

# ENVIRONMENTAL CONTROL TECHNOLOGY

## Instructional Program Review

10- 29 - 2012

**College:** Laney College

**Program Title:** Environmental Control Technology

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### 1. Narrative Description of the Discipline, Department or Program:

The Environmental Control Technology (formerly Air Conditioning and Refrigeration) program is one of the original technical programs at Laney College. The instruction methodology was and is lecture and laboratory. The department originally had three fulltime instructors and one classified staff for the tool-room and offered courses in three sessions. The department for many years was run by one fulltime instructor and part time instructors. This year the department hired another fulltime instructor while maintaining all part time instructors to better deliver the advanced curriculum the department offers. In the past the department was one of the most extensive and comprehensive programs in Northern California.

The department offers two Associate of Science Degrees and four Certificates in the Environmental Control Technology Program. With the completion of the required general education courses and the four certificates (in Refrigeration, Residential and Light Commercial HVAC, Commercial HVAC Building Automation and by fulfilling all the program requirements, students will receive a Degree or Certificate in the above Program.

Eight years ago, the ECT program partnered with Berkeley National Lab and received a large National Science Foundation (NSF) grant of \$900,000 to revise its curriculum, build computer-based software to simulate HVAC building systems and controls, in conjunction with ECT building a lab with hardware to simulate commercial HVAC systems and controls. Three years later, the department was awarded another million dollars to develop the Building Automation Program.

This year, the department received a grant from the NSF for the Building Efficiency for a Sustainable Tomorrow Center (BEST) in the amount of three and a half million dollars for next four years to strategically partner with key colleges to disseminate the advanced curriculum all around the country. Also, when the hardware and software are completed, the ECT program will offer a combination of hands-on and computer based learning that is going to be a one-of-a-kind learning tool for this type of a program.

The new curriculum has been gradually introduced since Fall 06, and enrollment figures have spiked. For example, while total duplicated enrollment was at 147 in spring of 2006, it was at 297 in spring of 2007 and 395 in spring of 2008 and has further increased since then. Census enrollment in 2008/09 was up to 898, compared to 682 in 07/08, 547 in 06/07 and 310 in 05/06. Along with increased student demand, the department is experiencing severe staff, lab and classroom space and resource shortages, hobbling full

deployment of the revised program. THE ONE-PERSON CORE FACULTY HAS HAD TO ACCOMMODATE A NEARLY THREE-FOLD INCREASE IN STUDENT ENROLLMENT.

In 2008, the program received a grant from the State Chancellor's Office Economic and Workforce Development Program (Industry-Driven Regional Collaboratives), and in 2009, we received renewal funding from NSF to expand our Educating Technicians for Building Automation and Sustainability programs. Two years we ago we started offering the new certificate and degree program in Building Automation Systems that so far has been very successful. While industry demand for building automation technicians is great, deployment of this new certificate and degree has created even greater staffing, classroom, and laboratory demands and shortages.

In addition, in collaboration with other CTE programs including Carpentry, Architecture, Electricity/Electronics, the Environmental Control Technology Department launched two new interdisciplinary programs to respond to the growing demand in green jobs development: the Building Performance and Energy Efficiency Program (BPEEP), and Oakland Green Jobs Corps, adding around 70 students per semester who are utilizing ECT and E/ET labs and classroom facilities and demanding instructor time of Laney's one full-time ECT instructor.

The ECT program has adopted a networking and program dissemination role regionally and nationally. In March 2009, we hosted the first California Community Colleges Energy Efficiency and HVAC Conference, with over 200 participants representing 30 regional community colleges, as well as industry, government, and community constituents. The program has recently launched a Center of Excellence in High Performance Building Operations and Maintenance Education, as part of the US Department of Energy

and Environmental Protection Agency – supported Labs for the 21<sup>st</sup> Century program. In addition, Laney has recently been designated a partner with the PG&E in the Power Pathway Training Network on Energy Efficiency. With the new NSF Center grant the program received this year has partnered with key colleges across the country to disseminate the curriculum and offer peer exchanges and workshops regionally and nationally and expand its outreach activities.

## **2. Curriculum**

**Is the curriculum current and effective? Have course outlines been updated within the last three years? If not, what plans are in place to remedy this?**

Yes. The department has updated the existing curriculum and continues to update and developed new advanced curriculum with more emphasis on Commercial Refrigeration, Residential and Light Commercial HVAC, Commercial HVAC Systems and Controls, Building Automation Controls and Energy Efficiency and Sustainability to better serve our students and the industry.

Student Learning Outcomes have been updated for all existing courses and developed for all new courses, including they were transferred in to the TaskStream.

**Has your department conducted a curriculum review of course outlines? If not, what are the plans to remedy this?**

Yes. The ECT program has been deepened, broadened, and has been reformulated into more specific courses and certificates leading to clear career paths. As part of our work with our previous National Science Foundation grant, all existing courses were updated, and

several were deactivated. New courses were added to the existing degree program between 2006 and 2009, including Technical Mathematics for ECT, Mechanical and Electrical Codes, HVAC Troubleshooting and Installation Practices, Motors and Drives, Energy Management and Efficiency in Building Systems, Commercial HVAC systems and troubleshooting, Building Commissioning, Testing, Adjusting and Balancing, Commercial Electricity for HVAC, Psychrometrics and Load Calculations, Direct Digital Controls, Indoor Air Quality and Building Envelope, HVAC System Design, Data Analysis for Performance Monitoring and Introduction to Control Systems Networking, in addition to a concurrent enrollment Physics 1 summer course is being taught for high school students. In addition to the long-standing degree in residential and light commercial HVAC, the certificate and AS degree in Commercial HVAC Systems was approved by the State Chancellors Office in 2009. All courses have been rolled out for this certificate. In addition, the program developed a new certificate and AS degree in Building Automation Systems which was approved by Laney and CIPD curriculum committees in February 2010. Based on extensive industry input, thirteen existing courses were utilized and seven new courses were developed for this new certificate and degree, including in Introduction to PC Hardware and Software for Building Technicians, Introduction to DDC Hardware for Building Automation Systems, Control Systems Design, Control Systems Networking for Building Automation, Control Routines for Energy Efficiency, Control Systems Integration; and Energy Issues, Policies, and Codes.

