures and processes. This examination is a good standard to gauge the depth of knowledge that a student obtains during their time in the El Camino College Welding Technology program. It also represents a high level of occupational readiness.

At the time of assessment, 98% of advanced students reported passing scores after taking the examination. With classroom review and further coverage of the relevant material, the passing rate improved to 100% when the students retested. The curriculum in the El Camino College Welding Technology program builds upon itself to facilitate a deep understanding of welding fundamentals. The foundation of this deep understanding starts at the very beginning of course sequences like Weld 10A and 40A. Welding students obtain the synthesis necessary to pass the LADBS examination as they progress through the program.

The El Camino College Welding program faculty continue to improve curriculum to ensure student success and meet the changing needs of the industry that employs our students. We will monitor the future success rates of students taking the LADBS written examination and adjust instructional methods when necessary to facilitate a state of employment readiness amongst our students.

PLO #2 Assessment Results

- *Safety Knowledge and Skills* – Upon completion of the welding program, whether in the certificate program or the degree program, students will acquire and be able to use specific safety knowledge and skills relating to the welding discipline and will be able to apply those skills to specific job requirements.

  During the last assessment period, the standard for this PLO was not met. We strive for 100% safety compliance and the results fell just below the 90% mark. The Welding faculty responded to this result by updating, expanding and improving safety training. There is a zero tolerance policy regarding unsafe practices in the Welding lab. Our intent is to simulate the safety programs of successful welding businesses that are in full compliance with OSHA and ANSI Z49.1. We will continue to adjust and improve safety training and curriculum until the standard for the PLO is regularly met.

PLO #3 Assessment Results

- *Attaining Certificates, Degrees, Transfer and Employment*- Upon completion of the Welding program, students will successfully earn a certificate, degree, or transfer to a four-year university and successfully compete for jobs in which they can apply their knowledge and communication skills acquired in the Welding program.

  The data set generated during the recent assessment of this PLO showed that a high percentage of students (70%) who completed the Welding program found employment in the welding field. Recent information from Strong Workforce indicates the number is as

high as 100%. New information from IRP regarding the number of completions in the Welding program has drastically increased our completion statistics. The newest data set indicates a 400% increase in degrees awarded and a 1200% increase in certificates awarded since the last Academic Program Review.

These increases are directly related to updated curriculum, expanded course offerings and new degree and certificate requirements. The Welding department recently created four stackable certificates of accomplishment that are in the process of being re-written and resubmitted as certificates of achievement under the new certificate guidelines provided by the State. These improvements will directly translate into a higher number of completions for the Program. The Welding department faculty continually improves instructional methods and completion options to generate greater levels of student success and employability.

WELD 10A Assessment Results

- The standards were met for all three SLOs during the last four years. Weld 10A is the foundational class for many of our students and has a heavy focus on safe practices in a welding workplace and the hazards of welding and machine tools. In depth training begins on day one and continues throughout the semester. Through faculty collaboration, the quality and scope of the safety training in the Welding program continues to improve.

  Training students to safely operate machine tools, such as, shears, punch presses, band saws, corner-shears, press brakes, pedestal grinders, oxy-fuel torches and angle grinders prepares them for future employment in the welding industry. The Department continues to improve methods of hazard identification, safe operation and basic machine maintenance.

WELD 10B Assessment Results

- The standard for SLO#1, "Welding students will produce quality welds utilizing various welds," was not met during the four-year period preceding this Academic Program Review. Faculty discussion has determined that the standard for success was set too high for an intermediate course. The majority of the students performed welds that fell within the acceptance criteria of the AWS but the number of students that produced truly exceptional welds was far below the initial expectation. The success rates will be adjusted before the next assessment.

  The standards were met for SLOs #2 & 3. The Department curriculum regarding blueprints and welding symbols has been improved and expanded. We endeavor to train students to technician level competency before they complete the welding program. Deep understanding of blueprints, welding symbols and their relationship to weldments is critical to set our students above competition in the job market. Welding theory and fundamentals are expanded in this course and become more technical as the knowledge base of the student grows. Student learning is reinforced through collaborative exercises that rely heavily on critical thinking and problem solving. The lecture information in this course relating to power sources, electrode classification, joint design and the weld-ability of metals has been greatly expanded and brought into line with content

requirements needed to pass the fundamentals portion of the LADBS D1.1 examination. This directly correlates with an increase in student success and employability.

WELD 10C Assessment Results

- During the assessment of SLO #3," Students will safely operate equipment and exhibit shop safety throughout the course," the standard was not achieved and the faculty has responded by constant reinforcement of safe practices and hazard identification across all courses. Safety packets are issued and reviewed machine by machine with lists of potential hazards and safe operating practices. Students are required to initial and date each section after understanding of the hazards and operation of the related machine is achieved. These are kept on hand throughout the semester for students to review as necessary. The Department goal is to achieve and maintain 100% compliance with safe practices.

  All other SLO standards were met and the faculty of the Welding Technology program continues to improve instructional methods involving weld joint preparation, troubleshooting welding machine parameters, cutting methods and groove weld fit-up. These improvements result in more students being able to perform the AWS qualifications necessary to obtain a structural steel welding license from the LADBS. This license improves students' employability and compensation range when they complete the Welding program.

WELD 15 Assessment Results

- Since the last period of Academic Program Review, the standard was not met for SLO #1 which states, "Students will be able to demonstrate basic knowledge of welding concepts." Weld 15 is often taken as an elective by students from other departments because of its more general approach to welding processes and metallurgy. Many of these students have not taken the foundational Weld 10A and Wed 40A courses and enter Weld 15 with no prior knowledge of welding. Course work, lectures and examinations have been modified to accommodate the entry level students which should result in the standard being met during the next assessment.

  All other standards were met, and the Welding faculty regularly engages in dialogue on how to improve the practical curriculum of this multi-process course to better serve the student population. Ideally, students will achieve a basic level of competency with shielded metal arc welding (SMAW), gas metal arc welding (GMAW) and gas tungsten arc welding (GTAW) once completing this course. More physical demonstrations during lecture time will be incorporated to assist visual and tactile learners and the difficulty of the practical welding projects will be increased to facilitate increased levels of student competency.

WELD 23 Assessment Results

- In the last four years the assessment standards were not met for SLO #2 and SLO #3. These results have sparked an ongoing and productive dialogue between Welding Technology department faculty members.

SLO #2 states, "Students will have a developed sense of the importance of joint fit-up." This statement is assessed with practical application quizzes. Instructor led welding demonstrations illustrating the detrimental effects of improper root opening, poor contact at the faying surface and improper fit-up have increased student success and facilitated deeper levels of understanding. Allowing small groups of students to observe instructor led welding demonstrations has improved troubleshooting and promoted the application of critical thinking to the joint construction process. The faculty of the Welding department will continue to engage in dialogue to improve instructional methods and demonstrations.

SLO #3 states, "At the completion of this course, students will be prepared to take the practical examination for D1.1 certification." The Welding department has no intention of lowering the standard for this SLO even though it failed to be met twice in the last four years. The Departments' goal is for 100% of the students who desire the LADBS structural steel license to be prepared and capable of obtaining it by the completion of Weld 23. The speed at which students attain skills is not a constant. Many students will need more time to acquire the skills necessary for licensure and AWS qualification than is allowed for with the current class offerings. The Welding faculty believes that at least one more class in the sequence prior to Weld 23 that allows for purely laboratory time is needed. This will increase the percentage of students that are prepared to obtain the AWS qualification necessary to acquire the LADBS structural steel welding license by the completion of Weld 23.

WELD 28 Assessment Results

- Weld 28 prepares students to take the code book portion of the Los Angeles Department of Building and Safety licensure examination. The examination requires the use of the American Welding Society (AWS) D1.1 Code book for the welding of structural steel. The code book is 539 pages of dense material that covers all aspects of structural steel welding including materials, electrode classification, pre-qualified welding procedures, qualification of personnel and welding procedures, engineering data, inspection criteria, fabrication and repair.

  This course has been highly successful and has routinely met the standards for SLO #1 and SLO #2. The Welding program continues to upgrade code books to the newest edition and gather test question from students that take the examination. This allows the Department to build an ever-expanding bank of practice test question that are pulled from the actual LADBS examination. Students routinely participate in timed mock examinations during class time to prepare them for the stress of navigating a dense code book during an examination with time limitations. This course also provides the review necessary for students to take the welding fundamentals section of the LADBS examination. The Welding department faculty routinely incorporates information from new test questions into the curriculum of Weld 10A and Weld 10B. This facilitates understanding of welding fundamentals into the students' education from the beginning of their experience in the El Camino College Welding Technology program.

  SLO # 3 states, "Students will be capable of finding tables and figures to support writing welding procedure specifications (WPS)." The standard for SLO # 3 was not met in the

Spring of 2017. The Welding department faculty believes this result may be related to a lack of community that had previously permeated the learning environment in this class. In past years the LADBS had come to El Camino College to administer the test on campus. This fostered intense cooperative learning among the students who understood from the beginning that the examination would be a shared event. The LADBS will no longer administer the examination on campus. Students are left to make appointments and take the test independently in downtown Los Angeles at the LADBS without the support of their peer group. In the Spring of 2018, the Welding faculty arranged a common test day and the College provide transportation to the LADBS, allowing many of the students to take the examination together. This shared experience once again promoted the supportive cooperative learning environment that had been present in the past and student success improved drastically.

WELD 40A Assessment Results

- The standards were met for all three SLOs during the assessment periods. The Welding department continually improves curriculum in our foundational classes as they provide the launching point for students entering the El Camino College Welding Technology program. Practical exercises involving both ferrous and non-ferrous materials are introduced in Weld 40A and the Welding faculty are always engaged in dialogue with aerospace industry employers regarding requirements for employment. Safety topics, safe machine operation, and hazard identification is thoroughly covered and enforced. We modify our curriculum to enable students to obtain the experience necessary to obtain employment in the welding industry.

  Acquisition of aerospace quality GTAW welding machines has given us the opportunity to introduce students to cutting edge technology used in local industry and gain experience welding on machines that will be encountered in the field. The Welding department faculty regularly engages in dialogue in ways to improve our GTAW curriculum to increase student success and employability.

WELD 40B Assessment Results

- During the last four years the standards were met for all three SLOs. Out of position welding and open root fit-up is a focus of Weld 40B curriculum. This material improves as industry employers communicate the details of their weld tests with the faculty of the Welding department. Allowing the department to provide students with simulations of welding tests they will experience when they begin to seek employment, drastically boosting their chances to earn a living wage.

  Students are introduced to welding fixtures and required to perform welds on metals of different thicknesses. This exercise promotes problem solving and critical thinking as they are required to adjust welding parameters to adapt to the unfamiliar situations. The department recently obtained aerospace quality test fixtures that allow for back purging full penetration welds on non-ferrous metals and stainless steels. This simulates industry conditions and familiarizes the students with standard aerospace practices improving students' employability.

The Welding faculty are engaged in dialogue to improve our curriculum and assessment methods. Obtaining GTAW welding machines that incorporate new technology will expose students to current industry trends.

WELD 40C Assessment Results

- Since the previous period of Academic Program Review, the standards for all three SLOs have been met. Welding department faculty regularly meet to discuss methods to improve the curriculum in Weld 40C to increase student success and employability. Students often finish this course and obtain employment in aerospace fabrication with companies like SpaceX, Honeywell, and Ace Clearwater. The Welding department constantly tries to improve instructional methods to ensure they are in alignment with current industry trends.

  We have obtained samples of exotic materials used in aerospace fabrication to expand student experience with unfamiliar metallurgy and provide demonstration of the practical application. Students have been given the opportunity to weld samples of Inconel, titanium, copper, and aerospace grade aluminum to improve problem solving skills and increase their desirability to employers. Different thicknesses of material have been introduced to expand the range of welding procedures that students are exposed to.

