

# Instructional Program Review Report

## Sierra College, 2016-17

Department/Program Name:     Mechatronics    

Date Submitted:     Jan 31, 2017    

Submitted By:     Tony Osladil    

Ideally, the writing of a Program Review Report should be a collaborative process of full-time and part time faculty as well as the appropriate educational administrator, instructional assistants, classified staff members and students who have an interest in the present and future vision of the program at all sites throughout the district. The Program Review Committee needs as much information as possible to evaluate the past and current performance, assessment, and planning of your program.

Please attach your Department Statistics Report (DSR) and your ePAR Report when sending in your Program Review.

**1) Relevancy: This section assesses the program’s significance to its students, the college, and the community.**

1a) To provide context for the information that follows, describe the basic functions of your program.

Our program is primarily focused on career-oriented technical training. Although some of our students do transfer to a university, the vast majority are looking for employment-oriented skills as maintenance technicians or similar positions within the field of mechatronics. Data collected by the department supports that we are successful in this mission. Although no comprehensive data exists either through the district or the state, data that we have collected via personal contacts shows that we have students working at over 80 local employers, many of which have hired more than one graduate. We know of at least three local employers that have hired 5 or more of our graduates due to the quality of the training they received here in the Mechatronics department.

1b) How does your program support the district mission, as quoted below? Please include an analysis of how your program supports ISLOs (Institutional Student Learning Outcomes): Communication, Technology and Information Competency, Critical and Creative Thinking, and Citizenship?

“Sierra College provides an academic environment that is challenging and supportive for students of diverse backgrounds, needs, abilities, and goals with a focus on access, equity, student-centered learning, and achievement. The college is committed to practicing diversity and inclusion, and recognizes that a diverse and inclusive curriculum and workforce promotes its educational goals and values. Institutional learning outcomes guide the college’s programs and services, encouraging students to identify and expand their potential by developing knowledge, skills, and values to be fully engaged and contributing members of the global community. Sierra prepares

students by offering Associate's and transfer degrees, certificates, career and technical education, foundational skills, as well as lifelong learning and enrichment."

Our program offers specialized career and technical education, culminating in certificates and Associate's degrees. This matches multiple aspects of the mission (see last sentence of the mission statement). Once they graduate, they usually find employment as technicians directly supporting the economy and infrastructure, thereby becoming contributing members of their community.

We support all of the college's ISLOs:

- We support **Communication** by including written and verbal presentation components in most of our classes. For example, students in our MECH-54 class must write 16 technical reports on their 16 lab exercises that thoroughly but succinctly explain their lab exercises, similar to writing an article for a technical journal. In MECH-54, MECH-90 and MECH-25 students must make a formal verbal presentation (approx. 15 minutes long) of their semester capstone projects. Students are also taught to critically listen and apply in lab the critical information they receive. If they do not actively listen, they will not be able to complete the lab exercises successfully.
- We support **Technology and Information Competency** because our program is based on real-world applications of technology which includes learning how to access, evaluate and apply up-to-date, industry-standard technical information on electric motors, electronic sensors, hydraulic valves and specialized industrial control computers.
- We support **Critical and Creative Thinking** by, among other things, having each student design and build a unique "capstone project" in their MECH-54 course. Since each project is unique and thought up by the student, they are required to inquire about various technologies and analyze how they can be applied to the student's project. Since no new unique design is ever perfect the first time, they must problem solve to resolve differences in their original idea to the final project. Due to the minimal boundaries placed on the project, the students are able to express their individual interests and aesthetics.
- We support **Citizenship** by emphasizing personal responsibility in all practices in our departments including safe industrial practices, constructive interaction with other students, and overall professional behavior. We do this to prepare them to use these skills in their career. Also, since Mechatronics is a huge aspect of societal infrastructure (power generation, water processing, etc.) we emphasize how the work that they do will affect the sustainability of natural resources.
- We believe in and support students of diverse backgrounds and abilities. We are aware that technical programs like ours are under-represented with females and minorities and we place special emphasis on improving those numbers by, for example, hosting "NEW – Nontraditional Education for Women" events in the department to encourage increased numbers of female students. Another example is that we have done outreach at career fairs at local Native American events. We have also worked with local agencies to coordinate the development of students to work as one-on-one classroom aides for fellow students with learning disabilities and we adjust classroom procedures as needed to provide access and support the equitable inclusion of these students. Multiple disabled students that would otherwise not have been able to complete our program have successfully earned their certificates as a result of these efforts.