In addition, the program created an interdisciplinary Certificate in Building Performance and Energy Efficiency (BPEEP) and an interdisciplinary six-month course of study for the Oakland Green Jobs Corps. Two new courses were developed under the ECT program for BPEEP and the Green Jobs Corps ECT 38 (Measurement of Building Energy Efficiency and ECT 39 (Energy Auditing

and Computer Analysis of Building Efficiency), in addition to several new courses were developed in the carpentry and architectural programs. The BPEEP certificate has been approved by the Laney and CIPD curriculum committee and is currently going through the State approval process.

In addition, the department is currently developing three new Certificates and Degree Program in Energy Management and Sustainability for Commercial Buildings to further expand the program and address the Industry needs.

**What are the department's plans for curriculum improvement (i.e., courses to be developed, updated, enhanced, or deactivated)? Have prerequisites, co-requisites, and advisories been validated? Is the date of validation on the course outline?**

See above. In 2009, the Certificate in Commercial HVAC Systems was approved by the State Chancellor's Office. In February 2010, the new certificate and AS degree in Building Automation Systems was approved by the Laney, CIPD and State. In addition, the new interdisciplinary Building Performance and Energy Efficiency Program were approved by PCCD and State and currently are being taught.

Currently, the ECT Department is developing new courses with emphasis on Energy Management and Sustainability, with the potential of a new energy efficiency track. The intention is to develop a program, which addresses the need of the industry in the area of energy management and sustainable use of resources while it provides a "transferable" curriculum to a 4-year program on energy engineering. As of 2006, the department has validated the prerequisites and co-requisites in all courses. Each course outline includes a date of validation.

**What steps has the department taken to incorporate student learning outcomes in the curriculum? Are outcomes set for each course? If not, which courses do not have outcomes?**

Yes. Student learning outcomes have been updated for each existing course and incorporated into each new course.

**Describe the efforts to develop outcomes at the program level. In which ways do these outcomes align with the institutional outcomes?**

The department has developed program outcomes for the Refrigeration, Residential and Light Commercial, Commercial HVAC degree and certificate, the Building Automation degree and certificate, and the interdisciplinary Building Performance and Energy Efficiency certificate and degree.

### **Institutional Learning Outcomes (ILOs)**

#### **Communication**

Students will effectively express and exchange ideas through various modes of communication.

Communication skills are imbedded in very courses and in some courses that we use PBL; students are required to do Public Speaking and proper communication skills.

#### **Critical Thinking and Problem Solving**

Students will be able to think critically and solve problems by identifying relevant information, evaluating alternatives, synthesizing findings and implementing effective solutions.

Critical thinking is part of the function of the Program. Students could not function, touch and troubleshoot any electrical mechanical devices without the ability to use the critical thinking skills.

#### **Career Technical Education**

Students will demonstrate technical skills in keeping with the demands of their field of study.

In the Technical Education, students learn the theory and practice on real equipment.

#### **Global Awareness, Ethics and Civic Responsibility**

Students will be prepared to practice community engagement that addresses one or more of the following: environmental responsibility, social justice and cultural diversity.

Students in the program learn about Energy Management and Efficiency, working and interacting with diverse student body.

### **Personal and Professional Development**

Students will develop their knowledge, skills and abilities for personal and/or professional growth, health and well being.

Students have to interact with each other working in groups during class and outside class time.

### **Recommendations and priorities**

- Create lesson plans for each new course.
- Update and document work projects for each course
- Create problem-based learning scenarios for each course.
- Re-write some of the existing courses with more energy efficiency-related content.
- Create a program strand on commercial energy efficiency

### **3. Instruction**

**Describe effective and innovative strategies used by faculty to involve students in the learning process. How has new technology been used by the department to improve student learning?**

The ECT program consistently applies new technology and innovative learning strategies to improve student learning. Strategies include:

- Extensive emphasis on hands-on learning with real-life equipment including



- The department has acquired a new lab space and is preparing it to build a computer lab and a multipurpose use lab to expose students to the different type of software the industry offers.
  - Encourage students to help install new equipment using various installation techniques.
  - A year ago, the department partnered with the Habitat for Humanity where students in the Program can get real hand-on experience by sizing, designing and installing new furnaces, duct systems and air conditioning units to the houses the Organization rebuild.
  - The hydronic HVAC and multi-vendor controls lab allows faculty to facilitate real-world hands-on demonstrations and simulations of complex, whole building HVAC systems and Controls.
  - The Direct Digital Controls (DDC) test-bench lab allows students to learn the basics of wiring, programming, and integrating controls.
  - Workbenches have been created and are continually updated for residential/light commercial HVAC/R, motors and drives, and commercial electricity.
  - An extensive selection of instrumentation and measuring devices have been acquired to support courses including Commercial HVAC Troubleshooting, Testing, Adjusting and Balancing, Psychrometrics and Load Calculations, Commissioning, Energy management and Efficiency, and Data Analysis for Performance Monitoring.
- Allowing students to work in groups to interact and think critically for troubleshooting electrical and mechanical problems.  
(Problem-based learning)

- Make students research through the Internet, library, books and industry to find answers to problems, so that they learn to independently gather information. (Project-based learning)
- A 28-station computer lab is available to ECT students only, outfitted with instructional software, including Learn HVAC, Write Soft, Trane software, Simutec, (a refrigeration and HVAC simulation tool), and Automated Logic Web Control.
- A first version of the computer-based HVAC simulation software tool Learn HVAC is being used for commercial HVAC systems classes.
- Guest speakers from leading manufacturers, vendors, and commissioning firms

**How does the department maintain the integrity and consistency of academic standards within the discipline?**

- The first method is prerequisites. All new students are required to take first the Fundamentals of Refrigeration, Fundamentals of Electricity, and Basic Skills (English, Math) courses.
- All our programs are continually vetted with industry and adapted to innovations in technology.
- New programs have been based on demand data from the CCC Centers of Excellence, the California Public Utility Commission, and regional and national labor market studies on green workforce development trends.
- Create more interactive and problem solving methods for teaching and improving student learning.
- Use interactive computer-based software for students to practice problem solving and complex systems thinking skills.