  Practical assessment methods have been modified to simulate aerospace industry weld tests. The fundamentals of pipe welding are explored to improve student success, create a deeper understanding of welding procedures and facilitate the skill attainment necessary for employment in the aerospace fabrication industry. Finished welds are inspected to the exacting standards of AWS D17.1 fusion welding for aerospace. The Welding department faculty consistently engages in dialogue to improve the assessment methods and standards to ensure that learning objectives are met in ways relevant to the GTAW aerospace fabrication industry.

WELD 45 Assessment Results

- During the last assessment, the standards were not met for SLO #2 and SLO #3. The findings of these assessments have led to improvements in curriculum in Weld 45 and the foundational courses to ensure that standards are met during the next assessment.

  SLO #2 states, "Students will be prepared to demonstrate job skills required for fabrication layout." The assessment results show that less than 75% of the students were able to achieve mastery of the skills necessary to perform fabrication layout to blueprint specifications. The Welding department faculty determined that reinforcement of math skills is necessary to improve this outcome. Curriculum incorporating fractions, decimals and angular measurement have been incorporated into the course sequence at all levels. The Welding sections supported by the Career Advancement Academy include co-teaching sessions between Math department faculty and Welding faculty. The mathematics are being introduced using contextualization and students have responded favorably, displaying deeper levels of understanding. The Welding department expects to see the standard met during the next assessment cycle.
  SLO #3 states, "Students will be able to correctly use measuring tools necessary for fabrication projects." The assessment of this SLO discovered that students were

performing just below the expected standard. The failure to meet the standard is related to the mathematical skills of the students. An imperfect understanding of fractional and decimal notation makes it impossible to accurately use precision measuring tools. The Welding department faculty is regularly discussing how to improve math skills through contextualization with existing and new welding projects. This effort is improving and updating curriculum from the foundational courses throughout the entire course sequence. We believe that we can foster a deeper interest and understanding of trade relevant mathematics if we can develop a link between mathematics and higher earning potential.

The Department continues to incorporate new fabrication equipment and projects that challenge our students practical and problem solving abilities. We are including automation into the Weld 45 curriculum as new equipment is obtained by the Department. The combination of traditional hands on methods and modern automation provides a relevant cross section of fabrication techniques to provide our students with ample opportunity for deep understanding through the contextualization of mathematics and welding.

E) Describe how you have improved your SLO/PLO assessment process and engaged in dialogue about assessment results.

Continuous engagement in assessment has led the Welding Technology program to make improvements in curriculum, student learning, and in the SLO assessment process. The Department meets regularly to discuss assessment results and evaluate SLO standards. Both full- and part-time faculty attend. The department discusses its systematic approach to the SLO process - from gathering data, analyzing and interpreting evidence through holding collaborative discussions about pedagogical and curricular changes to improve student learning. These approaches to engagement and dialogue have improved instruction and student learning across the department, enhanced the quality of the submissions and allowed the department to consistently complete and submit all assessments by scheduled deadlines.

F) List any related recommendations.

1. **Obtain new GTAW welding power sources that incorporate new welding technology arc controls. 40% of the machines should be updated to provide a reasonable cross section of the machines used in industry.**
2. **Achieve Los Angeles Department of Building and Safety (LADBS) accredited test facility status to allow for American Welding Society (AWS) qualifications to be performed at El Camino College in compliance with the requirements necessary for students to obtain LA city welding licenses.**
3. **Continue to work with the Mathematics department to develop contextualized math courses with trade relevant content.**
4. **Establish a procedure for all students to be transported to the LADBS on the same day to take the written D1.1 examination together.**
5. **Develop more Certificates of Achievement and update current Certificates of Accomplishment to Achievement to create more paths for student success and completion.**

SECTION 5
Analysis of Student Feedback

Provide a copy of any feedback reports generated by Institutional Research and Planning or your program. Review and discuss student feedback collected during the past four years including any surveys, focus groups, and/or interviews.

Appendix D: Student Survey- Program Review 2018

	Strongly Agree	Agree	Neither agree nor Disagree	Disagree	Strongly Disagree		Percent Conformance SA	A	N	D	SD
Student Support											
Instructors in this program have helped me achieve my academic goals.	22	17	3			42	52.38%	40.48%	7.14%	0.00%	0.00%
Instructors in this program have helped me stay on track.	19	20	3			42	45.24%	47.62%	7.14%	0.00%	0.00%
Instructors in this program provide me with opportunities to actively participate in my classes.	26	16				42	61.90%	38.10%	0.00%	0.00%	0.00%
I have felt a sense of community within this program.	26	13	3			42	61.90%	30.95%	7.14%	0.00%	0.00%
Student contributions have been valued by instructors in this program.	25	14	3			42	59.52%	33.33%	7.14%	0.00%	0.00%
Curriculum											
There is an appropriate range of courses offered in this program.	21	17	3	1		42	50.00%	40.48%	7.14%	2.38%	0.00%
Courses were scheduled on days and times that were covenient to me.	14	16	9	3		42	33.33%	38.10%	21.43%	7.14%	0.00%
I've been able to register for the classes I needed within this program.	20	20	2			42	47.62%	47.62%	4.76%	0.00%	0.00%
The courses in this program have helped me meet my academic goals.	20	19	3			42	47.62%	45.24%	7.14%	0.00%	0.00%
There is a variety of extracurricular activities related to this program on campus.	12	13	11	5	1	42	28.57%	30.95%	26.19%	11.90%	2.38%
The library has the resources to help me succeed in this program.	8	7	18	7	2	42	19.05%	16.67%	42.86%	16.67%	4.76%
Facilities, Equipment, & Technology											
The buildings and classrooms used by this program are satisfactory.	29	11	2			42	69.05%	26.19%	4.76%	0.00%	0.00%
I am satisfied with the equipment (projectors, machinery, models, etc.) used in this program.	27	11	3	1		42	64.29%	26.19%	7.14%	2.38%	0.00%
I am satisfied with the computers and software used in this program.	19	12	11			42	45.24%	28.57%	26.19%	0.00%	0.00%
Program Objectives											
I am aware of the course outcomes—what I should be able to to learn and what skills I should possess after completing courses in the program.	26	15	1			42	61.90%	35.71%	2.38%	0.00%	0.00%
Total Persons Surveyed							Percent Average (All Q)				
42							49.84%	35.08%	11.90%	2.70%	0.48%

Welding Technology
2018 Program Review
Dylan Meek &Renee Newell

A) Describe the results of the student survey in each of the following areas:

1. Student Support

Student Support	Strongly Agree	Agree	Neither agree nor Disagree	Disagree	Strongly Disagree	
Instructors in this program have helped me achieve my academic goals.	22	17	3			42
Instructors in this program have helped me stay on track.	19	20	3			42
Instructors in this program provide me with opportunities to actively participate in my classes.	26	16				42
I have felt a sense of community within this program.	26	13	3			42
Student contributions have been valued by instructors in this program.	25	14	3			42

Percent Conformance				
SA	A	N	D	SD
52.38%	40.48%	7.14%	0.00%	0.00%
45.24%	47.62%	7.14%	0.00%	0.00%
61.90%	38.10%	0.00%	0.00%	0.00%
61.90%	30.95%	7.14%	0.00%	0.00%
59.52%	33.33%	7.14%	0.00%	0.00%

The forty-two students who were surveyed are all students who have persisted in the program for at least a year. This extended experience with the El Camino College Welding program among those surveyed allowed for the creation of a rich and informed data set.

SS-1 - 92% of the students agreed that the instructors in the welding program have helped them achieve their academic goals. We strive to maintain a pedagogy and culture of care in the Welding department and we are very aware of the immensity of the college experience that awaits new students. We diligently labor to provide students with the guidance and assistance needed to navigate the college system and achieve academic goals.

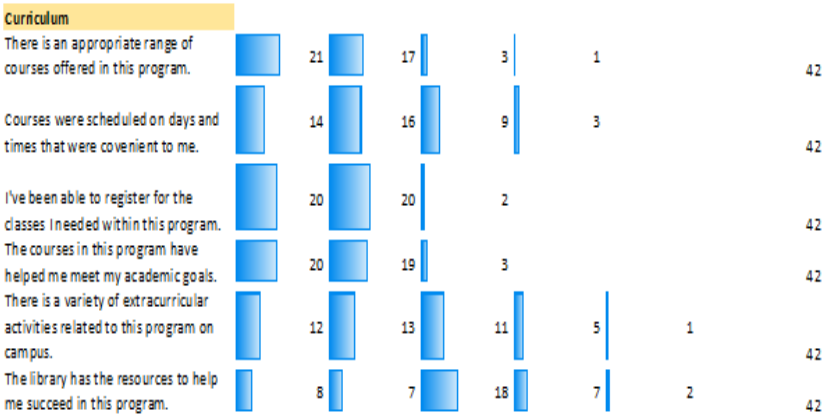
SS-2 – 92% of surveyed students either agreed or strongly agreed that the instructors in the Welding program have helped them stay on track. The Welding Department faculty has an open door policy for students and we regularly encourage students to seek counselor guidance through the Start Center.

SS-3 – The Welding students surveyed unanimously agreed (100% agreement) that the Welding faculty provides ample opportunity to actively participate in class. The Welding Technology department strives to provide a dynamic learning environment that is rich in cooperative learning and interactive problem solving.

SS-4 – Almost 93% of the surveyed students agreed that they felt a sense of community during their time in the welding program. The sense of community has drastically improved in the department since the inception of the eight week courses. The students who participate in the accelerated courses spend significantly more time with their peers. They often end up in a sixteen-week cohort if they take two eight-week courses in the same semester and this creates intense bonds between the students and between the faculty and students.

SS-5 – The faculty of the Welding department encourages and fosters a lecture environment based around discussion, questions and active interaction between students and instructors. Approximately 93% of students surveyed agreed that their contributions during class time are valued by the instructors in the Welding Technology program.

2. Curriculum



50.00%	40.48%	7.14%	2.38%	0.00%
33.33%	38.10%	21.43%	7.14%	0.00%
47.62%	47.62%	4.76%	0.00%	0.00%
47.62%	45.24%	7.14%	0.00%	0.00%
28.57%	30.95%	26.19%	11.90%	2.38%
19.05%	16.67%	42.86%	16.67%	4.76%

SS-1 – 90% of the students agreed that there is an appropriate range of courses offered by the Welding Technology program. There was a small minority (2.38%) that disagreed with this statement. We are always improving and expanding our curriculum and class offerings within the range of resources allocated. This is a labor that will never be finished as we strive to maintain pace with changing industry needs.

SS-2 – Of the surveyed students, approximately 71% agreed that courses were scheduled on days and times that were convenient to them. A significant number (21.43%) responded that they neither agreed nor disagreed with the statement. A small minority, disagreed (7.14%) with the statement. The Welding department will need to hire more adjunct instructors and be allocated more resources to significantly expand our nighttime and weekend offerings which may remedy some of the students' non-agreement with the statement.

SS-3 – Over 95% of the students surveyed agreed that they were able to register for the classes they needed to advance in the course sequence. The faculty in the Welding Technology department constantly strives to accommodate student scheduling needs. The department regularly has class populations that exceed the enrollment cap to facilitate student persistence and progression through the course sequences. This protocol is stimulating an increase in completions.

