2014-2015 Comprehensive Program Review
ACADEMIC AFFAIRS - SAN JOSÉ CITY COLLEGE

PROGRAM: Air Conditioning Technology

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PROGRAM REVIEW SUBMISSION DATE: Feb / 10/2015

PART ONE: PROGRAM DESCRIPTION

1. Description of the program components, function and purpose.
   This program is designed to develop the appreciation, knowledge and skills essential for employment in the Air Conditioning and Refrigeration industry. Instruction includes both theory and practical work with Air Conditioning and Refrigeration machinery. The program also includes the study of electrical concepts, control concepts, mechanical concepts and the use of applied mathematics for troubleshooting. The program offers both Certificate Level 2 and Certificate level 3 and also an Associate Degree in Science in Air Conditioning Technology.

   Completion of the course may lead to careers as:
   Air Conditioning Technician
   Refrigeration Technician
   Facilities Technician
   Sales Engineer

   The mission of the program is to equip students with the ability to maintain, install and troubleshoot Air Conditioning and Refrigeration type equipment. Students of the program will be exposed to the concepts of analytical thinking and theories required for troubleshooting and problem solving, so that they become empowered with the skills for future and gainful employment within this global, lucrative and stable industry.

1.1 Describe current program staffing.
   Staffing of the program is as follows:
   2 x FTEF
   1 x .6 FTEF
   1 x .35 FTEF
   1 x .25 FTEF
   1 x Applied Science’s shared Laboratory Assistant (position open at present)
2. **Describe Program Goals and how they support the college’s mission.**

Program Goals:
- To prepare students to be successful in a lucrative and sustaining career in the discipline of Air Conditioning and Refrigeration Technology
- To empower students with analytical and troubleshooting skills that will enhance their technical careers
- To prepare students that wish to transfer and advance their education at other institutes

The Mission Statement of the program is firmly aligned with the Mission Statement of the College; which addresses the college’s commitment to empower students in succeeding in a global and multicultural society.

The program contributes to the College’s Mission Statement by providing accessibility to students of all backgrounds, the opportunity in to partake in a course of study which can lead to a host of dynamic and progressive careers. The program not only leads to instant employability but can also be used as the building block for higher level education in the associated areas of Mechanical and Electrical Engineering.

3. **Program Student Learning Outcomes (PSLOs).**

**The student will be able to:**

1. Recognize the components that constitute Residential and Commercial Air Conditioning and Refrigeration systems. Perform Maintenance and Repair on complex Air Conditioning and Refrigeration systems.

2. Analyze, maintain, service and commission Air Conditioning and Refrigeration systems. Problems solve and troubleshoot complex Air Conditioning and Refrigeration systems using analytical and methodical practices.

3. Interpret and process Wiring Diagrams and Pipe Diagrams and demonstrate proficiency in writing service reports in both hard and soft copy.

4. Maintain energy efficient Air Conditioning and Refrigeration equipment and recognize and be capable of implementing modern technologies so as to maintain proper and efficient functionality of Air Conditioning and Refrigeration systems.

5. Demonstrate awareness of Global Warming, Green House Gases Effect and Ozone Depletion as related to the use of common refrigerants.
6. Demonstrate honesty and integrity when dealing with customers and employers. Exercise professional courtesy in the workplace. Recognize proper attire and etiquettes expected of Professional Air Conditioning and Refrigeration Technicians and Engineers. Perform Mechanical and Electrical installations of Air Conditioning and Refrigeration systems that are both safe and aesthetically pleasing.

4. How do the Program Student Learning Outcomes (PSLOs) align with San Jose City College’s Institutional Student Learning Outcomes (ISLOs)?

Institutional Student Learning Outcomes:

1. Communication
   Students will communicate effectively including reading, writing, speaking and listening
   
   PSLO #3 Communication
   Ability to interpret and process Wiring Diagrams and Pipe Diagrams. Demonstrate proficiency in writing service reports in both hard and soft copy.

2. Critical and Analytical Thinking
   Students will analyze problems using evidence and sound reasoning to make decisions.
   
   PSLO #3 Critical Thinking Skills
   Competence in analyzing, maintaining, servicing and commissioning Air Conditioning and Refrigeration systems. Problem solve and troubleshoot complex Air Conditioning and Refrigeration systems using analytical and methodical practices.

3. Global Awareness and Social Justice
   Students will demonstrate an awareness of social, economic, ecological, historical, and cultural differences and their implications.
   