**Discuss the enrollment trends of your department. What is the student demand for specific courses? How do you know? What do you think are the salient trends affecting enrollments?**

Enrollment figures have increased steadily in the last seven years. Enrollment was at 147 in spring of 2006, 297 in spring of 2007, and 395 in spring of 2008 and has further increased since then. Census enrollment in 2008/09 was up to 898, compared to 682 in 07/08, 547 in 06/07 and 310 in 05/06, 689 in fall 2009, 539 in fall 2010, 665 in fall 2011. Along with increased student demand, the department is experiencing severe staff, lab and classroom space and resource shortages, hobbling full deployment of the revised program. ONE-PERSON CORE FACULTY HAS HAD TO ACCOMMODATE A NEARLY THREE-FOLD INCREASE IN STUDENT ENROLLMENT.

Over the past two years, the department chair has had to routinely over-fill courses and turn away students for first-semester classes because they have been overenrolled. Classrooms are being utilized beyond capacity. Second-year advanced courses are now also at capacity. We are seeing an increasing number of incumbent worker students taking advanced HVAC and Control courses for up grading their skills.

Students show interest in courses that directly increase their hand-on skills and knowledge; either they are working in the industry already and would like to hone their skills or new comers wanting to enter the HVAC industry. New programs such as the Building Automation and Energy Efficiency and Sustainability will increase students' interest with some understanding of the HVAC industry; this program offers great potential to increase the number of students if the appropriate outreach approach is implemented.

As of this year, the department finally managed to hire another fulltime instructor to relieve the one person from some of the pressure and work load.

**Are courses scheduled in a manner that meets student needs and demand? How do you know?**

Yes. The program starts with the fundamental courses and gradually builds knowledge as students go through the program. The courses are scheduled to accommodate both full time students and incumbent workers that need to come and take one or two courses per semester to enhance their knowledge. At present time, demand is so great that the program could likely fill a parallel track of day courses.

In addition, the Building Performance for Energy Efficiency and Green Jobs Corps programs are being offered during the day. Applicant demand far exceeded enrollment capacity for those programs.

**4. Student Success**

**Describe student retention and program completion (degrees, certificates, persistence Rates) trends in the department. What initiatives can the department take to improve retention and completion rates?**

Persistence rates have increased from 55.4% in 05/06 to 69.8% in 08/09.

Course completion rates have been at 76.9% in 07//08 and 75.1% in 08/09. The slight drop might be a reflection of the department operating beyond capacity with limited instructor staff and not enough class and lab space.

Retention has been steady: 87.7% in 08/09 from 84.5% in 07/08 and 82.6% in 06/07, 90% in fall 2009, 89% in fall 2010, 87% in fall 2011.

With the economy slowdown still the industry demands are such that companies hire students before they get to finish the program.

This has always affected somewhat the area of retention and completion.

More instructional assistants and instructor availability would ensure smoother operation of classroom, increased safety, and higher quality of teaching, leading to higher completion and retention rates.

**What are the key needs of students that affect their learning? What services are needed for these students to improve their learning? Describe the department's efforts to access these services. What are your department's instructional support needs?**

Students need a better and safer environment in the class and laboratory. This includes an urgent need for instructional assistants. It also includes addressing basic safety and indoor air quality concerns that are affecting student learning, and addressing classroom capacity shortages:

- The ECT Program got an additional lab space in A-Building to build two new multi purpose computer labs to better serve our students in Building Automation, Computer Software and Hardware, DDC Software and Hardware, Programmable Logic Controls, Pneumatic Controls, Motor and Controls, Bio-Medical Devices and Advanced Lighting and Controls. As the program expands further into building automation, more classroom and lab facilities designated for it and high tech applications will be needed.

- B-150: Original breaker panels and electrical outlets need to be updated and all the wiring in the lab should be rewired above ground for safety reasons. A combustion exhaust fan needs to be installed in a common vent pipe for the residential furnaces. Flex gas pipes or rubber hoses on rollers need to be installed for the rooftop and residential furnaces. Two or three exhaust fans need to be installed in the lab area for properly exhausting the lab.
- Evening tutorial services specific to the field would greatly enhance the learning of some of our students.
- Instructional assistant(s) would better help students with their learning.

**Describe the department's effort to assess student learning at the course level. Describe the efforts to assess student learning at the program level. In which ways has the department used student learning assessment results for improvement?**

Students are assessed for project completion, through tests, and by job placement success. Students have done better with tests that use open ended questions rather than multiple choice questions. Due to the significant work overload, the department chair is not able to follow through on course and program assessment strategies as he would like to. As part of our National Science Foundation grant, the program is conducting a student satisfaction surveys for most classes at the end of each semester. Survey results are shared with each instructor and discussed at team meetings. Overall, the program is experiencing a high level of student satisfaction. Typical student suggestions for improvement include: more hands-on work, need instructional assistant and smaller classes, instructor is overloaded.

For the last three semesters the department has been implementing the Task Stream assessment process and adjusts the tests and projects to improve the results.