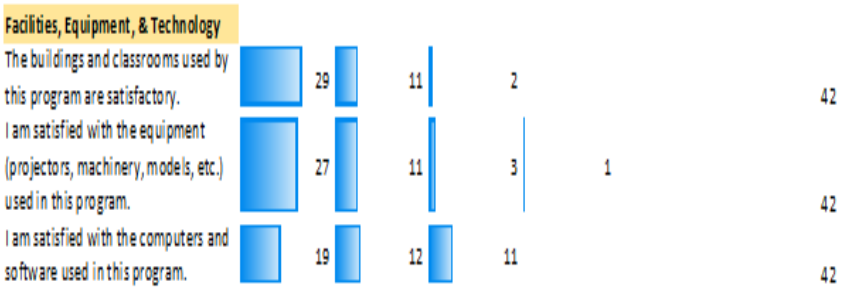
SS-4 – The students in the welding program often enter our program undecided as to their academic pathway and future occupation. The Welding department faculty strives to provide clear guidance and for program completion and occupational pathways. This data is reflected by approximately 93% of the students surveyed agreeing that the Welding Technology program has helped them meet their academic goals.

SS-5 – The students surveyed were split between agreement and non-agreement regarding extracurricular activities on campus that are related to the Welding program.

59.5% agreed that the opportunities existed. 26% neither agreed nor disagreed, 12% disagreed and less than 3% strongly disagreed. This data set shows a need for more extracurricular activity on campus related to the Welding program. In the past years the faculty has encouraged and supported students to build and showcase fabricated products at school events like College Night and other similar campus events, but that only applies to those who participate. One solution may be the formation of a Welding Club or similar organization to allow students to participate in welding related activities outside of classroom hours.

SS-6 – 64.29% of students survey were in non-agreement regarding whether the El Camino College library has the resources to help them succeed in the Welding program. Only 35.72% of the students agreed that the welding resources of the Library were sufficient to promote their success. The Welding department faculty will contact the Library Services staff and discuss what is available for students to use and whether we need to look at getting more copies of pertinent textbooks and supplements on hand for them to use. An option may be to see if we can get older editions of textbooks and code books donated to the library.

3. Facilities, Equipment, and technology



69.05%	26.19%	4.76%	0.00%	0.00%
64.29%	26.19%	7.14%	2.38%	0.00%
45.24%	28.57%	26.19%	0.00%	0.00%

SS-1 – 95.69% of the students surveyed agreed that the buildings and classrooms used by the Welding program are satisfactory. The CAT building is a new facility and the modern feel and clean features of the building appeal to the students entering the program. Students transferring to the El Camino College Welding program from other institutions frequently comment on how clean and organized the Welding laboratory is.

SS-2 – The Welding Technology program is ever attempting to update and modernize equipment used in the laboratory to simulate the conditions that students will encounter in industry. 90.48% of students surveyed are satisfied with the equipment used in the program.

SS-3 – Approximately 74% of the students surveyed agreed that the computers and software used in the Welding program are satisfactory. 26% of the students neither agreed nor disagreed with the statement. The Welding program is incorporating more computer-based curriculum in course offerings. As the Program obtains more robotic and CNC equipment there will be a greater need for computer interaction and software to support the systems.

4. Program Objectives

SS-1 – 97.61% of the students surveyed agreed that they are aware of course outcomes and what they should be able to learn and what skill they should possess after completing courses in the Welding program. The faculty in the Welding Technology department constantly strive to highlight objectives and facilitate clarity for skill attainment. The data set supports a very positive result for our efforts.

B) Discuss the implications of the survey results for the program.

The data set provided by the student survey is useful and informative. The survey confirms and supports the work that the Welding Technology department faculty members perform on a daily basis in a positive and affirmative way.

The Welding program students feel supported and focused in regards to their instruction. They answered the survey statements in an overwhelmingly positive manner regarding their ability to achieve academic goals, stay on track, actively participate, and freely contribute in valuable ways during instructional sessions. The students are also actively participating in developing a lasting network of valuable community during their time in the El Camino College Welding Technology program.

The students surveyed also strongly felt that the Program curriculum is relevant, convenient and mostly available at times that meet their needs. Survey results positively reinforce that the improved curriculum of the Welding program is helping our students meet their academic needs in a positive and timely manner. The data set shows a need and want for more extracurricular activities and one possible solution is the creation of a Welding Club or similar organization. We believe this need is arising due to the sense of community being experienced by the Welding students and their desire to continue the experience outside of classroom hours. The availability of resources at the ECC library to support Welding program students' needs will be explored. At this point it is unknown whether the Library has resources and the students are not utilizing them or if the resources available need to be brought up to date and expanded.

Survey results show that the students are satisfied with the facilities and equipment being used for educational purposes in both the lecture and laboratory portions of the Welding program. Welding faculty constantly strive to secure grant funding to modernize the equipment used in the laboratory to keep pace with what is being used in industry. A significant number of the students surveyed were ambivalent towards the computers and software being used in the Welding Technology program. As the program continues to develop curriculum and obtain equipment that features automation, the need for computers

and accompanying software will grow. This need will addressed by Welding program faculty members as it arises.

The results of the student survey concerning program objectives was particularly satisfactory as it establishes that the Welding Technology program faculty are clearly transmitting to the students what the outcomes of the classes are. This clarity assists the students in rapidly attaining skill sets and understanding theory. As new courses are offered to the student population of the Welding program, we will continue to ensure that course and program objectives are clear and that pathways are created to attain them.

Student satisfaction, through analysis of student survey results and success and completion rates indicate high levels of satisfaction, a stable metric of high success rates and a growing trend of completion. The weld program at ECC needs to continue the drive toward technology and leadership skills. Based on student feedback and the analysis of industry needs these are the drivers of student career success and program prosperity.

C) Discuss the results of other relevant surveys.

N/A – No other surveys were administered

D) List any related recommendations.

1.) **Work with the students to explore the possibility of creating a Welding student organization or club and encourage participation in available extracurricular activities that allow students to work together to highlight their welding skills.**
2.) **Communicate with to Gary Medina (Access Services Librarian) to identify what resources are presently available for Welding program students and find ways to augment these if they are found to be lacking.**

SECTION 6
Facilities and Equipment

A) Describe and assess the existing program facilities and equipment.

The Welding program moved into a new facility in 2015. This has facilitated the need for program changes that focus on technology in a space that is two-thirds smaller than the one the program previously occupied. With the new facility, the effort to create a modernized and rejuvenated Welding program began. This updated Welding program has required new state of the art equipment and supportive resources along with the support for smaller class sizes due to the lack of booths available in the given disciplines taught. As the Welding program has diversified and expanded its course offerings to include more focused paths to specific welding processes, our enrollment has surged. Since the last cycle of Academic Program Review, enrollment in the Welding program has increased 58%.

This surge in enrollment has spotlighted the need for the Welding Technology program to obtain more laboratory space to accommodate the current student population and facilitate

growth. In the Fall of 2018, the Welding program is offering Weld 20A which focuses on gas metal arc welding (GMAW) and flux cored arc welding (FCAW) and its offering resulted in replacing a Weld 10A on the Fall schedule. This Weld 10A is typically run at night to facilitate entry level students who need to attend class in the evenings. This is a result of our constant current (CC) SMAW machines and our constant voltage (CV) GMAW/FCAW machines being housed in the same welding booths. Housing two different types of machines in a single booth makes it an impossibility to run a SMAW class and FCAW/GMAW course concurrently. Housing multiple machines in a single welding booth is necessary due to the limited real estate available for use by the Welding program. This can be remedied by the Welding program obtaining enough new space to accommodate twenty more welding booths to house our CV wire fed welding machines.

Students must have the hands on and classroom experience to understand and implement blueprint reading, fabrication and welding code application. The only way to do this is to provide students direct access to the equipment and technology used by the welding industry to comply with AWS Standards. This requires the purchase of new equipment designed for the fabrication standards of the 21st century. Supportive resources including computer programs, hand tools and modern welding machines are required for students to meet the challenges of becoming a weld technician and leader in the industry.

The Welding laboratory has forty-one welding booths. Twenty-one booths are dedicated to transformer/rectifier GTAW machines and the remaining twenty booths house our constant current SMAW machines and constant voltage FCAW/GMAW machines. The SMAW machines have been updated to smaller, more compact inverter units which has helped to reduce operating costs and save space in the new Welding laboratory. The Welding department also has one modern Dynasty series GTAW inverter machine for demonstrations and specialty applications. Two portable plasma cutting machines are also available for demonstrations and student use. The Welding department maintains three portable SMAW inverter machines to support the growing student population of the Welding program.

The Welding Technology program has an assortment of manual, semiautomatic and automatic tools to familiarize students with industry standards and assist in fabrication. Inside the laboratory, two dedicated stations provide access to a Lincoln Electric robotic welding cell and a Torchmate 4x4 automated plasma cutting table to provide education that is relevant to current industry automation trends. Traditional fabrication machines such as a vertical band saw, horizontal band saw, Ironworker, corner shear, guided bend test fixture and pedestal grinders are also stationed in the Welding laboratory machine tool bay. Two Bluco fitting tables are centrally positioned to allow for work space and fabrication needs.

Outside, in the covered portion of the Welding yard, the Department has a manually operated sheet metal press brake, mechanized oxy-fuel track torch, mechanized oxy-fuel pipe beveller, 1/8” thickness guillotine style sheet metal shear, cold saw, and a tubing-notcher. Several portable oxy-fuel torch outfits are kept outside for cutting, pre-heating and post weld heat treatment applications. Anvils, bench vises, forming stakes and mobile tables used as work and welding stations are available for student use in the yard. There is a need to replace a recently removed shear that was dated, difficult to repair and becoming unsafe for operation. A new shear should be capable of cutting thicknesses to at least ½ inch as we work with

heavy plate for structural training. There is also need for a heavy-duty work table to mount pipe clamps, additional bench vises and safely operate a drill press.

The Welding shop uses a manifold system to provide shielding gas to welding booths that house GTAW and GMAW machines and provide acetylene and oxygen to the mechanized torch systems. All shielding gas is stored according to industry safety standards in a dedicated gas storage room. Water is piped into the GTAW welding booths to provide adequate cooling for the welding torches. The Welding program maintains an air compressor that is used to operate stationary pneumatic tools and provide compressed air to drops that are positioned throughout the welding lab for handheld tools and plasma cutting machines.

Power supply is distributed throughout the Welding laboratory in the form of fixed outlets and power drops both inside and outside. Single and three phase input is available with 120V/240V/480V options allowing the Welding program students to use a myriad of tools and welding machines. This versatility allows the Welding program to operate industry quality welding machines to better prepare our students for employability.

The CAT building tool room is adjacent to the Welding laboratory and is stocked with equipment, tools and supplies to support student success. The tool room provides students with access to measuring tapes, combination squares, friction strikers, cutting goggles, electrodes, GTAW filler material and torch equipment, angle grinders, die grinders, magnets, welding fixtures, welding and cutting machine consumables, and a vast array of hand tools. The support and materials available through the tool room is abundant and critical to maintaining high levels of student success.

The Welding department shares two lecture classrooms with two other departments which results in lectures having to be held in the ITEC building on occasion. The rooms are equipped with computers, projectors, DVD players, document cameras and sound systems. This setup is sufficient and effective for multi-media instructional presentations. Difficulties occasionally arise when the technology is not operating correctly, which is a reoccurring issue in CAT 104.

B) Explain the immediate (1-2 years) needs related to facilities and equipment. Provide a cost estimate for each need and explain how it will help the program better meet its goals.