1c) Program offerings align with which of the following mission categories (check all that apply):

X  Transfer    X  Career Technical Education  
 Basic Skills    X  Personal Development/Enrichment    X  Lifelong Learning

1d) Please analyze your department's role and its success in supporting the mission categories marked in 1c above. Please provide evidence in support of this analysis. If any of the following apply to your program, please address them in your analysis.

- Degrees, certificates, and/or licenses your department has generated:
  - The alignment of these awards with the district's mission and/or strategic goals. (See the district "Awards Data File, available from Research and Planning, for your numbers).
- Job placement or labor market information for your program's awards and licenses.
- The contribution your program makes to student transfer.
- Participation in basic skills programs.

Our program does have students that are focused on transfer, personal development and/or lifelong learning. However, the vast majority of our students are interested in Career Technical Education, so this response will focus on that aspect. In the last three years, our department has generated 170 certificates and 78 AA/AS degrees (Source: Attached DAR). Just as important, our students are obtaining employment within this field after graduating. Although no comprehensive employment data is available, self-reported data from graduates and employers shows that our students are employed at over 80 mechatronics-industry employers, bringing needed skills to the local workforce. This makes them highly contributing members of our local community. This aligns exactly with the district mission statement.

1e) Optional Additional Data: Comment on any other relevant contributions of your program to the district mission, goals, outcomes, and values not incorporated in the answers above. Examples include but are not limited to contributions to student equity and success, diversity, campus climate, cultural enrichment, community ties, partnerships and service, etc. Include specific data and examples.

Our department is highly supportive of the district's partnership with Hacker Lab, supporting their mission of developing local entrepreneurship. Our instructors and emeritus instructors provide consultation and teach classes at Hacker Lab. We also have participated in both of the Maker Fairs held on campus, hosting booths to perform outreach to the community. We also host scores of middle and high school students for tours of our labs during "CTE Days" every year.

**2) Currency: This category assesses the currency of program curricula as dictated by Title 5 and the currency of efforts in meeting accreditation standards as well as improving pedagogy and engaging in professional development.**

2a) Curriculum: Comment on the currency of your program's curricula, including discussion of any recent or projected changes. Please describe your process for evaluating and revising curriculum, including the use of SLOs.

Every year we have two Industry Advisory Committee meetings with local employers where they give us direct, actionable input on the currency of our curriculum relevant to current industry standards and needs. For example, over the last two years we have used this information to revise and integrate the major topic of PID loop control (a modern industrial control method) in our capstone MECH-54 course. We of course utilize the college's standardized SLO procedures and have assessed every one of our courses during the required three-year timeline. As noted in 2b (below) we have revised multiple topics in our curriculum due to the standard SLO process. However, we feel we go significantly beyond the required assessment / evaluation schedule. Since all of our classes have lab exercises that immediately follow each lecture topic, we are immediately able to assess and evaluate the effectiveness of our teaching methods and make immediate changes to address any shortcomings on a continuous, daily basis. Therefore every instructor in every section of every course receives real-time feedback on the effectiveness of their teaching and is able to revise their curriculum real-time, for continual incremental improvement. An example of this is that our MECH-10 instructors have recently collaborated and reduce the depth of the topic of "AC reactance" to spend more time reinforcing the basic concepts of that topic after seeing poor results in laboratory exercises.

A good example of the value of our industry advisors and our response to their inputs is the following email correspondence that I had with the owner of a local tech company called Mesotech, where 4 out of 5 of their technicians are graduates of our program. His comments resulted in a evaluation and significant revising of our curriculum, especially in the lab methodology and the writing component of our capstone MECH-54 class.

*"I've found that the Mechatronics grads are well equipped to get started with the work that we do. They've got the basics of soldering, electronics, and machining.*

*One thing that I consistently see lacking in technicians new to our company is an understanding of quality work. I think that the concept of industry level quality standards and "understand before you do" in general could be implanted during class.*

*Writing skills from the mechatronics grads have been inconsistent and sometimes very poor. I'm not sure if there is a general education/writing component to your program, but a technician's versatility and ability to advance can be limited by the fact that they can't put together an e-mail or document with proper punctuation, spelling, grammar, and capitalization. "*