## **5. Recommendations and priorities**

Hire an Instructional Assistant(s) or lower the number of students in the lab to be able to teach students more safely and effectively. The ECT department is in great need of new and modern instructional facilities; our competitors in the industry are the unions who provide somewhat similar courses and training but also invest lots of money for new state of the art facilities!! Our challenge as a public institution is the lack of funding; however, there can be creative solutions to overcome this obstacle. Partnering with the industry can be one way to bring needed resources to the ECT program. Companies like Johnson Controls, Honeywell, Siemens and more would be interested in these types of partnerships.

First Priority: Hire Instructional Assistant(s) and fulltime clerical support.

## **6. Human and Physical Resources (including equipment and facilities)**

**Describe your current level of staff, including full-time and part-time faculty, classified staff, and other categories of employment.**

Currently, the Department has two full-time instructors and eight part-time instructors. A project manager for the NSF grant has been partially supporting the program since 2007. Presently, there is a temporary student aid assisting with clerical support the department chair part-time. In addition, two consultants are currently providing grant support functions for the Building Performance and Energy Efficiency and the Oakland Green Jobs Corps program.

Seminars and short courses taught by experts from different industries will be added in the future to increase the exposure of our students to current trends and technologies.

**Describe your current utilization of facilities and equipment.**

Classrooms and labs are being utilized to their maximum; the program is in need of more classroom space and better laboratories. With the addition of the new programs such as the Building Automation and the Energy Management Program being developed, the need will increase dramatically in the next few semesters, which the program cannot afford to lose students due to the lack of appropriate teaching space if we want to keep or raise the student retention. The existing facilities were designed for teaching residential and light commercial HVAC systems, while new technologies require different type of settings in classroom. As an example, Energy performance monitoring requires utility metering which do not exist or can be implemented in the current lab setting.

***Commercial HVAC Lab***

The 7,000 square foot Environmental Control Technology (ECT) Lab holds a full size commercial hydronic system consisting of all major components, including boiler, chiller, heat exchangers, cooling tower, variable frequency drives (VFDs), variable air volume boxes (VAV), economizers, sensors, and controls. The hydronic lab was designed by Taylor Engineering, one of the leading engineering firms for energy efficiency in the country. The lab allows instructors to simulate a variety of real-life problem scenarios, to install temporary faults and bugs, and to have students solve complex problems as a team.



### ***Multi-vendor Building Controls Lab***

With current NSF renewal funding, Laney has installed a multi-vendor control system in its commercial HVAC lab. The latest devices on the market will operate in unison to support HVAC training equipment in the lab. The different systems will be fully integrated through an interoperable network, simulating the latest trend in building automation. Read more about the multi-vendor control systems lab.

At our multi-vendor Direct Digital Controls (DDC) test-bench lab students practice controls wiring, programming, and systems integration strategies.

### ***Computer Lab, Classroom, and Workbenches***

A 28-station computer lab is available to ECT students only, outfitted with instructional software, including Energy Pro, EQuest, LearnHVAC, Write Soft, Trane software, Simutec, (a refrigeration and HVAC simulation tool), and AutomatedLogic Web Control.

The facility also contains an array of workbenches and trainers, including refrigeration trainers, refrigerators and freezers for teaching commercial refrigeration troubleshooting, light commercial/residential HVAC trainers, Variable Air Volumes (VAV), compressors for teaching compressor tear-down, brazing, soldering, and bending, basic motors and controls, ignition systems, and pneumatic and electromechanical controls.

In addition, Laney's 5,500 square foot Electrical Department provides 10 work stations for teaching Variable Frequency Drives, motors, and controls.

Also, the department just got another lab space big enough to house two labs with computers to be able to better teach Building Automation Controls, Advanced Lighting Controls, Programmable Logic Controls, Bio Medical Devices and Pneumatic Controls.

**Are the human and physical resources, including equipment and location, adequate for all the courses offered by your department (or program)? What are your key staffing and facilities needs for the next three years? Why?**

#### **Key Staffing Needs**

The department chair needs a fulltime office assistant to deal with everyday office work so he or she can designate more time with the everyday tasks. The ECT Program was just awarded with a grant of three and a half million dollars by the National Science Foundation (NSF) as a Center for Building Efficiency for a Sustainable Tomorrow (BEST). Also, we have been designated a Center of Excellence with the US DOE and EPA supported Labs for the 21<sup>st</sup> Century program. Part-time faculty is not available for the program and curriculum development work needed. Generally, part-time faculty in the ECT program work full-time during the day.

In addition, we need at least one full-time instructional and one part-time instructional assistant to assist students during lab time. This will ensure adequate safety and better quality of teaching for short term while we need to look for long term as we develop new courses for the new Certificates and Programs. Also as the ECT and EET department expand with more computer labs, it will become more of a necessity to house an IT specialist.

Special needs are in the administration and support areas; a marketing specialist can be useful to promote the program to local schools and industry.

**Staff:**

The technical programs, especially the ECT and E/ET departments, need a full-time IT person to support and maintain the computer labs.

In addition, the department has grown to a degree and gained so much visibility that an administrative assistant is now badly needed to help with day-to-day administrative and clerical support.

**Equipment Needs:**

The department will need two to three new air conditioning units with R-410a refrigerant which replaces the R-22 refrigerant, in order to meet the current industry standards. All of our air conditioning lab equipment supports only R-22 refrigerant and since 2010 incrementally is being phased out. Due to this shift in policy and standards, we will need new manifold gauges, leak detectors, recovery machines, and more.

The department also needs solar thermal systems, geothermal heat pumps, including water source heat pumps to be able to teach more energy efficient equipment.

In addition, the department needs commercial refrigeration equipment, such as freezers, supermarket refrigeration, and ice machines.

For simulating high-tech facilities and clean-rooms, the department needs to acquire a fume hood.