   PSLO #5 Demonstrate the ability to work as an individual and in groups of all social and economic backgrounds. Demonstrate awareness of Global Warming, Green House Gases Effect and Ozone Depletion as related to use of common Refrigerants.

4. Personal Responsibility, Ethics and Civility
   Students will demonstrate personal and civic responsibility and professional integrity.
   
   PSLO #6 Personal Responsibility, Ethics and Responsibility
   Demonstrate honesty and integrity when dealing with customers and employers. Exercise
5. What were the student demographics of your program in the previous five years (student population served/demographics-age, gender, ethnicity, income, previous education, etc.)? Discuss how these demographics impact your program.

As statistics show, the typical evening student of the program remains fairly constant over the last 6 years. The typical student can be described as a White or Latino male, average age late 20’s to early 30’s, employed but seeking job advancement or career change. Previous education will be typically to high school graduation level with some on – the – job training or short formal training in another discipline. Although statistics on income level is vague, typically the student will be earning above minimum wage and will pursue overtime opportunities to supplement their basic income. It is observed that for many of the students, basic math and reasoning skills are generally weak. Anecdotally it must be noted that the majority of students in the night time program do have financial commitments such as rent, mortgages and children, and they try hard to juggle their personnel lives around class times and therefore as shown statistically, approximately 75% of the student population of the night-time program are classified as part-time students.

Statistics over the last 6 years also show that in general, there has been an increase in morning/day time students. These students are typically younger than their nighttime cohorts, typically middle to early 20’s, that entered fulltime employment early without formal training beyond high school. This cohort of students can be described as White or Latino males wishing to explore and pursue a meaningful and
lucrative career and are willing to follow an accelerated curriculum of more than 12 units per semester.

The majority of students of the program that complete at least 4 units of study indicate that they wish to pursue a qualification in the subject to at least Certificate level 3. This is also indicated by the “above average” (statistically shown) state completion rate for this type of program.

This demographic has a positive impact on the program. As stated, the majority of students in the program are goal driven and hence committed to their education. There are little or no discipline or tardiness problems within the program. Students that are only mildly interested in the subject, or are pursuing the subject for other intentions (other than those stated above) tend to drop out early as course work and commitment is greater than many of them expected. This also has a positive effect on the connection that the program has with its industry partners. The industry can be very demanding and requires people that can commit and self-start.

1. Provide a comprehensive course listing including dates of last revision, advisories, co and prerequisites, and articulation with four year colleges for your program.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Last Revised</th>
<th>Board Approval</th>
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</thead>
<tbody>
<tr>
<td>AIRC-121</td>
<td>Electrical Principles for Air Conditioning/Refrigeration</td>
<td>10/25/2011</td>
<td></td>
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<tr>
<td>AIRC-122</td>
<td>Refrigeration Principles</td>
<td>10/25/2011</td>
<td></td>
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<tr>
<td>AIRC-131</td>
<td>Intermediate Air Conditioning</td>
<td>2/14/2012</td>
<td></td>
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<tr>
<td>AIRC-132</td>
<td>Refrigeration Service</td>
<td>12/13/2011</td>
<td></td>
</tr>
<tr>
<td>AIRC-141</td>
<td>Hydronics and Air Distribution</td>
<td>12/13/2011</td>
<td></td>
</tr>
<tr>
<td>AIRC-142</td>
<td>Air Conditioning Control Systems</td>
<td>12/13/2011</td>
<td></td>
</tr>
</tbody>
</table>
• Industry advisory meetings are held annually (April/May) and the minutes are on file in division office. Advisory panel is updated and kept informed by e-mail of pertinent changes deletions/additions to the program.
• There is no articulation with 4 year colleges, however, some of the Program faculty members are academic members of SJSU Technology Program and keep tight links between both programs.

2. Include a list/diagram of courses reflecting course sequencing and how often courses have been offered.

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall Day</th>
<th>Spring Day</th>
<th>Fall Evening</th>
<th>Spring Evening</th>
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<tbody>
<tr>
<td>Air C 121</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>Air C 122</td>
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<td>Air C 142</td>
<td>X</td>
<td>X</td>
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<td>X</td>
</tr>
</tbody>
</table>

These have been the course offerings over the last 3 years.

3. In what capacity have your program and course SLOs been mapped? Please provide three examples of how the course SLOs map to the Program SLOs.

Both PSLO’s and SLO’s have been mandated and agreed upon by all faculty and advisory Board members. Each SLO has been designed to coordinate and correspond to at least one PSLO.

Example: PSLO’s:
1. **General Theory & Practice**
   Recognize the components that constitute Residential and Commercial Air Conditioning and Refrigeration systems. Perform Maintenance and Repair on complex Air Conditioning and Refrigeration systems.