	<b>MECH 0025 Personal Computer Configuration and Repair</b>																			
CSL O 1	Construct an electro-mechanical system using a personal computer as the control device.																			
CSL O 2	Construct functional electronic circuits built using solder.				X				X											
CSL O 3	Apply computer interface techniques to use a computer system as a data acquisition device.																			
	<b>MECH 0044 Mechatronic Processes and Materials</b>	Enter "X" in boxes as appropriate																		
CSL O 1	Create precision metallic components using common machine tools and mechanical drawings.			X														P		
CSL O 2	Construct and evaluate control circuitry for electro-mechanical systems.																			
CSL O 3	Assemble metal components into working systems.																			
	<b>MECH 0054 Mechatronics System</b>																			
CSL O 1	Diagnose and develop solutions for issues with complete mechatronic control systems.								X										P	
CSL O 2	Analyze and construct pneumatic and hydraulic actuated systems.																			
CSL O 3	Design and create closed loop industrial control systems.									X									P	
	<b>MECH 0090 Microcontroller Embedded Systems</b>																			
CSL O 1	Create microcontroller programs to provide deterministic control of actuators.		X															P		
CSL O 2	Design, construct and critique complete mechatronic systems.																			
CSL O 3	Design and construct input and output interface hardware for microcontrollers.																			

2c) Professional development: Please describe how your department's individual and group activities and professional development efforts serve to improve teaching, learning and scholarship.

For us as a Career and Technical Education program, professional development centers around staying current with industry and disseminating that information amongst our staff. We keep our program current by regularly visiting local industry to review the equipment and techniques currently used in industry. We also have two formal Industry Advisory Committee meetings per year where we bring in local industry representatives to review our curriculum and suggest updates. We disseminate this information among our staff at meetings during flex week as well as ad-hoc meetings during the semester of instructors of particular courses to align best practices amongst our various instructors (see MECH-10 changes discussed in section 2a, above). We subscribe to and read multiple industry periodicals to monitor developing industrial trends. We review the content of local and national trade shows and conferences to monitor developing technologies, and attend some of these events to see them first-hand.

2d) Optional Additional Data: Enter additional data here that you believe to be an indicator of your program's effectiveness and explain why.

As a CTE program our effectiveness is best indicated by our student's ability to be attractive to employers and attain living-wage employment. Although no comprehensive data is available from the district or the state, data generated through personal contacts shows our graduates are employed at over 80 local companies. More importantly, over 20 of those employers have come back and hired a second, third or more graduates after seeing the quality of the skillset of their first Sierra Mechatronics graduate. Over the last six months the local employer Bowe Systec hired 5 of our graduates to increase their total to 6 from our program and Smartrise Elevator also hired 5 graduates to increase their total hires to 7. In the Spring 2016 semester we were contacted by 14 local employers looking to hire students specifically from our program. One employer flew a representative from their national headquarters in North Carolina to Sacramento just to spend one day recruiting our graduates for their local facility. Last semester we were unable to produce enough graduates to meet the demand of our industry partners. This high demand for graduates from our program is a clear indicator of our program's effectiveness in meeting its CTE mission.

**3) Effectiveness: This section assesses the effectiveness of the program in light of traditional measurements.**

3a) Retention and Success: Identify and explain the three-year trends in your program's data contained in the DSR. Address separately the data for on ground and on-line course. Evaluate the significance of the trends, including any challenges experienced by the program and any relevant data/analysis from your course and program outcomes assessments. If applicable, please analyze any significant trends related to student equity and success. If you determine that you need to improve the program's performance, please describe how you plan to achieve this goal. Please include the results of your outcomes assessments, as appropriate.

Our three year trend in retention shows a consistent value between 87 and 91%. Our success numbers are also consistent with a range of 72 to 78%. Both of these numbers consistently exceed the district averages, in some semesters by up to 8%. We are pleased with these numbers and feel that these numbers speak well of our program. Although higher numbers are always desired, indicate no particular performance shortcomings or need for radical changes. There are no significant trends related to equity or success, either up or down. Our relatively high success numbers are in alignment with the high percentage of “Proficient” or “Mastery” level students in our course and program assessments (Note: The data in our DSR does not provide Retention or Success numbers broken out by individual campuses. Also, our department does not teach online courses so we have no data regarding that.)

3b) Enrollment Trends: Identify and explain the three-year enrollment trends in your program’s DSR data. Address separately the data for on ground and on-line, as well as the data at the various centers in which your program may operate. Evaluate the significance of the trends including any challenges experienced by the program. If applicable, please analyze any significant trends related to student equity and success. If you determine that you need to improve the program’s performance in any way, please describe how you plan to achieve this goal.

Our three-year enrollment numbers show no overall trends up or down. There is some normal variation, from semester to semester, but no more than 4% above or below the three-year average. Spring enrollments tend to be lower than fall enrollments by about 5%, but I believe that is typical for the college overall. Enrollments at NCC and TT campuses are significantly lower than Rocklin and vary significantly some semesters (by as much as 50%), but again, I believe that is typical for those campuses overall and does not indicate a particular issue with our department. NCC and TT constitute 15% and 3% of our department’s enrollment respectively and although we plan to continue to support them, demographic trends in those areas dictate enrollment numbers and trends more than anything we as a department can directly affect. Our department does not teach online classes so we have no data for that category. As stated above, our DSR provides us with no data regarding equity or success numbers at the various campuses so we are unable to speak to that topic.