1.) To improve efficiency in the Welding program we need to obtain a guillotine style plate shear that is capable of shearing through thicknesses of at least ½ inch. This shear should have CNC programmability to reflect current industry trends and be equipped with state of the art safety features. This is a large item and will require delivery, rigging and installation.
Cost: $125,000

2.) To reflect the high caliber nature of our program and increase our appeal to any visiting industry representatives the shop floor needs to be sealed. Sealing the shop floor is necessary for cleanliness, efficiency, safety and hazardous waste management and it is an industry standard that is not currently represented in our shop facility.
Cost: $25,000 – 35,000

3.) To enable the El Camino College Welding program to provide students with the greatest opportunity it is imperative that our facility achieves LADBS accredited test facility status. Both full-time instructors in the Welding program are AWS Certified Welding Inspectors and are capable of issuing AWS qualifications to students. For students to obtain their LADBS welding licenses those qualifications must be performed at a recognized test facility. This is in progress, but may require some funding to have machines and equipment certified during the process. This will also open the possibility of becoming a testing facility available for non-students which could be a source of revenue for the department.
Cost: $5,000

4.) The department needs an industry quality outdoor work station for fabrication. This station should be fixed and capable of supporting pipe clamps, bench vises, and include an area to operate fixed and magnetic base drill presses.
Cost: $10,000

C) Explain the long-range (2-4+ years) needs related to facilities and equipment. Provide a cost estimate for each need and explain how it will help the program better meet its goals.

1.) The Welding department does not have enough space available to accommodate our growing enrollment. We are unable to expand course offerings without removing a course from the schedule. The Department is also pressed for space regarding machine tools and new equipment. It is a reality that we will have to remove existing equipment to create space if we want to acquire new types of tools and machines. The Welding Technology department needs space for twenty additional welding booths and we need to extend the existing canopy over more of the yard to create additional space to house fabrication tools and machines.
Cost: $500,000

2.) Update at least 40% of our GTAW machines with new models that provide superior arc control. These machines will provide students with experience operating machines that frequently seen in aerospace fabrication that is so prevalent in our region. Updating our transformer /rectifier machines to state of the art inverters will also reduce power usage.
Cost: Eight Miller Dynasty series machines with carts and foot pedals $100,000

3.) Expand the Departments' ability to perform destructive testing by obtaining the machinery necessary to perform the break and bend tests required for AWS welder qualification tests. Charpy impact testing equipment to perform V-notch testing on pipe specimens and plunger type guided bend test presses for performing face bends, root bends and fillet weld break tests.
Cost: $15,000

D) List any related recommendations.

1.) Obtain LADBS Accredited Test Facility status

2.) Purchase a modern programmable guillotine style plate shear capable of shearing thicknesses up to ½ inch.

3.) Seal the concrete floors of the Welding laboratory.

4.) **Increase current laboratory space or obtain new space for the Welding department to install twenty additional welding booths and extend canopy coverage over the existing yard space.**
5.) **Large outdoor workstation for fabrication and drill presses.**
6.) **Replace 40% of our current GTAW machines with new model, modern Miller Dynasty series machines with foot pedals and carts.**
7.) **Communicate with Northrop Grumman and SpaceX to determine trending aerospace equipment needs**
8.) **Expand the Departments' ability to perform destructive testing by purchasing Charpy impact and plunger type guided bend test apparatus.**
9.) **Create a cycle for maintenance, repair, and replacement related to facilities and equipment.**

SECTION 7
Technology and Software

A) Describe and assess the adequacy and currency of the technology and software used by the program.

The Welding Technology program currently utilizes software for designing products and operating the Torchmate 4x4 automated plasma cutting table. To use this software in a classroom setting, Welding has to borrow laptops that belong to the ACR department. This is a situation that requires action due to scheduling conflicts between the two departments. Designing products on the Torchmate CAD software and actualizing the products on the plasma cutting table has become an integral part of the Departments' move toward automation. We need to explore the possibility of purchasing laptops for the welding department to facilitate future growth of automation curriculum.

The department also utilizes software from Lincoln Electric to monitor and troubleshoot our Powerwave S350 multi-process machines and our robotic welding cell. This software is utilized and kept up to date by our machine tool Technician. As the Department improves its technology and implements more automation more software will become necessary to maintain the equipment and support student learning.

When the El Camino College Welding laboratory becomes a LADBS accredited test facility and AWS qualifications are routinely being performed by the Welding department faculty, it may become necessary to obtain specialized software for recording and keeping track of results. There are several options available for this such as WeldNote, Smart Welding Manager and Weld-Console. This is a long-term goal, but it is certainly possible that it will be needed in the next four years.

The Welding program also utilizes the standard suite of software that is installed on the computers and media in the classrooms. This software and equipment is sufficient for Welding department instructional purposes.

B) Explain the immediate (1-2 years) needs related to technology and software. Provide a cost estimate for each need and explain how it will help the program better meet its goals.

1.) Purchase laptops and software to facilitate designing and fabrication on the Torchmate plasma cutting tables**.** The department needs at least twenty-four laptops and carts to meet current class caps. These computers would continue to be of use as the Department incorporates new software and implements more automation curriculum. Communicate with ITS to discuss whether a moratorium on purchasing new laptops exists.
Cost: $15,000

C) Explain the long-range (2-4+ years) needs related to technology and software. Provide a cost estimate for each need and explain how it will help the program better meet its goals.

1.) Obtain and implement software to track and categorize welding procedure specification. This same software should be able to record the results of procedure qualification records and welder qualification test records. This will be necessary once the El Camino College Welding Technology program beings to issue a large number of AWS qualifications and assumes the responsibility of being an accredited test facility. WeldNote appears to be a great option for this type of record keeping.
Cost: This would require a yearly subscription $1,200

D) List any related recommendations.

1.) Purchase laptops and software to facilitate designing and fabrication on the Torchmate plasma cutting tables. The department needs at least twenty-four laptops and accompanying carts to meet current class caps. These computers would continue to be of use as the Department incorporates new software and implements more automation curriculum.

2.) Create a cycle for maintenance, repair, and replacement of any technology and software (including license renewal).

3.) Obtain and implement software to track and categorize welding procedure specification. This same software should be able to record the results of procedure qualification records and welder qualification test records. This will be necessary once the El Camino College Welding Technology program beings to issue a large number of AWS qualifications and assumes the responsibility of being an accredited test facility.

SECTION 8
Staffing

A) Describe the program's current staffing, including faculty, administration, and classified staff.

The El Camino College Welding Technology program faculty currently includes two full-time faculty members and one adjunct instructor who is currently on an extended medical leave. The Department lost one adjunct in 2016 that was never replaced, and the class load has been distributed amongst the remaining faculty, but this has limited the ability of the

Program to expand class offerings. The current certificated staffing is insufficient to accommodate current enrollment and makes growth an impossibility.

With consideration to increasing student demand for classes in this trade, pending staffing changes, and current staffing levels, the program is unable to keep up with demand. Additional staffing will be required to address increasing class size and need to provide supervision for all the students in the lab. Safety is our biggest concern for the students. The program needs additional (adjunct) faculty for the night and GTAW portions of the Program.

The Welding Technology department also needs qualified and laboratory assistants. The Welding shop is very compartmentalized, making it difficult to maintain visual contact with students and address safety concerns. The Program faculty also spend hours of time during and outside of class preparing metal and maintaining supplies. Hiring full-time laboratory assistants would facilitate a safer educational environment and reduce the time instructors spend preparing metal allowing for a greater focus on curriculum and instruction.

The Departments' current classified staff includes a dedicated full-time machine tool technician and a number of part-time tool room attendants. The Welding program is in dire need of a full-time tool room attendant to provide steady and reliable support for the student population and Welding faculty. The Division of Industry and Technology is currently in the process of hiring tool room attendants for several vacant positions in multiple departments.

B) Explain and justify the program's staffing needs in the immediate (1-2 years) and long-term (2-4+ years). Provide cost estimates and explain how the position/s will help the program better meet its goals.

1.) – Short Term- Currently, we need to address our short term staffing needs by hiring two adjunct instructors. The Welding laboratory can accommodate two separate lab classes offering Gas Tungsten Arc Welding and Shielded Metal Arc/ Flux Cored Welding simultaneously to cover the growth we will need to provide our community. Local aerospace fabrication companies are constantly seeking new welders due to the nationwide skills gap. We need to focus on training superior Gas Tungsten Arc welding technicians that can pass the grueling tests required for employment at the major aerospace producers located in Southern California. If our program is allowed more growth, we will seek out adjunct faculty to fill in the voids. Resources for staffing development will need to be included in the annual budget each year to enable program and student success.

Cost: $80,000 annually to hire and retain two adjunct instructors to expand our GTAW program.

-Short Term- The Welding department has a need for at least two full-time laboratory assistants. The Welding shop is very compartmentalized, making it difficult to maintain visual contact with students and address safety concerns. The Program faculty also spend hours of time during and outside of class preparing metal and maintaining supplies. Hiring full-time laboratory assistants would facilitate a safer educational environment and reduce the time instructors spend preparing metal allowing for a greater focus on curriculum and instruction. Once the laboratory becomes a LADBS accredited test facility, there will be a significant amount of new work associated with prepping metal

for test specimens, performing bend tests and storing results for the requisite time. Laboratory assistants will allow the new testing facility to operate smoothly and move quickly towards developing a reputation with local industry for being efficient and reliable.
Cost: $60,000 - $70,000 annually to hire and retain two full-time laboratory assistants.

2.) **–Long Term-** The Welding Technology will need two additional adjunct instructors over the course of the next two to four years. These new hires would need to be combination welders that are versatile enough to teach most of the course offerings at El Camino College. This would allow the Program to bolster its night and weekend offerings and ensure that night time students are given the same opportunities for completion as day students. More instructors will also be necessary if the Welding program is able to obtain more laboratory space to accommodate twenty additional welding booths.
Cost: $80,000 annually to hire and retain two additional adjunct instructors to bolster and expand night and weekend class offerings.

3.) List any related recommendations.
1.) **Hire two adjunct instructors with strong aerospace and GTAW experience to replace lost instructors and expand the Programs' ability to train aerospace quality weld technicians.**
2.) **Hire and retain two full-time laboratory assistants to improve laboratory safety and facilitate a more efficient educational environment.**
3.) **Hire two additional adjunct instructors that are versatile multi-process welders capable of teaching the majority of course offerings in the El Camino College Welding Technology program to expand and support our night and weekend offerings.**

SECTION 9
Direction and Vision

A) Describe relevant changes within the academic field/industry. How will these changes impact the program in the next four years?

The Weld program is developing program content in compliance with industry trends and demands. For the program to develop in the needed direction to support student success requires the integration of technology into the program. This integration requires automation technology to the existing curriculum and add certificates of achievement to complement these changes. This high demand for technology-based skills requires that the Program update and add courses that complement this demand. In our continuing contact with industry officials, concern about writing, reading and basic math skills continues to top the list of concerns.

With the importance of reading, writing and math skills continually reinforced during interactions with industry, the Welding program faculty recommend an advanced course in

technical writing as a long-term goal. This course would be a great option for the Welding department to offer through Distance Education. All employers are competing for the same, relatively small pool of qualified technicians. In order to meet this demand, the weld program should increase its efforts to develop students who are more qualified and more marketable in the selection process.

Welding is now the universally accepted method of permanently joining all metals. The welding industry is mature when assessed in terms of longevity and universal acceptance, but it is still a growing and changing field. The value of the parts produced by welding, the amount of money saved by the use of welding over other metal joining processes and the value of products made possible by welding illustrate how large of an impact welding technology has on metalcraft and the world that benefits from its products.
Historical data sets are available that record the growth of the welding equipment and materials industry. This data gives an indication of the growth for the future. The arc-welding segment of the industry has shown the most growth in recent years but the entire industry shows an average of 6% growth per year. Over two-thirds of this total growth is seen in the consumables and equipment sold for conventional arc welding processes (SMAW, GMAW, FCAW, and GTAW).

Changes in the distribution of sales amongst these products allows us to track emerging trends in the welding industry.