Workbenches and small labs to instruct students in the many areas are in bad need to support current and future program objectives; as the ECT program develops into a more commercial and industrial instructional program, the existing equipment and workbenches become obsolete. Lighting controls and a new DDC internet base system required different labs; advanced cooling technologies (thermocooling, water to water heat pumps, etc.) also require different type of instructional materials and space to teach effectively.

### **Facilities Needs**

Design/build and showcase energy efficient and sustainable light commercial/commercial building.

- Demonstration site for energy efficient and renewable energy technology
- Accessible by the industry and the community as a demonstration site
- Living laboratory for hands-on learning
- Teaching site for community-based classes, and in partnership with the utilities
- 40000 – 70000sqft, preferably two-story building
- The building needs to be in close proximity to the ECT and E/ET departments
- Significant industry donations can be expected
- Cross-departmental project: involve architectural department in design, carpentry and welding department in construction. All of the above departments have expressed a great interest in collaborating on this important project. Architectural department did a design contest for this type of building. A viable design scenario is available by Flood Architects.

Original breaker panels and electrical outlets in B-150 need to be updated and all the wiring in the lab should be rewired above ground for safety reasons. A combustion exhaust fan needs to be installed in a common vent pipe for the residential furnaces. Flex gas pipes or rubber hoses on rollers need to be installed for the rooftop and residential furnaces. Two or three exhaust fans need to be installed in the lab area for properly exhausting the lab.

The ECT program is currently not able to adequately teach stand alone courses for continues education such as boiler, heat pumps, solar thermal systems, market refrigeration, ice machines and more. Currently, we have a boiler that is not being used due to the lack of proper gas pressure. The existing gas line is sized for smaller gas pressure. We need the district to bring in a new gas line with more pressure, utilizing bond money.

### **Technology Needs**

Technical programs are constantly evolving, residential and light commercial programs are being enhanced and the few commercial small industrial programs become even more complex with the ever-changing technology. In the last few years the HVAC industry has finally cough up with the high tech sector such as, wireless web base controls making the HVAC industry more complex and in need of better prepared technicians to work in the 21<sup>st</sup> century facilities. Our current facilities were design for the 1970's which they are inadequate for the current industry standards even though we try maintaining the program and the facilities current with the industry. It should become a college priority not only to have additional space but to have instructional labs to teach the new high tech HVAC systems, Control systems and Energy Management and Efficiency.

For the department to be able to teach state of the art technology will also need a large building around 70000 sq feet building to house labs, classrooms, conference rooms and office spaces to use it as a living lab. This will allow the program to collect energy use data, water use data and much more.

Since the department has expanded significantly, we will need additional computers, LCD projectors, and large screen TV's for videos and DVD's.

To keep up with rapidly changing technology, we will need different types of software for our building automation controls, refrigeration as well as for the computer lab.

### **Recommendations and priorities**

The Department needs some help finishing the installation of the Hydronic System and Controls, to be able to offer regularly the advanced courses and begin marketing the program with the industry. We also need to upgrade the reach-in refrigerators with new condensing units and controls. The department also needs four ice machines, shelf and chest type refrigerators and freezers to allow students to work on the different types of low temp and medium temp freezers and refrigerators.

Below are the priorities for necessary next steps:

1. Hire a fulltime and part-time Instructional Assistant to better serve our students.
2. Immediately address the safety and indoor air quality hazards described above.
3. Build showcase instructional facility for sustainable building operations

4. Provide additional classroom and more computer lab space
5. Upgrade equipment as specified above
6. Install a common vent pipe with an exhaust fan to properly vent the residential and light commercial furnaces.
7. Upgrade all the reach-in refrigerators by the windows with the latest technology.
8. Create more workstations in the lab for students to work on pneumatic and electrical controls.

## **7. Community Outreach and Articulation**

**Describe the department's connection with industry. Is there an Advisory Board or Advisory Committee for the program? If so, how often does it meet? Is the program adequately preparing students for careers in the field? How do you know?**

Laney has very strong connections with the industry. The ECT NSF industry advisory group consists of 80+ members on our advisory group mailing list and an average of 30 meeting attendees. The multi-sector industry advisory group continues to be active both in general advisory group meetings as well as in task-specific sub committees. In the last three years we have seen a significant increase in involvement of most leading control companies in the field. In addition, several high-level energy management firms have been added to the advisory group. Industry partners participate in continuing curriculum review, donations for our lab facilities (\$100,000 in FY 08/09 alone), and the design of a fully integrated control systems network of our new commercial HVAC lab. In addition, industry partners contribute as guest speakers and frequently contact the department with job opportunities for students.

In addition to the ECT advisory group for commercial HVAC systems, a controls curriculum subcommittee met throughout the past two years to give input on the certificate in Building Automation. The certificate was endorsed with unanimous approval by the large industry advisory meeting in February 09.

Industry advisory meetings also serve as a forum for a big-picture discussion on industry trends and the urgent need for scalability and replicability of Laney's efforts in light of statewide and federal energy efficiency mandates.

Three years ago, we created a new industry advisory group specifically for residential and light commercial building performance which will support us in the development of our new Energy Management focus. The industry advisory group consists of 30 professionals in building performance, energy auditing, utility energy programs, and municipal energy programs. A critical new partner is the California Building Performance Contractors Association who will collaborate directly with Laney to offer train-the-trainer workshops in building performance and energy assessments.

Our database of industry, industry association, community, and educational contacts lists over 600 individuals, organizations, and entities that have been involved in ECT's activities or outreach.

Industry also greatly contributed to the new regional Energy Efficiency Occupations workforce study prepared by the CCC Centers of Excellence, Silicon Valley and San Francisco Bay Area. Thanks to Laney's contacts with industry associations, the utilities, and advisory group members, over 700 responses were received. The survey confirmed the growing demand for qualified HVAC, controls, and building performance technicians.