3c) Productivity: Comment on how the program contributes to overall district productivity. Evaluate the significance of the trends including any challenges experienced by the program. If you believe the statistical trends need improvement, and can be affected by your actions, If you determine that you need to improve the program’s performance in any way, please describe how you plan to achieve this goal.

Our productivity numbers are quite consistent, with an average efficiency of 403 (+/- 3% in any single semester). Our efficiency numbers are somewhat lower than the district average but our enrollment per section is limited by space availability, equipment availability and lab safety / assistance issues so we are unable to add students to each section to raise our productivity. Increasing the amount of equipment would not change this situation, since we would still be space limited in most of our classrooms and we are financially constrained from hiring additional student help to provide the lab safety and assistance that would be required if we added students.

3d) Analysis and Planning: Referring to your ePAR Report of Goals, Strategies, Actions, and outcomes assessment cycle and relevant assessments/evaluations, please describe your program's plans to maintain or increase its effectiveness and analyze and evaluate your efforts to achieve these goals.

I was unable to find a way to generate ePAR reports using the updated version of ePAR software. I checked with Barry Abrams and he confirmed no reports are currently available from ePAR. We do however have plans to continue to increase our program's effectiveness by continually identifying new potential employers and querying them on the skillset required by their industry. In the last year we have added three new employers to our advisory board in order to keep our program consistent with industry trends.

3e) Optional Additional Data: Enter additional data here that you believe to be an indicator of your program's effectiveness and explain why.

Although previously stated (in 2d above), I would like to reiterate the main reason why we as a Career Technical program feel we are effective. Our department's purpose is to train people to be employable in local industry. We feel we do that extremely well. No comprehensive data is available from the district or the state, but data generated through personal contacts shows our students are employed at over 80 local companies. More importantly, over 20 of those employers have come back and hired a second, third or more graduates after seeing the quality of the skillset of their first Sierra Mechatronics graduate. Over the last six months the local employer Bowe Systec hired 5 of our graduates to increase their total to 6 from our program and Smartrise Elevator also hired 5 graduates to increase their total hires to 7. In the Spring 2016 semester we were contacted by 14 local employers looking to hire students specifically from our program. These numbers clearly demonstrate that we are an effective and successful department.

**4) Resources: This category assesses the adequacy of current resources available to the program and describes and justifies the resources required to achieve planning goals by relating program needs to the assessments above. (Refer to the bottom row of your DSR in your response to this category. You may include budget information if you have it.)**

4a) Please describe the future direction and goals of your program for the next three years in terms of sustaining or improving program effectiveness, relevance, and currency. Please incorporate analysis of any relevant outcome or other data in this description.

We believe that our department is working at a high level of effectiveness (see data in 3e (above)). Our goals for maintaining and improving our program's relevance and currency is to implement improvements identified by our industry partners and recent graduates in our annual formal meeting as well as individual ad-hoc feedback from them. One example of that is our recent addition of PID Loop Control (an advanced industrial control method) in response to industry demand for that skill.

We will also continue to implement cross-department partnerships such as our work with the Strong Workforce Initiative Task Force in developing the interdisciplinary Advanced Manufacturing certificate which combines courses from the Mechatronics, Drafting, Welding and Engineering departments.

In our last Program Review three years ago, the committee asked for quotes from emails regarding industry advisory recommendations in this section. In order not to be redundant, I will refer the reader to the quotes in section 2a (above).

4b) Equipment and Technology: Comment on the adequacy of the program's equipment and technology funding level for the District as well as for specific sites, including a projection of equipment and technology needs for the next three years. Please provide a justification for these needs, incorporating relevant assessments of the data above in this explanation.

In general, our department is well positioned in the area of large equipment and technology items. There are no large unmet needs. However, the computers in our labs are approximately 10 years old and are no longer up to current industry standards. Therefore, at some point in the near future we will need a significant upgrade of up to 48 desktop computers.

Also, as identified in our last program review, we have an ongoing issue with funding for consumable items for our student projects. Every year our supplies budget becomes more constrained by the need to support all of our sections across the three campuses and the constant increase in prices of components due to standard economic inflation. Through diligent searches for lower-cost alternatives such as surplus stock we have been able to meet our needs to this point, but this trend is unsustainable.