- **Covered electrodes for SMAW are in decline. There use has been steadily decreasing for the last fourteen years, dropping from 81% to 59% of the total sales. SMAW consumables sales projections predict a drop to 45% of the total arc welding consumables sold by 2024.**
- **Submerged arc welding has remained constant at about 5% to 7%.**
- **Gas metal arc welding has almost doubled, rising from 10% to 20%, and is projected to double again in the next ten years.**
- **Flux-cored arc welding consumables sales have doubled since 2004 and continue to rise as FCAW replaces SMAW as the primary choice for structural welding applications.**
- **Gas tungsten arc welding consumables and equipment show considerable growth and is predicted to grow as fast, or faster than the total welding market. This trend will continue because GTAW is adaptable to automation, it used for high quality work and for welding newly developed specialty metals.**

This information clearly illustrates that semi-automatic and gas tungsten arc welding will greatly increase, machine and automatic welding will increase modestly, but shielded metal arc welding is steadily decreasing as a percentage of the total. Construction and fabrication companies are constantly seeking means of improving quality, reducing manufacturing costs and increasing productivity.

Due to the skills gap that is present in the United States, employers are struggling to find new welders to fill spots vacated by retirements. This has resulted in a resurgence of apprenticeship programs, higher pay for entry-level welders and more on the job training. The expectations of the employers have changed to reflect this reduction in the labor force

and higher pay scales by requiring higher levels of productivity and versatility from their welders.

The materials used for both parent and filler materials are rapidly changing as new products are developed to meet the industry need for stronger, lighter weight welded connections. The use of high strength alloys and specialty metals throughout the welding industry has become common in order to achieve specific mechanical properties in finished weld deposits. These changes in construction and fabrication have resulted in the development of new welding consumables, processes and power sources for efficiently welding the new materials.

The trend towards automation has accelerated due to the skills gap. Though the number of welders available to fill jobs has decreased and will continue to decrease, the number of jobs that require welding continues to grow. If employers are unable to secure the skilled labor force necessary to meet demand, then automation becomes a necessary adaptation to stay solvent and maintain production. Automated and semi-automated cutting, welding and forming solutions allow welding companies to maintain or even increase productivity and efficiency with a smaller labor force. Manual welding and cutting operations have the lowest efficiency ratings. Updating fabrication equipment to include programmability and CNC options doubles accuracy and productivity over traditional manual methods. Semi-automatic and automatic welding solutions provide similar returns to welding outfits that are willing to invest in new equipment and adequate training for their welders. When a structural steel erection company makes the transition from SMAW to FCAW they often see a 400% increase in weld metal deposited. These solutions directly translate into an increase in productivity and profitability.

All of these changes reflect a need for a higher level of knowledge and versatility amongst new candidates entering the welding industry. New hires will need to be able to fit, fabricate, understand blueprints and welding symbology, utilize multiple welding processes, understand welding metallurgy and operate state of the art cutting and forming machinery that incorporates automation. New applicants to the welding industry are no longer, "just a welder," but someone who possess technician level skills and knowledge.

The skills gap needs to be addressed by all educational institutions in order to train enough skilled workers to meet industry needs. Industrial work needs to become more attractive and hospitable to female workers. More than half of the population of the United States is female. Industry needs to access this untapped labor resource to fill and sustain employment. As an educational institution, El Camino College needs to promote the Welding program and make it attractive to women to create a growth point capable of shrinking the skills gap.

The Welding program needs to keep pace with the changing needs of industry to facilitate employment for our students. This will require the El Camino College Welding Technology program to continue developing curriculum that focuses on semi-automatic wire fed welding processes and update our machinery to incorporate modern CNC and programmability options.

Obtaining Los Angeles Department of Building and Safety accredited test facility status for the Welding laboratory will allow the Welding faculty to issue AWS qualifications that are

necessary for locally issued trade license. The Program needs to increase its ability to perform destructive testing, we can then expand the number of qualifications available to students and provide training that covers a more significant cross section of local welding interests.

To stay abreast of the relevant changes in the welding industry the Program needs to develop better relationships with local industry. This includes strengthening ties with local unions, contractors and aerospace fabricators to obtain information of current welding procedures and provide pathways for student employment. The El Camino College Welding Technology program strives to provide our students with industry relevant training to increase success, ensure employability and strengthen the economic stability of the communities we serve.

B) Explain the direction and vision of the program and how you plan to achieve it.

The direction and vision of the El Camino College Welding Technology program is to promote student success and employability through welding theory, hands-on application, qualification, certification and licensing. We are updating our curriculum to reflect the need for skilled and versatile welding technicians. The Welding program is working with other relevant construction technology departments to strengthen and broaden students' understanding of fabrication techniques.

We have expanded our views and application of cohort teaching in conjunction with Mathematics' faculty through the Career Advancement Academy supported sections. By incorporating math into the fabric of our curriculum we are creating an intrinsic link between mathematical aptitude, problem solving and fabrication. The goal is to train welding technicians capable of passing employer and trade union entry-level exams and excelling in the process. Contextualized learning is especially effective for students who enter the Program struggling with math and English.

The El Camino College Welding Technology program seeks to maintain and promote an inclusive and welcoming learning environment. Our goal is to attract non-traditional candidates to the welding field. Only through expanding the scope of our student base at educational institutions can we hope to provide enough skilled welders to fill jobs in the next decade. Inviting and encouraging Women to learn the skills necessary to become high earning welding technicians is at the forefront of the Departments' vision for attraction and promotion.

Our lecture curriculum focuses on teaching the problem solving and critical thinking skills necessary for our students to become welding technicians and leaders in their industry. We will continue to emphasize new technology that reflect the current trends in industry and provide the training required for students to thrive in the constantly changing technological landscape of the welding industry. At our core, we desire to effect change in our students' lives that allows them to thrive and achieve positions of professional leadership. The skills that are developed in the El Camino College Welding Technology program will provide students with the problem-solving aptitude and adaptability required to compete in a dynamic world that is ever changing and expanding.

C) List any related recommendations.

1.) **Continue the development of and increase funding for semi-automatic welding courses to reflect industry need.**
2.) **Expand our GTAW curriculum and course offerings to meet the needs of local industry.**
3.) **Attract non-traditional students to the Welding program to maintain current enrollment trends and provide training that will facilitate the closure of the skills gap.**
4.) **Develop stronger ties with local welding employers and trade unions to facilitate job placement.**
5.) **Modernize and update welding power sources and machine tools to stay relevant with current industry trends.**

SECTION 10
Prioritized Recommendations

A) Provide a single, prioritized list of recommendations and needs for your program/ department (drawn from your recommendations in sections 2-8). Include cost estimates and list the college strategic initiative that supports each recommendation. Use the following chart format to organize your recommendations.

	Recommendations	Cost Estimate	Strategic Initiatives
1.	**Hire two adjunct instructors with strong aerospace and GTAW experience to replace lost instructors and expand the Programs' ability to train aerospace quality weld technicians.**	**$80,000 annually**	**A, B, D, E, F**
2.	**Obtain LADBS Accredited Test Facility status**	**$5,000**	**A, B, D, E, F**
3.	**Purchase a modern programmable guillotine style plate shear capable of shearing thicknesses up to ½ inch.**	**$125,000**	**A, B, E, F**
4.	**Increase the department supply budget to facilitate and expand GMAW/FCAW and GTAW course offerings to meet current industry trends.**	**$15,000 annually**	**A, B, D, E, F**
5.	**Hire and retain two full-time laboratory assistants to improve laboratory safety and facilitate a more efficient educational environment.**	**$60,000 - $70,000 annually**	**A, B, E**
6.	**Seal the concrete floors of the Welding laboratory.**	**$25,000 - $35,000**	**B, E, F**
7.	**Large outdoor workstation for fabrication and drill presses.**	**$10,000**	**A, B, E, F**
8.	**Increase current laboratory space or obtain new space for the Welding department to install twenty additional welding booths and extend canopy coverage over the existing yard space.**	**$500,000**	**A, B, D, E, F**
9.	**Replace 40% of our current GTAW machines with new**	**$100,000**	**A, B, E, F**

	model, modern Miller Dynasty series machines with foot pedals and carts.		
10.	**Purchase laptops and software to facilitate designing and fabrication on the Torchmate plasma cutting tables. The department needs at least twenty-four laptops to meet current class caps.**	**$15,000**	**A, B, E, F**
11.	**Expand the Departments' ability to perform destructive testing by purchasing Charpy impact and plunger type guided bend test apparatus.**	**$15,000**	**A, B, E, F**
12.	**Hire two additional adjunct instructors that are versatile multi-process welders capable of teaching the majority of course offerings in the El Camino College Welding Technology program to expand and support our night and weekend offerings.**	**$80,000 annually**	**A, B , D, E, F**

B) Explain why the list is prioritized in this way.

The first seven recommendations are immediate concerns that need to be attained within the next two years to maintain program vision and direction. **Recommendation #1- Hire two adjunct instructors with strong aerospace and GTAW experience to replace lost instructors and expand the Programs' ability to train aerospace quality weld technicians-** This is a hiring need that has been unfilled for several years. The program lost one of its adjuncts in 2016 and he was never replaced. The Department's perennial adjunct and GTAW specialist has gone out on an indefinite medical leave that began in the Fall of 2018. These staffing issues have resulted in class cancellations and continue to create roadblocks to expansion and growth. This is the most pressing need of the Department.

Recommendation #2 -Obtain LADBS Accredited Test Facility status. This will enable the Welding department faculty to provide AWS qualifications for students that will be recognized by the LADBS for obtaining LA City structural steel welding licenses. The Welding department and the administration of the Division of Industry and Technology are already working on the process and communicating with the Los Angeles Department of Building and Safety. Both Welding faculty members are AWS Certified Welding Inspectors capable of issuing qualifications, we just need the facility recognized so that the LADBS will accept the qualifications for licensing purposes. The results of these qualifications can be tracked and used as an additional success metric for the Department. This is an immediate need (within 1 year) that is already in progress.

Recommendation #3 -Purchase a modern programmable guillotine style plate shear capable of shearing thicknesses up to ½ inch- is an immediate need because the department just removed an unsafe aging shear that had become costly and difficult to maintain. We need to replace this loss with a shear that is capable of shearing plate thicknesses of at least ½" to support our structural steel program. The replacement should incorporate programmability and modern safety features to provide students with the chance to operate equipment that will be present in the welding industry and become familiar with automation. This is an immediate need (within 1-2 years) to replace equipment that was recently marked for surplus.

Recommendation #4 -Increase the department supply budget to facilitate and expand GMAW/FCAW and GTAW course offerings to meet current industry trends. These courses have a higher cost in materials due to shielding gas and welding processes with higher deposition rates. We need to offer these courses every semester to keep pace with industry trends. The Welding department needs to able to offer our GTAW and GMAW/FCAW course every semester to facilitate student employability when they complete program. This is an immediate need (within 1-2 years) to increase student success and employability upon Program completion.

Recommendation #5- Hire and retain two full-time laboratory assistants to improve laboratory safety and facilitate a more efficient educational environment. As the Welding program grows, more eyes and hands are needed in the Welding laboratory. This will decrease the amount of time that the Welding faculty spend monitoring and preparing material and increase the amount of time spent on hands on instruction. This will also increase the safety of the educational environment of the Welding laboratory which is compartmentalized and difficult to visually monitor with one set of eyes. Once the laboratory obtains LADBS accredited test facility status, this additional help will allow the department to more quickly and efficiently operate as a testing lab. This is an immediate need (within 1-2 years) that will increase safety conditions and increase Program efficiency.