Based on employer satisfaction surveys conducted as part of the NSF grant and anecdotal evidence, it is safe to state that the program is not only adequately preparing students for entry-level career opportunities but also for career advancement. Frequently, students get recruited even before finishing the program. In addition, when students finish the program, they get placed with high-paying jobs. Incumbent workers who come and take the courses frequently get advancements within their position.

*For transfer programs:*

**Describe the department's efforts in meeting with and collaborating with local 4-year institutions. Is the program adequately preparing students for upper division course work? How do you know?**

While the ECT program is not primarily designed as a transfer program, it is one of our tasks as an NSF grantee to develop relationships with 4-year institutions, including articulation agreements. We currently have an articulation agreement with Penn College of Technology which agreed to accept the entire ECT program as a block transfer. We are also working on additional articulation agreements with other universities.

Several of our students have transferred to engineering departments, including at Cal Poly and UC Berkeley.

The program increasingly attracts college graduates with engineering degrees who have not been exposed to the hands-on, real-life learning opportunities we provide in the ECT program. Several four-year programs, including CSU East Bay, San Jose State University, Cal Poly, and UC Berkeley have approached us to explore partnership opportunities where college students could benefit from our curriculum and lab facilities.

**Have students completing the program attained a foundation of technical and career skills? How do you know? What are the completion rates in your program?**

Yes. See summary tables below. They usually get jobs and their employers usually call to thank us or for more students. The completion rates have been over 75%.

**What industry trends are most critical for the future viability of the program? How do you know? What are the implications of these trends for curriculum development and improvement?**

This is a critical time to strengthen the ECT program at Laney. Demand for technicians trained in state-of-the-art technology, complex problem solving skills, and hand-on trouble-shooting is increasing as the industry is rapidly evolving. Emphasis on energy management, energy efficiency, and integrated whole building analysis is becoming increasingly important with a stricter regulatory environment responding to environmental and public health concerns. The ECT department continuously is receiving encouragement for its innovative strategy through conversations with industry experts both regionally and at national conferences. Recent workforce studies confirm the growing demand for technicians trained in energy efficiency, HVAC, and building controls in the residential and commercial sectors.

According to a March 2009 study by the Centers of Excellence (SF Bay Area and Greater Silicon Valley) *Energy Efficiency Occupations: Bay Region*, the projected growth rate for building automation and control systems technicians is 10% over a 12 month period and 42% over a 36 month period ([www.coecc.net/energy](http://www.coecc.net/energy)). According to the study, 4 out of 5 employers experience difficulty finding qualified building control systems technicians. More than half of employers surveyed expressed interest in a two-year

Associate degree or certificate program for building controls systems technicians. Employers were most comfortable with community college training for HVAC Technicians and Building Controls Systems Technicians. One in three employers surveyed prefer HVAC Technicians and Building Controls Systems Technicians with an Associate degree or program certificate specific to the occupation. The ECT program's advisory committee members (comprised of large employers, manufacturers, suppliers, contractors, utilities, municipalities, colleges, and state agencies) confirm that the lack of qualified building automation technicians is one of the greatest barriers to improving occupancy comfort and energy efficiency in commercial buildings. Advisory members have repeatedly emphasized that building automation technicians working on commercial facilities need complex problem solving, systems thinking, diagnostic, and troubleshooting skills that require advanced training. The advisory committee worked with ECT faculty over the last two years to develop skill sets and course requirements responsive to modern industry needs. The proposed curriculum was unanimously endorsed at the advisory committee meeting on February 23, 2009. The same feedback regarding market place demand and urgency has been received from the industry advisory committee of the new interdisciplinary Building Performance and Energy Efficiency (BPEEP) program.

In addition, the ECT program has begun to serve as a role model for other higher education institutions nationally and internationally. With advanced HVAC technology being such an instrumental strategy for the mitigation of global warming, ECT will be drawing attention of the growing sustainability movement in higher education. For example, we have recently been designated a Center of Excellence in High-Performance Operations and Maintenance Education and Training with the US DOE and EPA supported Labs 21 partnership.

**Describe the department's effort to ensure that the curriculum responds to the needs of the constituencies that it serves.**

See above. The department maintains regular contact with industry partners and closely works with research scientists at Lawrence Berkeley National Labs, as part of its NSF grant. During advisory board meetings, the department conducts thematically structured focus group sessions soliciting detailed feedback from industry advisors for curriculum structure, sequencing, and content. This feedback is being continuously integrated.

**Recommendations and priorities**

- Expand partnership opportunities with high schools and four year colleges and universities, including articulation opportunities
- Add more building managers, company owners, and alums from the program to the advisory committee
- Dedicate additional staff time to program outreach and representation at regional, national, and international meetings
- Develop stronger ties with industry associations

**SUMMARY OF DATA**

## Laney College Program Review Data

**Subject: ECT**

### Section II Student Data

#### Department Overview

Dimension	Fall 2009	Fall 2010	Fall 2011
Census Enrollment	689	539	665
Sections	22	19	27
Total FTES	65.98	50.33	61.88
Total FTEF	7.02	6.69	9.2
FTES/FTEF	18.78	15.04	13.44

#### Student Retention

Dimension	Fall 2009	Fall 2010	Fall 2011
Census Enrollment	912	744	683
Retained	825	661	593
Retention Rate	90%	89%	87%

#### Student Success

Dimension	Fall 2009	Fall 2010	Fall 2011
TOTAL GRADED	906	724	677
Success Grades	728	580	515
Success Rate	80%	80%	76%

### Section III Faculty Data

Dimension	Fall 2009	Fall 2010	Fall 2011
Contract FTEF	0.85	0.85	0.85
Hourly FTEF	2.57	2.4	3.66
Extra Service FTEF	0.1	0.1	0.1
% Contract/Total	0.24	0.25	0.18