4c) Staffing: Comment on the adequacy of your program's faculty, classified, and student help staffing levels for the overall District as well as specific sites, including a projection of staffing needs for the next three years. Please provide a justification for these needs, incorporating relevant assessments of the data above in this explanation.

In May 2016 one of our three full-time faculty retired and we have requested a replacement. That request is currently going through the normal college hiring prioritization process and we have not heard the results yet. We feel that it is critical that we have three full-time faculty members to do the things that make us a successful department and that part-time faculty are not paid to do or are prohibited from doing. These include meeting with industry partners, updating curriculum due to information from those meetings, lab equipment maintenance and upgrade, mentoring of new faculty, holding open lab hours for student design projects, etc. Without a 3<sup>rd</sup> full-time faculty member we will not be able to provide the college with the level of results our program has provided for the last 10 years.

Our staffing of classified and student help positions is stretched to the limits of its capacity but is not limiting our effectiveness. With the addition of two new part-time faculty in the last two years, our part-time faculty staffing level is adequate.

Our Rocklin staff supports NCC and TT as well. However, due to our small enrollment at those campuses, we do not have full-time classified staffing at either site and the majority of our sections at NCC and TT are taught by part-time faculty. This is adequate, but more full-time support at those campuses would provide better support for students due to being able to hold open lab hours, etc. This is another reason why we feel we need a (replacement) third full-time faculty member.

Due to our inability to provide enough graduates to meet employer demand, we are currently performing additional community and high-school outreach to improve enrollment and thereby increase our graduation rates over the next three years. If we are successful in this we will need to identify and hire additional faculty. These faculty would, at least initially, be part-time faculty.

4d) Facilities: Comment on the program’s fill rate and the adequacy of the facilities for the District as well as specific sites, including a projection of facility needs for the next three years. Please provide a justification for these needs, incorporating relevant assessments of the data above in this explanation.

With an overall fill rate of 88.5% we are close to capacity for our program. Our DSR provides no fill rate data for specific sites and therefore we are unable to comment on that. We have no data indicating what our enrollment trends over the next three years will be. As with most CTE programs, our enrollment typically increases when the economy is slowing down and enrollment increases as the economy expands. Therefore, since we have no control over the state’s economic growth levels, we have no prediction or control over the major enrollment trends in our program. Our facilities are adequate for our current enrollment, however, if demand for our program grows, we will be limited by available classroom / lab space. In Rocklin we may need to investigate options for utilizing classrooms beyond our dedicated three rooms.

Storage needs have been a continual issue for us due to the equipment-intensive nature of our program. The addition of two Conex containers on the Rocklin campus has noticeably improved the storage issue on that campus, but we continue to be limited at the NCC and TT campuses.

4e) Please check the appropriate boxes in the chart below indicating the general reasons for the resource requests described above (please check all that apply):

Function/Role	Maintenance	Development	Growth	Safety	Outcomes	Other success measures	No Requests
X			X				

## 5) Summary/Closing

5a) Based on the analysis above, briefly summarize your program’s strengths, weaknesses, opportunities, and challenges.

Our program is strong. Our classes have a high fill rate and our graduates have a proven track record of successfully competing for jobs and excelling in their jobs once they begin their careers. Our graduates are working at over 80 local, regional and national employers and have become solid contributing members of the local community.

We offer a world-class program that is rivaled by less than a dozen community colleges or private colleges in the United States. According to one of our industry partners Cirque du Soleil (Las Vegas, which has hired two of our graduates), we are one of only three programs in the United States that offer a program of this caliber. Every year we host visits by other colleges from California and around the country to discuss how we can help them develop or improve a mechatronics program at their institution. The state of Texas has published a report recommending that Texas follow the Sierra College Mechatronics model in developing CTE programs across their entire state.

At the current time, our main weakness and opportunity is to produce more graduates since we can not provide enough graduates to support the demand of our local tech employers. We plan to do more community and high-school outreach to increase our enrollment and thereby our graduation rate.

Our main concern is to have sufficient fulltime staffing and sufficient supplies budget to support and grow our program as needed, and to insure that the program offered at NCC and TT is not significantly inferior to Rocklin due to limited outside-of-class support from faculty and/or substandard support from classified staff and student assistants.

5b) How has the author of this report integrated the views and perspectives of stakeholders in the program?

Before writing this report I have had numerous one-on-one discussions about the status and the future of our program with our other full-time and part-time faculty members, our classified employee, our student assistants, my dean and the deans of NCC and TT. As a full-time professor, I constantly receive feedback from students at both the Rocklin and NCC campuses. I have synthesized these diverse inputs to the best of my ability.