2. **Critical Thinking Skills**
   Competence in analyzing, maintaining, servicing and commissioning Air Conditioning and Refrigeration systems. Problem solve and troubleshoot complex Air Conditioning and Refrigeration systems using analytical and methodical practices.

3. **Communication**
   Ability to interpret and process Wiring Diagrams and Pipe Diagrams. Demonstrate proficiency in writing service reports in both hard and soft copy.
4. Technology
   Competence and skill in maintaining energy efficient Air Conditioning and Refrigeration equipment. Recognize and be capable of implementing modern technologies so as to maintain proper and efficient functionality of Air Conditioning and Refrigeration systems.

5. Global Awareness and Social Awareness
   Demonstrate the ability to work as an individual and in groups of all social and economic backgrounds. Demonstrate awareness of Global Warming, Green House Gases Effect and Ozone Depletion as related to use of common Refrigerants.

6. Personal Responsibility, Ethics and Responsibility
   Demonstrate honesty and integrity when dealing with customers and employers. Exercise professional courtesy in the workplace.

7. Aesthetics and Creativity
   Recognize proper attire and etiquettes expected of Professional Air Conditioning and Refrigeration Technicians and Engineers. Perform Mechanical and Electrical installations of Air Conditioning and Refrigeration systems that are both safe and aesthetically pleasing.

Example x 3 SLO mapping:

Refrigeration Principles 122:

SLO’s:

Upon completion of this course, the student will be able to:

I. Assemble a mechanical refrigeration system.
   Meets requirements of PSLO #1

II. Evaluate a running mechanical refrigeration system.
   Meets requirements of PSLO #1

III. Select and install safety and control switches to a mechanical refrigeration system.
   Meets the requirements of PSLO #5

IV. Troubleshoot and repair a mechanical refrigeration system.
   Meets the requirements of PSLO #2

V. Evacuate, charge, and test refrigerant.
   Meets the requirements of PSLO #2

Refrigeration Service 132:

SLO’s:

- Assemble, test and evaluate Walk in and Reach in coolers
  Meets requirements of PSLO #1, #2, #3, #4
• Evaluate the running parameters of a cooling tower  
  *Meets requirements of PSLO #4*

• Apply practical thermodynamics to maintain efficient operation of Commercial Refrigeration systems  
  *Meets requirements of PSLO #4, #5*

• Apply knowledge to pass the EPA Certification test (Section 608, Safe handling of refrigerants)  
  *Meets requirements of PSLO #4, #5*  
  *Meets ISLO 3 (Students will demonstrate an awareness of social economic and ecological awareness)*

**Intermediate Air Conditioning 131:**

**SLO’s:**

• Assemble, evaluate and test central air conditioning systems  
  *Meets requirements of PSLO #1, #2, #3 #4*

• Evaluate the parameters of a Heating unit  
  *Meets requirements of PSLO #2, #4*

• Apply practical psychrometrics to maintain an efficient system  
  *Meets requirements of PSLO #4*

• Evaluate energy saving methods of air conditioning  
  *Meets requirements of PSLO #5*

• Solve complex mechanical, electrical and air side problems found on Air Conditioning systems  
  *Meets requirements of PSLO #1. #2, #3, #4*

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**PART THREE: PROGRAM IMPROVEMENT/ANALYSIS AND ASSESSMENT**

1. **What process is used to review and revise the curriculum? Include information on advisory committee and workforce data (if applicable).**

   Curriculum updates and new curriculum proposals are discussed with all faculty and advisory board members. New proposals from both part-time faculty and full-time faculty are forwarded to the advisory board for their input. Course changes are considered if they add value to the program in the areas of content, and employment enhancement. The department faculty work well together and they are in constant dialogue regarding analysis of program improvements. Program
improvements are also reflected in the choice and utilization of laboratory equipment as per agreement with faculty members.

Advisory committee recommendations are implemented on a yearly basis (annual advisory meeting held in Spring semester)

One course SLO is assessed each semester. A standard course semester document has been developed for the program and on a Rota basis, faculty complete the assessment document and forward the results to a designated fulltime faculty member who inputs the data onto Trac-Dat. All SLO assessment results are shared with faculty.