Recommendation #6- Seal the concrete floors of the Welding laboratory. The concrete in the Welding laboratory is not sealed. This represents a safety hazard in regards to the porous concrete absorbing liquid material from nearby machine tools. Sealing the floors will also increase the longevity of the existing facility. This will allow for easier cleanup of cutting fluids and lubricants associated with the welding industry and provide a safe educational environment for students. This is an immediate need (within 1-2 years) that will increase laboratory safety and cleanliness.

Recommendation #7- Large outdoor workstation for fabrication and drill presses. The Welding department requires a large outdoor fabrication station to mount bench vises, pipe clamps, machine vises, drill presses and operate magnetic base drill presses. This is vital to support our structural fabrication course. This is an immediate need (within 1-2 years) that will increase student success through hands on fitting and fabrication training.

Recommendation #8- Increase current laboratory space or obtain new space for the Welding department to install twenty additional welding booths and extend canopy coverage over the existing yard space. Currently, the Welding department has its GMAW/FCAW machines sharing booth space with the SMAW machines. This makes it an impossibility to run any of our SMAW classes concurrently with a GMAW/FCAW course in the laboratory. This has resulted in classes being offered less frequently to accommodate our limited laboratory space. Enrollment in the Welding program has increased 58% since the last Academic Program Review and we need the space and resources to manage this growth and meet the needs of an industry that is starving for skilled labor. This is a long-term need (2-4 years) that will facilitate program growth allow us to meet the needs of local industry.

Recommendation #9- Replace 40% of our current GTAW machines with new model, modern Miller Dynasty series machines with foot pedals and carts. Most of the GTAW machines utilized by the Welding program are dated transformer/rectifier power sources. We need to start modernizing these machines to allow students to work with aerospace quality GTAW power sources. This will prepare students for work at Ace Clearwater, Honeywell, SpaceX, and Robinson Helicopter. This is a long-term need (2-4 years) that will improve student success and support the initiative for modernization.

Recommendation #10- Purchase laptops and software to facilitate designing and fabrication on the Torchmate plasma cutting tables. The department needs at least twenty-four laptops and carts to meet current class caps. As industry responds to a dwindling skilled labor work force by implementing increasing amounts of automation, more and more of the machines will have computerized telemetry and interface. The Welding department already incorporates automation curriculum supporting its Torchmate Plasma Cutting Table. Currently the Department borrows laptops from another department to support this curriculum. This often leads to scheduling conflicts. The Welding Technology needs its own laptops to adequately support its' students in automation education. This is a long-term need (2-4 years) that will support student success and employability.

Recommendation #11- Expand the Departments' ability to perform destructive testing by purchasing Charpy impact and plunger type guided bend test apparatus. Once the Welding laboratory is operating as an accredited testing facility it will be advantageous to us to expand our ability to perform destructive testing. This will allow the Department to offer more qualifications to its students. Eventually this will lead to local industry sending their employees to our facility to obtain qualifications. This is a long-term need (within 2-4 years) that will increase student success and employability as well as earning our facility industry recognition and legitimacy.

Recommendation #12- Hire two additional adjunct instructors that are versatile multi-process welders capable of teaching the majority of course offerings in the El Camino College Welding Technology program to expand and support our night and weekend offerings. The program is expanding, both in terms of enrollment and course offerings. To allow our night and weekend program to be as robust as our day time offerings, the Program will require two additional adjuncts capable of teaching the entire Welding catalog of offerings. This is a long term need (within 2-4 years) that will allow the El Camino College Welding Technology department to better serve its nighttime student population, supporting student success and facilitating program completion for our students that work full time.

Appendix A
ALIGNMENT GRIDS

INDUSTRY AND TECHNOLOGY
Institutional (ILO), Program (PLO), and Course (SLO) Alignment

Program: **Welding**	**Number of Courses:** 12	**Date Updated:** 09.18.2014	**Submitted by:** SueEllen Warren, ext. 4519 Renee Newell, ext. 3308

ILOs	**1. Critical Thinking** *Students apply critical, creative and analytical skills to identify and solve problems, analyze information, synthesize and evaluate ideas, and transform existing ideas into new forms.*	**2. Communication** *Students effectively communicate with and respond to varied audiences in written, spoken or signed, and artistic forms.*	**3. Community and Personal Development** *Students are productive and engaged members of society, demonstrating personal responsibility, and community and social awareness through their engagement in campus programs and services.*	**4. Information Literacy** *Students determine an information need and use various media and formats to develop a research strategy and locate, evaluate, document, and use information to accomplish a specific purpose. Students demonstrate an understanding of the legal, social, and ethical aspects related to information use.*

SLO-PLO-ILO ALIGNMENT NOTES:

Mark boxes with an 'X' if: SLO/PLO is a major focus or an important part of the course/program; direct instruction or some direct instruction is provided; students are evaluated multiple times (and possibly in various ways) throughout the course or are evaluated on the concepts once or twice within the course.

DO NOT mark with an 'X' if: SLO/PLO is a minor focus of the course/program and some instruction is given in the area but students are not formally evaluated on the concepts; or if the SLO/PLO is minimally or not at all part of the course/program.

PLOs	**PLO to ILO Alignment** *(Mark with an X)*			
	1	2	3	4
PLO #1 Success in the Welding Industry Success in the Welding Industry Upon completion of the Welding program, students will be able to demonstrate knowledge of the skills needed for success in the welding industry.	X			
PLO #2 Safety Knowledge and Skills Upon completion of the Welding program, whether in the certificate program or degree program, students will acquire and be able to use specific safety knowledge and skills relating to welding discipline and will be able to apply those skills to specific job requirements.				X
PLO #3 Attaining Certificates, Degrees, Transferring and Attaining Job Upon completion of the Welding program, students will successfully earn a certificate/graduate/transfer to 4 year universities and will successfully compete for jobs in which they can apply their knowledge and communicative skills acquired in welding program.	X			

SLOs	**SLO to PLO Alignment** *(Mark with an X)*			**COURSE to ILO Alignment** **FOR OFFICE USE ONLY**			
	P1	P2	P3	1	2	3	4
WELD 1 Introduction to Welding: SLO #1 Students will be able to demonstrate basic knowledge of welding concepts.	X		X				
WELD 1 Introduction to Welding: SLO #2 Welding students will produce quality welds utilizing various welding techniques.	X		X	X			X
WELD 1 Introduction to Welding: SLO #3 Students will be able to demonstrate the safe set up and operation of welding equipment using all applicable personal protective equipment.		X	X				
WELD 10A Introduction to Shielded Metal Arc Welding (SMAW): SLO #1 Students will be able to demonstrate the safe set up and operation of welding equipment using all applicable personal protective equipment.		X	X				
WELD 10A Introduction to Shielded Metal Arc Welding (SMAW): SLO #2 Safe operation of manual and semi-automatic base metal cutting tools.	X		X	X			X
WELD 10A Introduction to Shielded Metal Arc Welding (SMAW): SLO #3 Students will have a basic understanding how heat affects their weldment.	X						
WELD 10B Intermediate Shielded Arc Metal Welding (SMAW): SLO #1 Welding students will produce quality welds utilizing various welding techniques.	X		X				
WELD 10B Intermediate Shielded Arc Metal Welding (SMAW): SLO #2 Students will understand Blueprint symbols and their relationship to the weldment.	X		X	X			X
WELD 10B Intermediate Shielded Arc Metal Welding (SMAW): SLO #3 Student will exhibit knowledge in electrode identification, weldability of metals, joint design and power sources.	X		X				
WELD 10C Advanced Certification and Career Preparation Lab: SLO #1 Student will perform destructive test on a qualification plate exam (guided bend tests).	X		X				
WELD 10C Advanced Certification and Career Preparation Lab: SLO #2 Students will have working knowledge of manual and semi-automatic tooling used in industry.	X		X	X			X
WELD 10C Advanced Certification and Career Preparation Lab: SLO #3 Student will safely operate equipment and exhibit shop safety throughout course.		X					
WELD 15 Basic Welding for Allied Fields: SLO #1 Welding Concepts Students will be able to demonstrate basic knowledge of welding concepts.			X				
WELD 15 Basic Welding for Allied Fields: SLO #2 Safe Setup & Operation Students will be capable of the safe set up and operation of welding equipment.		X		X			X
WELD 15 Basic Welding for Allied Fields: SLO #3 Welding Process Selection Capability to choose an electrode or process that suits the metal thickness, joint fit up, and alloy composition.	X		X				

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SLOs	SLO to PLO Alignment (Mark with an X)			COURSE to ILO Alignment *FOR OFFICE USE ONLY*			
	P1	P2	P3	1	2	3	4
WELD 23 Advanced Arc Welding Specialty Lab: SLO #1 3G and 4G Positions Welding students will produce quality weld in the 3G And 4G positions.	X		X				
WELD 23 Advanced Arc Welding Specialty Lab: SLO #2 Joint Fit-Up Students will have a developed understanding of the importance of joint fit up.	X		X	X			
WELD 23 Advanced Arc Welding Specialty Lab: SLO #3 D1.1 Certification At the completion of this course, students will be prepared to take the practical exam for their D1.1 certification.	X		X				
WELD 28 American Welding Society (AWS) D1.1 Certification Test Preparation: SLO #1 Preparing for Certification Exams Students will be able to locate and use charts, index and table of contents to answer open book questions to prepare for the exam.	X		X				
WELD 28 American Welding Society (AWS) D1.1 Certification Test Preparation: SLO #2 D1.1 Written Exam Prep At the completion of this course, students will be prepared to take the written exam for their LA City D1.1 Structural Steel certification.	X		X	X			
WELD 28 American Welding Society (AWS) D1.1 Certification Test Preparation: SLO #3 Welding Procedure Specifications Capability to process Welding Procedure Specifications (WPS), which provides direction to the welder or welding operators for making sound and quality production welds as per the code.	X		X				
WELD 40A Gas Tungsten Arc Welding (GTAW), Gas Metal Arc Welding (GMAW): SLO #1 TIG Weld Concepts Students will be able to express a basic knowledge of TIG welding concepts.	X						
WELD 40A Gas Tungsten Arc Welding (GTAW), Gas Metal Arc Welding (GMAW): SLO #2 GTAW Gases Students will be able to demonstrate a knowledge of the gases used for the GTAW processes.				X			X
WELD 40A Gas Tungsten Arc Welding (GTAW), Gas Metal Arc Welding (GMAW): SLO #3 Constant Current Welding Students will be able to correctly set up and use a constant current welding machine.		X					
WELD 40B Intermediate Gas Tungsten Arc Welding (GTAW): SLO #1 Safely set up weldment and GTAW equipment.		X					
WELD 40B Intermediate Gas Tungsten Arc Welding (GTAW): SLO #2 Correctly adjust welding parameters to produce quality weldments in and out of position.	X		X	X			X
WELD 40B Intermediate Gas Tungsten Arc Welding (GTAW): SLO #3 Produce GTAW weldment according to administered blueprint.	X		X				

SLOs	SLO to PLO Alignment (Mark with an X)			COURSE to ILO Alignment *FOR OFFICE USE ONLY*			
	P1	P2	P3	1	2	3	4
WELD 40C Advanced Gas Tungsten Arc Welding (GTAW): SLO #1 Apply the proper safety procedures and precautions required when working with GTAW.		X					
WELD 40C Advanced Gas Tungsten Arc Welding (GTAW): SLO #2 Use the appropriate equipment and materials to develop the welds and weld joints illustrated on a job sheet.			X	X			X
WELD 40C Advanced Gas Tungsten Arc Welding (GTAW): SLO #3 Produce a quality "out of position" weldment and adjust his welding parameters accordingly.	X						
WELD 45 Structural Fabrication: SLO #1 Safe Setup & Operation Students will be able to demonstrate the safe set up and use of various welding and cutting apparatus.		X					
WELD 45 Structural Fabrication: SLO #2 Job Skills Students will be prepared to demonstrate job skills required for fabrication layout.	X			X			X
WELD 45 Structural Fabrication: SLO #3 Measuring Tools Students will be able to correctly use measuring tools necessary for fabrication projects.	X						
WELD 5 Basic Welding Technology: SLO #1 Quality Welds Welding students will produce quality welds utilizing various welding techniques.	X						
WELD 5 Basic Welding Technology: SLO #2 Blueprint Symbols Students will understand Blueprint symbols and their relationship to the weldment.	X			X			
WELD 5 Basic Welding Technology: SLO #3 Welding & Weldability Student will exhibit knowledge in electrode identification, weldability of metals, joint design and power sources.	X						