### Section IV Faculty Data Comparable Fall 2011

Dimension	Alameda	Berkeley	Laney	Merritt
Contract FTEF	0	0	0.85	0
Hourly FTEF	0	0	3.66	0
Extra Service FTEF	0	0	0.1	0
Total FTEF	0	0	9.2	0
% Contract/Total	0	0	0.18	0

**Duplicated Enrollment by Time of Day**

Day_Eve	F09	F 09	F10	F 10	F11	F 11
Day	296	32%	205	28%	79	12%
Evening	616	68%	539	72%	604	88%
Total	912	100%	744	100%	683	100%

**Headcount by Gender**

Gender	F09	F 09	F10	F 10	F11	F 11
Female	13	6%	19	8%	8	4%
Male	199	86%	194	81%	163	84%
Unknown	20	9%	26	11%	22	11%
Total	232	100%	239	100%	193	100%

**Headcount by Ethnicity**

Ethnic Group Desc	F09	F 09	F10	F 10	F11	F 11
American Indian/Alaskan Native	1	0%	3	1%	3	2%
Asian	46	20%	33	14%	34	18%
Black/African American	41	18%	58	24%	55	28%
Filipino	10	4%	11	5%	6	3%
Hispanic	35	15%	34	14%	29	15%
Pacific Islander	2	1%	4	2%	2	1%
White Non Hispanic	31	13%	53	22%	34	18%
Multiple	2	1%	15	6%	12	6%
Other Non white	4	2%	4	2%	1	1%
Unknown/Non Respondent	60	26%	24	10%	17	9%
Total	232	100%	239	100%	193	100%

**Headcount by Age Group**

AGE	F09	F 09	F10	F 10	F11	F 11
16-18	4	2%	1	0%		0%
19-24	45	19%	47	20%	37	19%
25-29	23	10%	40	17%	28	15%
30-34	24	10%	34	14%	33	17%
35-54	115	50%	89	37%	85	44%
55-64	19	8%	26	11%	9	5%
65 & Above	2	1%	2	1%	1	1%
Total	232	100%	239	100%	193	100%

**Grade Distribution**

Grade	Fall 2009	Fall 2010	Fall 2011
A*	251	246	186
B*	272	223	223
C*	203	111	106
D*	33	21	39
F*	62	57	34
I'	0	3	6
NP*	0	0	0
P*	2	0	0
W*	81	63	83
Total	904	724	677

**Fall to Spring Persistence Rates**

		F09 to S10 Persistence		F10 to S11 Persistence			F11 to S12 Persistence	
F09	S10	Rate	F10	S11	Rate	F11	S12	Rate
232	153	66%	239	137	57%	193	122	63%

**Awards by Gender and Type**

Gender	2011-12				2010-11				2009-10			
	AA	AS	CA	CP	AA	AS	CA	CP	AA	AS	CA	CP
Female			2									
Male		3	31	4		3	51	8			14	5
Unknown			4	1			5				3	1
Total		3	37	5		3	56	8			17	6

**Awards by Ethnicity and Type**

Ethnicity	2011-12				2010-11				2009-10			
	AA	AS	CA	CP	AA	AS	CA	CP	AA	AS	CA	CP
Asian		1	7	1		1	12	2			6	2
Black/African American			5	2			6	1			2	1
Filipino		2	4				1				1	1
Hispanic			7				12	1			1	1
Multiple							2					
Other Non white							1					
Pacific Islander			1				1				1	
Unknown/Non Respondent			6				9	1			3	1
White Non Hispanic			7	2		2	12	3			3	
Total		3	37	5		3	56	8			17	6

**LANEY COLLEGE: FALL TERM DEMOGRAPHICS  
ETHNICITY BY DEPARTMENT (UNDUPLICATED COUNT)**

DEPT	ETHNICITY	2005-06		2006-07		2007-08		2008-09	
ECT	ASIAN	15	20.3%	25	33.3%	25	27.8%	22	19.0%
	AFRICAN AMERICAN	20	27.0%	16	21.3%	20	22.2%	26	22.4%
	FILIPINO	2	2.7%	4	5.3%	3	3.3%	3	2.6%
	HISPANIC/LATINO	19	25.7%	18	24.0%	20	22.2%	31	26.7%
	NATIVE AMERICAN	1	1.4%	0	0.0%	0	0.0%	1	0.9%
	OTHER NON WHITE	2	2.7%	2	2.7%	2	2.2%	4	3.4%
	WHITE NON HISPANIC	12	16.2%	6	8.0%	17	18.9%	21	18.1%
	UNKNOWN	3	4.1%	4	5.3%	3	3.3%	8	6.9%
	Total	74		75		90		116	

**Age distribution**

ECT	16-18	4	5.4%	2	2.7%	3	3.3%	6	5.2%
	19-24	14	18.9%	11	14.7%	8	8.9%	8	6.9%
	25-29	18	24.3%	15	20.0%	13	14.4%	23	19.8%
	30-34	10	13.5%	17	22.7%	22	24.4%	20	17.2%
	35-54	27	36.5%	29	38.7%	39	43.3%	56	48.3%
	55-64	1	1.4%	1	1.3%	4	4.4%	3	2.6%
	65 AND OVER	0	0.0%	0	0.0%	1	1.1%	0	0.0%
	Total	74		75		90		116	

**Matriculation**

ECT	EXEMPT	16	21.6%	14	18.7%	23	25.6%	19	16.4%
	MATRICULATING	57	77.0%	61	81.3%	66	73.3%	97	83.6%
	UNKNOWN	1	1.4%	0	0.0%	1	1.1%	0	0.0%
	Total	74		75		90		116	

**Gender distribution**

ECT	FEMALE	4	5.4%	3	4.0%	1	1.1%	4	3.4%
	MALE	68	91.9%	71	94.7%	89	98.9%	97	83.6%
	UNKNOWN	2	2.7%	1	1.3%	0	0.0%	15	12.9%
	Total	74		75		90		116	