2. **Indicate how program and course-level Student Learning Outcomes (SLOs) are assessed on a regular basis.**

   As stated above, the department has created a simple assessment document which is completed for every course offered per semester. The assessment tools used to gather data for the document includes written assignment, laboratory practices and assignments for each SLO. Where there is a single faculty member specifically teaching on a specific course, then that faculty member is responsible for submitting the assessment results to a designated fulltime faculty member. Where there are more than one faculty member teaching on the same course, then the responsibility of submitting SLO data is done on a Rota basis. Data is reviewed at the end of each semester and pertinent changes and methods of instruction are aligned so as to help student performance. As each SLO is assessed, it is reassessed on a Rota basis or it can be re assessed the following semester on a need to be basis. Each SLO has been mapped and ties in with the PLO’s (refer to 3, part 2 above)

3. **How have Student Learning Outcome (SLO) assessments and program data been utilized to improve instruction in the program?**

   At program level, SLO assessments can and may have tightened the link between what is being taught and what is being assessed in a course where there are multiple section offerings of the same course. Data sharing is useful when making changes to laboratory assignments and testing. Advisory committee members (wide range of members including owners, managers and employers) see little value in the complexity of mapping data on career associated programs typical of the Air Conditioning Program and see no useful purpose in this method of mapping for this HVACR program and the students it turns out. They have never been consulted by the authors of this laborious task.

4. **How is data collected on student satisfaction of your program? To what extent are students satisfied? How is this feedback used in program enhancement and revision?**
Student satisfaction is monitored by their performance and success in the workplace. At present, the HVACR department at SJCC is the largest (non organized labor) supplier of HVACR entry level technicians in the bay area. Entry level students are polled on their first day of class regarding why they chose the program. In general, the results show that the majority of the students enter the program as a method of securing a stable and lucrative career, and they have chosen their program on the recommendations of former students. State completion data for CTE programs shows that the HVACR program at SJCC is in the top tier. In the future, faculty may conduct a hard copy survey on entry level students to qualify the above statement.

## PART FOUR: STRATEGIC PLANNING

1. **Year of last Comprehensive Program Review and previous three Annual Program Reviews with validation rating. (Proficient or In Progress)**
   - Comprehensive Review 4 years ago
   - Yearly annual reviews all Proficient

2. **Describe any changes in the program that have occurred since the last Comprehensive Program Review. (See intervening Annual Program Reviews.)**
   - Larger space allocation
   - Improvement in heating and ventilating in some classrooms (non-existent prior 2014)
   - Large investment from bond money in state of the art laboratory equipment
   - Seems as if Community College system has finally woken up to the need to invest in CTE programs

3. **What are the current strengths of the program? Include faculty and staff training, projects and other achievements.**
   - Constantly finding well paid jobs and opportunities for students
   - Faculty constantly updating their skills by attending conferences and training classes
   - Laboratory redesign with faculty collaboration

4. **What changes to the program do you plan to (would you like to) implement before the next Comprehensive Program Review?**
   - Utilize the new laboratory equipment to its maximum
   - Redesign laboratory projects so as to break away from simulated testing and perform real life testing of equipment
   - Include summer session, 098 type class for students requiring more ‘hands on’ training
- Increase Laboratory Technician support to the program so as to eliminate ‘unsafe practices’ that are currently taking place
- Increase Full Time Faculty staff by 1

5. How will these changes impact student success, instructional techniques, and course offerings?
- Student success should increase if students can obtain more ‘hands on’ experiences on state of the art equipment.
- Instructional techniques will be easier to comprehend by the students when live equipment is commissioned
- Faculty members will be able to dedicate more time to laboratory instruction if they have Laboratory Technician support
- More classes and sections can be offered if a 3rd Fulltime Faculty member is in place

6. Budget: Please address current status and projected needs in the following areas and indicate how each supports Program/College Goals and/or PSLOs and SLOs. Include specific cost information.

| STAFFING                          | 2x FT Faculty (they also teach on the FMT program)  
|                                  | 6 x P/T Faculty (4 of which also teach on the HVAC program)  
|                                  | 1 X vacant Technician position  
|                                  | Need for 1 X Fulltime Faculty position to grow and maintain this vibrant program  

| FACILITIES                       | On-going rehabilitation of the 100 and 200 wings (behind schedule for Semester Fall 2014 but progress is being made  

| LIBRARY                          | adequate  

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>New equipment presently being installed and commissioned by use of bond monies</th>
</tr>
</thead>
<tbody>
<tr>
<td>TECHNOLOGY</td>
<td>• New software (simu-tech) recently installed</td>
</tr>
<tr>
<td></td>
<td>• New computers recently installed in simulator laboratory</td>
</tr>
<tr>
<td></td>
<td>• Internet connection being improved in classrooms</td>
</tr>
</tbody>
</table>