Appendix B
SLO/PLO TIMELINES

Welding Technology
2018 Program Review
Dylan Meek &Renee Newell

SLO Timeline *Worksheet*
(2017 - 2020)

Division: Industry and Technology **Program: WELDING** **Program Review Year: _____**

Directions: *Use this worksheet to enter the existing assessment timelines for 2016 as listed in TracDat and distribute assessments for each SLO/PLO statement over the next four-year timeline (2017-2020). Type an* ***X*** *in the cells below to indicate the semester in which the SLOs/PLOs are being assessed. The completed worksheet should be emailed to the division facilitator by* ***JUNE 1, 2017*** *. Facilitators are responsible for making sure the information is complete and e-mailing an electronic copy of this Timeline Worksheet document (in Word or PDF format) to ipena@elcamino.edu by _____. Once received by the SLO Administrative Assistant, this information will be input into TracDat.*

Course and SLO #	Note if offered only in FA/SU/SP	SP 2016	SU 2016	FA 2016	SP 2017	SU 2017	FA 2017	SP 2018	SU 2018	FA 2018	SP 2019	SU 2019	FA 2019	SP 2020	SU 2020	FA 2020
PLO #1								**PROGRAM**					X			
PLO #2				X				**REVIEW**								X
PLO #3							X									
WELD 10A - SLO #1											X					
WELD 10A - SLO #2		X												X		
WELD 10A - SLO #3					X											
WELD 10B - SLO #1											X					
WELD 10B - SLO #2		X												X		
WELD 10B - SLO #3					X											
WELD 10C - SLO #1											X					
WELD 10C - SLO #2		X												X		
WELD 10C - SLO #3					X											
WELD 15 - SLO #1											X					
WELD 15 - SLO #2		X												X		
WELD 15 - SLO #3								X								

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Course and SLO #	Note if offered only in FA/SU/SP	SP 2016	SU 2016	FA 2016	SP 2017	SU 2017	FA 2017	SP 2018	SU 2018	FA 2018	SP 2019	SU 2019	FA 2019	SP 2020	SU 2020	FA 2020
WELD 23 - SLO #1											X					
WELD 23 - SLO #2					X									X		
WELD 23 - SLO #3					X											
WELD 28 - SLO #1											X					
WELD 28 - SLO #2		X												X		
WELD 28 - SLO #3					X											
WELD 40A - SLO #1											X					
WELD 40A - SLO #2					X									X		
WELD 40A - SLO #3					X											
WELD 40B - SLO #1											X					
WELD 40B - SLO #2		X														X
WELD 40B - SLO #3							X									
WELD 40C - SLO #1								X								
WELD 40C - SLO #2		X												X		
WELD 40C - SLO #1					X											
WELD 45 - SLO #1				X												X
WELD 45 - SLO #2							X									
WELD 45 - SLO #3													X			

Appendix C
6-YEAR CURRICULUM COURSE REVIEW TIMELINE

WELDING CURRICULUM – 2015-2020					
COURSE	**2015-2016**	**2016-2017**	**2017-2018**	**2018-2019**	**2019-2020**
Welding 1	2 Year CTE Review			Inactivation	
Welding 1A		NEW		2 Year CTE Review	
Welding 1B			NEW		
Welding 5	Inactivation				
Welding 10A	2 Year CTE Review		2 Year CTE Review		2 Year CTE Review
Welding 10B	2 Year CTE Review		2 Year CTE Review		2 Year CTE Review
Welding 10C	2 Year CTE Review		2 Year CTE Review		2 Year CTE Review
Welding 15	2 Year CTE Review			2 Year CTE Review	
Welding 20A		NEW		2 Year CTE Review	
Welding 23		Course Review Prerequisite Change		2 Year CTE Review	
Welding 28		Course Review Prerequisite Change		2 Year CTE Review	
Welding 29		NEW		2 Year CTE Review	
Welding 40A	2 Year CTE Review			2 Year CTE Review	
Welding 40B	2 Year CTE Review			2 Year CTE Review	
Welding 40C	2 Year CTE Review			2 Year CTE Review	
Welding 45				Separate into 2 courses	
Welding 95					
Welding 99					

ASSOCIATE IN SCIENCE - DEGREES AND CERTIFICATES	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
Associate in Science Degree *Welding* *Adding Welding 1A, 1B, 15, 20A, 29 Removing Welding 1*			Approved		
Certificate of Achievement *Welding* *Adding Welding 1A, 1B, 15, 20A, 29 Removing Welding 1*			Approved		
Certificate of Achievement *Structural Steel Fabrication*				In Progress	
Certificate of Achievement *Semi-Automatic Welding*				In Progress	
Certificate of Achievement *Gas Tungsten Arc Welding (GTAW) Ferrous and Non-Ferrous Metals*				In Progress	
Certificate of Achievement *Shielded Metal Arc Welding (SMAW) Structural Steel*				In Progress	
Certificate of Accomplishment *Structural Steel Fabrication*			Approved		
Certificate of Accomplishment *Semi-Automatic Welding*			Approved		
Certificate of Accomplishment *Gas Tungsten Arc Welding (GTAW) Ferrous and Non-Ferrous Metals*			Approved		
Certificate of Accomplishment *Shielded Metal Arc Welding (SMAW) Structural Steel*			Approved		

APPENDIX D
CAREER AND TECHNICAL EDUCATION (CTE) SUPPLEMENTAL QUESTIONS

CTE programs must conduct a full program review every 4 years. The comprehensive program review includes responses to the CTE supplemental questions below. Every two years (once between full program reviews) these supplemental questions must be answered and submitted to Academic Affairs for posting on the College website.

Use labor market data, advisory committee input/feedback, and institutional and program-level data to respond to the following questions:

1. **How strong is the occupational demand for the program?** In your response, describe any changes in demand over the past 5 years and discuss the occupational outlook for next 5 years. Provide applicable labor market data (e.g., US Bureau of Labor Statistics, Employment Development Department) that address state and local needs.

   According to the Federal Bureau of Labor Statistics, the projected percent change in employment in California for welders, ironworkers, fitters/fabricators from 2016 to 2026 is between 7.8% - 20.6% depending on the profession. Millwrights, a combination of welder and machinist/maintenance technician is projected to grow with employment opportunities during this next decade at a rate of a 20.8% percent increase. The increased use of machinery in manufacturing will require millwrights to install and disassemble this equipment, as well as perform some repair work on it. The average growth rate for all occupations is 7 percent, our trade is growing at a much faster than the average for all occupations. Employment of pipefitters, and steamfitters is projected to grow 12 percent.

   Skilled job opportunities are coming back from China and Mexico since companies have found overseas production to be more costly in mistakes than having the work done in the US. National Skills, USA says that manufacturing in the USA is the 8th most important economy in the world. They are stressing the need for workers capable of leadership skills and possessing qualities that involve critical thinking. Manufacturers Alliance for Productivity and Innovation revealed that there is twenty years of growth in the Aerospace market and US manufacturing assessment states the market will outlast the projects that are booked until the year 2028. Gas Tungsten Arc Welders (GTAW) and people with their AWS D1.1 LA City Certification fall into the category of workers needed to fill this supply. There are six bridge projects starting in our surrounding area. The largest is a six-year contract in San Pedro that will be actively seeking welders with their D1.5 certifications in semi-automatic wire NR232 and 305.

   The increased adoption of sophisticated manufacturing machinery will require more

"technicians" and critical thinkers to keep machines in good working order. Employment of machinery maintenance workers is projected to grow 20.8% in California from 2016 to 2026 and 7-10% nationwide. Increased automation, including the use of many computer-controlled machines in factories and manufacturing plants, should raise the demand for machinery maintenance workers to keep industries operating smoothly and supporting growth.

The state has many projects with their metro systems, rebuilding bridges, reconstruction of highways, large contracts for sports arenas and building construction that will require highly skilled welders. California specific demand is as follows:

Area	Title	Base	Projected	Change	% Change	Avg. Anl Openings
California	Millwrights	2,400	2,900	500	20.8	290
California	Operating Engineers and Other Construction Equipment Operators	26,900	31,100	4,200	15.6	3,560
California	Plumbers, Pipefitters, and Steamfitters	50,000	60,100	10,100	20.2	6,690
California	Sheet Metal Workers	13,500	15,200	1,700	12.6	1,650
California	Structural Iron and Steel Workers	6,800	8,200	1,400	20.6	910
California	Welders, Cutters, Solderers, and Brazers	29,500	31,800	2,300	7.8	3,450
	Totals	129100	149300	20200	15.6	16550

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program

National Demand is as follows:

Employment projections data for ironworkers, 2016-26

Occupational Title	SOC Code	Employment, 2016	Projected Employment, 2026	Change, 2016-26		Employment by Industry
				Percent	Numeric	
Ironworkers	—	90,300	101,700	13	11,400	—
Reinforcing iron and rebar workers	47-2171	20,100	22,500	12	2,400	xlsx
Structural iron and steel workers	47-2221	70,200	79,200	13	9,000	xlsx

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program

Employment projections data for industrial machinery mechanics, machinery maintenance workers, and millwrights, 2016-26

Occupational Title	SOC Code	Employment, 2016	Projected Employment, 2026	Change, 2016-26		Employment by Industry
				Percent	Numeric	
Industrial machinery mechanics, machinery maintenance workers, and millwrights	—	476,100	508,200	7	32,100	—
Industrial machinery mechanics	49-9041	346,900	370,100	7	23,200	xlsx
Maintenance workers, machinery	49-9043	89,700	94,700	6	5,000	xlsx
Millwrights	49-9044	39,500	43,400	10	3,900	xlsx

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program

Employment projections data for construction equipment operators, 2016-26

Occupational Title	SOC Code	Employment, 2016	Projected Employment, 2026	Change, 2016-26		Employment by Industry
				Percent	Numeric	
Construction equipment operators	47-2070	426,600	479,300	12	52,700	xlsx
Paving, surfacing, and tamping equipment operators	47-2071	51,900	58,200	12	6,300	xlsx
Pile-driver operators	47-2072	3,700	4,200	15	500	xlsx
Operating engineers and other construction equipment operators	47-2073	371,100	416,900	12	45,800	xlsx

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program

Employment projections data for plumbers, pipefitters, and steamfitters, 2016-26

Occupational Title	SOC Code	Employment, 2016	Projected Employment, 2026	Change, 2016-26		Employment by Industry
				Percent	Numeric	
Plumbers, pipefitters, and steamfitters	47-2152	480,600	555,800	16	75,200	xlsx

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program

Employment projections data for sheet metal workers, 2016-26

Occupational Title	SOC Code	Employment, 2016	Projected Employment, 2026	Change, 2016-26		Employment by Industry
				Percent	Numeric	
Sheet metal workers	47-2211	138,900	150,900	9	12,000	xlsx

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program

Employment projections data for welders, cutters, solderers, and brazers, 2016-26

Occupational Title	SOC Code	Employment, 2016	Projected Employment, 2026	Change, 2016-26		Employment by Industry
				Percent	Numeric	
Welders, cutters, solderers, and brazers	51-4121	404,800	427,300	6	22,500	xlsx

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program

2. **How does the program address needs that are not met by similar programs in the region?** In your response, identify any distinctive components of the program (e.g., curriculum, facilities, and resources) and/or describe any unique contributions the program or its students/graduates make to the community served.

   We are dissecting our educational approach trying to introduce all aspects of our trade, offering students a strong foundation of education, nomenclature, machinery exposure, fit-up, inspection and print reading. El Camino Weld Program is about training the students to be Weld Technicians that can be leaders in the field. They must be comfortable to operate equipment commonly used in metal fabrication with the ability to assess their job assignments and apply critical thinking to complete their task. Combination welders are in high demand - a difficult task since each process requires a different style, rhythm and technique. Fabrication, print reading, lay out and fit-up skills that require a deeper understanding of math are all focus points so that students can excel as leaders in our industry.

Each course in the Weld program will build on the previous course to develop each student into highly valued resources for Weld industry employers. Students advancing through the program will develop an in-depth understanding of the science behind Welding. This understanding will help guide students to problem resolution and enable good decision-making when evaluating problems in the field. Each class on the way to completion will look back at the history behind Welding, evaluating industry trends and future needs. Fabrication is a key component to success in the weld industry. Every class along the way to program completion will seek to have students come up with creative solutions to complex problems.

3. **What are the completion, success, and employment rates for students in the program?** In your response, identify the standards set by the program and discuss any factors that may impact completion, success, and employment rates among students in the program. Describe the status of any action plans for maintaining/improving rates relative to such benchmarks.

   We have approximately 200 students currently enrolled at ECC and we will be looking into accommodating for the growth that is expected. We are involved in a grant funded program, the Career Advancement Academy, which involves cohort teaching and contextualized learning. Overwhelmingly supported by our Advisory Committee, math and the ability to communicate are extremely important to advance in a career as a Weld Technician. To achieve this goal, they need trained welders. El Camino College offers a program that applies principles of welding to the practical techniques needed to build their skills. Our program is aware of the need for weld technicians and we are updating our curriculum to keep abreast of the new technology and training methods.

   Our employment rate for students is at 87%. If students would be willing to move out of state it would increase by 11%. Since the last period of Academic Program Review in 2014, Certificate completion has increased by 1200% and Degree completion has increased by 400%

4. **List any licensure/certification exam(s) required for entry into the workforce in the field of study and report the most recent pass rate(s) among program graduates.** In your response, identify any applicable performance benchmarks set by regulatory agencies and describe the status of any action plans for maintaining/improving pass rates relative to such benchmarks.

   We offer the prep course for the written part of the LA City D1.1 structural steel certification exam. We are experiencing a 75-100% pass each semester that we offer this course, which encourages our students to finish their practical qualification either the same semester or the following. The department is working out the logistics to certify our shop as an official test site to administer the practical 3G/4G exam to complete the requirements of the D1.1 certification. The first semi-automatic Weld 20A course is being offered in the Fall 2018 semester, an additional certification that completes the LA City D1.1 license and is needed to become an ironworker. This certification will guarantee job placement with the bridge contracts and metro link.

75% of our advance students have completed the testing for the manual part of this license in 2015/2016. We will begin to construct a data set to track FCAW qualifications that result in licensing. Once the Laboratory is a LADBS accredited testing facility, the number of licensure completions will increase as both full-time faculty members are AWS Certified Welding Inspectors capable of issuing in house qualifications.

5. **Are the students satisfied with their preparation for employment? Are the employers in the field satisfied with the level of preparation of program graduates?** Use data from student surveys, employer surveys, and other sources of employment feedback to justify your response.

   Students routinely report that they are extremely satisfied with the level of employment preparation they receive in the El Camino College Welding Technology program. The student survey conducted for the Academic Program Review showed a high level of student satisfaction with all aspect of the program. The Strong Workforce recently awarded the Welding program with a Silver Star and noted that 100% of students employed are working in the welding industry.

   Union response has indicated that our students are showing a high level of job readiness for the structural steel industry. While aerospace employers like Honeywell, Ace Clearwater, Robinson Helicopter and SpaceX routinely hire graduates from the El Camino Welding program. Smaller fabrication shops report that they are impressed with our students' ability to utilize multiple welding processes after completing the Program.

   Overall, both the industry and student response has been overwhelmingly positive. This reinforces the direction and the vision maintain by the El Camino College Welding Technology program to train versatile welding technicians.

6. **Is the advisory committee satisfied with the level of preparation of program graduates? How has advisory committee input and feedback been used in the past two years to ensure employer needs are met by the program?** Describe the status and impact of any advisory committee recommendations.

   A review of the program has been presented to the advisory committee. The advisory committee members discussed the changes to the program and the importance of implementing emerging technologies into the program. The advisory board is used to exchange and gather information, many of the questions posed result in innovation and respond to employment needs. We are looking to build our membership to reflect all the welding techniques used in the field. We use members of the board for additional information of equipment and state of the art training. We are looking to increase our coverage of companies participating on our board.

   The advisory committee agreed on the importance of flux core certification, fabrication, and automation systems into the program; however, the consensus to maintain building on the foundations of the fundamentals of process and print reading is crucial in the welding trade.

The committee agreed that students need to develop basic skills to use common hand tools and semi-automatic equipment used in the industry. The committee agreed that many of those completing Weld programs do not have the basic hand tools skills necessary to work effectively in the industry. We continue to survey our Advisory Committee members throughout the year to track industry trends and discover emerging needs in their specific fields. This input helps the Program to clarify its direction and vision and continue to train highly skilled welding technicians capable of supporting the needs of industry

California Education Code 78016 requires that the review process for CTE programs includes the review and comments of a program's advisory committee.
Provide the following information:

a. Advisory committee membership list and credentials.
b. Meeting minutes or other documentation to demonstrate that the CTE program review process has met the above Education Code requirement.

Welding Technology Advisory Committee Minutes – Spring 2018

Members in attendance-Renee Newell (Faculty), Dylan Meek (Faculty), Daniel Rodriguez (Division Technician), Kiera Griffin (CAA Peer Mentor), Angel Ocampo (Student Representative), Bill Barnard (General Contractor, Barnard and Barnard Construction), Don Nicholson (Field Manager, Sempra Utilities)

Members consulted with throughout the year, but not in attendance-Willie Graham Jr. (Local 433), Nick Colin (Faculty and Aerospace welder), Bruce Capucetti (Former LADBS Materials Control), Steve Rowden (Chevron, Welding Training Supervisor)

1.) Program updates:
   a.) New Courses Launched and Pending and Proposed.

1.) Weld 20A Flux cored and Gas Metal Arc Welding scheduled for Fall 2018
2.) Welding 1 split into Welding 1A and Welding 1B. Weld 1B scheduled for Spring 2019
3.) Split Welding 45 into Weld 45A and Weld 45B. This action is in progress.
4.) Expand GTAW offerings
5.) Creation of a non-credit course covering hand tools, measuring devices and basic trade math

2.) Automation program:
   a.) Manufacturing/Fabrication

3.) Need for new equipment and facilities:
   a.) New guillotine style plate shear with programmability capable of shearing at least ½" thicknesses.
   b.) Expand the weld shop to increase the number of weld booths. Noted that SMAW machines should be separated from FCAW machines to accommodate growth in industry and the need for skilled semi-automatic welders.
   c.) Obtain LADBS accredited test facility designation.
   d.) Modernize GTAW machines.
   e.) Expand the Departments' ability to perform destructive testing

4.) Degrees, Certificates of Achievement and Accomplishment:
   a.) New degree requirements to become active in Fall 2018
   b.) New Certificate of Achievement requirements to become active in Fall 2018
   c.) New Certificate of Accomplishment- Gas Tungsten Arc Welding (GTAW) Ferrous and Non-Ferrous to become active in Fall 2018
   d.) New Certificate of Accomplishment - Semi-Automatic Welding Certificate of Accomplishment to become active in Fall 2018
   e.) New Certificate of Accomplishment- Shielded Metal Arc Welding (SMAW) Structural Steel to become active Fall 2018
   f.) New Certificate of Accomplishment- Structural Steel Fabrication to become active Fall 2018.

5.) Alignment with industry needs:
   a.) A more robust FCAW program to maintain pace with industry trends.
   b.) Multi-process manufacturing welding courses.
   c.) Fabrication and automation courses.
   d.) Expand GTAW offerings to better serve local aerospace needs.

6.) Program direction and updates:
   a.) Increase offerings that incorporate semi-automatic wire fed welding.
   b.) Update GTAW machines.
   c.) Move forward with establishing the El Camino College Welding Technology laboratory as a LADBS accredited testing facility.

d.) Update technology and follow the industry trend toward automation.
e.) Continue to build on Welding Technology Theory curriculum to develop versatile Welding Technicians.

During the advisory committee meeting, the team review industry trends and the shortage of skilled welders. It was noted that two adult training centers that had been reopened by LAUSD are experiencing overloaded training sections to accommodate the massive need for skilled welders. All committee members that attended the meeting and those that have been in contact throughout the year emphasized the importance of the FCAW endorsement of the LA City D1.1 Structural Steel Certification. It was stressed that the SMAW and FCAW machines should be separated to accommodate more FCAW courses being offered to meet the needs of the structural steel industry.

Among the skills that the committee agreed were important for the students success in the industry were print reading and soft skills including, communication, integrity, ability to work with others and punctuality. The committee also generally agreed on the importance of academic skills including math, writing, critical thinking and the ability to read technical manuals. Leadership, problem solving and the ability to work independently ranked the highest among attributes that our industry partners were looking for in potential candidates.

All contacted members of the committee agreed that for growth in many companies, students should have documentation to validate their skills levels and qualifications. They were informed that the Welding program is offering a lot of new Certificates and that our Degree requirements will soon reflect the new classes that are being offered. The Advisory Committee unanimously agreed that it was crucial for the El Camino College Welding Technology laboratory to become a LADBS accredited testing facility and that the school should expand its ability to offering qualifications and perform destructive testing. The Committee members showed great enthusiasm toward the College offering more FCAW and multi-process courses. The Advisory Committee was informed that the Welding Technology program was offering Weld 20A, Weld 1A and Weld 1B within the next year. All members agreed that Flux Cored Arc Welding offered the greatest opportunities for students wanting to work in the field of structural steel welding.

The Advisory Committee agreed that the new equipment the Welding program is looking to procure is acceptable and industry relevant. They were impressed with the idea of students have experience with programmable machines like a CNC plate shear and Plasma Table. Fabrication skills are paramount in many small companies and is required for any student seeking leadership positions. Our members with aerospace experience agreed that updating our GTAW welding machines would help modernize the program and improve chances of student success in the industry.

In Summary the committee believed the El Camino College Welding program is on the right path and is providing students with the skills necessary to be successful at entry level positions within the welding industry. It was unanimously agreed that improving our students' soft skills would increase their employability. The Committee was advised that the ECC Welding program will continue to produce Welding Technician candidates that the industry so desperately needs. The El Camino College Welding Technology program is evolving into a premier program

specifically designed to meet the long-term aerospace, pipe welding and structural steel industry needs of local employers and unions.

There was unanimous agreement across all industries that exists tremendous growth opportunities within the next two to five years for manufacturing, aerospace, pipe welding and structural steel. Overall the committee was very impressed with the progress that the El Camino College Welding Technology program has made over the last few years and is excited about participating in the program growth.

Advisory Committee Master List

Title	FirstName	LastName		JobTitle	Company	ECC	Address1	City, ST Zip	WorkPhone	Notes	Email	Department
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Welding Technology
2018 Program Review
Dylan Meek &Renee Newell

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