LANEY COLLEGE: FALL TO SPRING PERSISTENCE RATES BY DEPARTMENT USING CW1 ENROLLMENT: UNDUPLICATED BY DEPARTMENT												
DEPT	2005-06			2006-07			2007-08			2008-09		
	CW1	PERS	RATE	CW1	PERS	RATE	CW1	PERS	RATE	CW1	PERS	RATE

ECT	74	41	55.4%	75	41	54.7%	90	60	66.7%	116	81	69.8%
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LANEY COLLEGE: SUCCESSFUL COURSE COMPLETION RATES BY DEPARTMENT USING TOTAL LETTER GRADES								
DEPT	2005-06		2006-07		2007-08		2008-09	
	ATT	SCSS	ATT	SCSS	ATT	SCSS	ATT	SCSS
ECT	339	74.6%	577	74.5%	726	76.9%	949	75.1%

LANEY COLLEGE: FALL 2009: GRADE DISTRIBUTION BY SECTION (four or more grades only)														
DEPT	CRS	CODE	INSTRUCTOR	A	B	C	CR	D	F	INC	NC	IP	W	TOTAL
ECT	011	40486	STANLEY MARGARET	6	16	16	0	2	0	1	0	0	14	55
ECT	012	44953	DOUGLAS BRUCE	2	9	4	0	5	3	0	0	0	2	25
ECT	012	40488	STANLEY MARGARET	30	6	0	0	0	11	1	0	0	7	55
ECT	013	45397	KYRIAKOPEDI NICK	5	11	12	0	0	0	0	0	0	0	28
ECT	013	40489	KYRIAKOPEDI NICK	6	18	14	0	2	1	1	0	0	12	54
ECT	014	45401	GOETSCH ROGER BR	5	9	13	0	0	1	0	0	0	0	28
ECT	014	40491	EGELSTON GREGORY	5	5	12	0	1	2	0	0	0	3	28

ECT	015	45403	GOETSCH ROGER BR	5	9	13	0	0	1	0	0	0	0	28
ECT	015	40493	EGELSTON GREGORY	5	5	11	0	1	0	0	0	0	8	30
ECT	016	45405	KYRIAKOPEDI NICK	5	12	11	0	0	0	0	0	0	0	28
ECT	016	40495	KYRIAKOPEDI NICK	7	11	7	1	1	0	0	0	0	4	31
ECT	017	40497	KYRIAKOPEDI NICK	10	9	4	0	0	0	0	0	0	3	26
ECT	017	45407	KYRIAKOPEDI NICK	5	9	14	0	0	0	0	0	0	0	28
ECT	018	45409	KYRIAKOPEDI NICK	5	10	12	1	0	0	0	0	0	0	28
ECT	018	40499	KYRIAKOPEDI NICK	10	9	4	0	1	4	0	0	0	0	28
ECT	019	41429	HARTSHORN HADLEY	5	14	5	0	5	0	2	0	0	0	31
ECT	021	40501	FROSTJR. CHARLES	17	5	2	1	0	0	0	0	0	2	27
ECT	022	40503	FROSTJR. CHARLES	8	9	5	0	0	0	0	0	0	2	24
ECT	024	40505	FROSTJR. CHARLES	20	1	1	0	0	0	0	0	0	2	24
ECT	025	41430	JACKSON FREDRICK	4	18	5	0	0	0	2	0	0	0	29
ECT	028	40507	HOLLOWAY WILLIAM	8	7	2	0	7	7	0	0	0	5	36
ECT	038	44955	DOUGLAS BRUCE	6	6	9	0	0	1	2	0	0	2	26
ECT	039	44959	DOUGLAS BRUCE	7	12	2	0	0	1	0	0	0	2	24
ECT	211	45487	DOUGLAS BRUCE	13	4	2	0	1	0	0	0	0	1	21
ECT	211	40509	TANIOS JOSEPH	29	8	0	0	0	12	1	0	0	8	58
ECT	213	44677	HARTSHORN HADLEY	4	15	2	0	3	0	2	0	0	0	26
ECT	214	40510	PETTITE JUDI	16	13	3	0	4	0	7	0	0	6	49

LANEY COLLEGE: GRADE DISTRIBUTION BY DEPARTMENT									
DEPT	GRADE	2005-06		2006-07		2007-08		2008-09	
		#	%	#	%	#	%	#	%
ECT	A	84	25.1%	171	30.2%	187	26.3%	276	29.4%
	B	78	23.3%	158	27.9%	226	31.8%	248	26.4%
	C	91	27.2%	101	17.8%	145	20.4%	188	20.0%
	CR	0	0.0%	0	0.0%	0	0.0%	1	0.1%
	D	11	3.3%	31	5.5%	37	5.2%	34	3.6%
	F	28	8.4%	15	2.6%	18	2.5%	84	8.9%
	INC	6	1.8%	4	0.7%	1	0.1%	12	1.3%
	P	0	0.0%	0	0.0%	0	0.0%	6	0.6%
	W	37	11.0%	87	15.3%	96	13.5%	91	9.7%
Total		335		567		710		940	

**Laney College  
Instructional Program Review  
Resource Needs Reporting Template**

<b>Division: Vocational Technology</b>		<b>Department/Program: ECT</b>		<b>Contact: Nick Kyriakopedi</b>	
<b>Item Identified in Program Review (justification)</b>	<b>Human Resources (Staffing)</b>	<b>Physical Resources (Facilities)</b>	<b>Technology and/or Equipment</b>	<b>Supplies Budget</b>	<b>Curriculum</b>
Teach courses, revise and document curriculum, involve external resources in instruction (speakers, donations, internships, field trips)	One full time and one part-time instructional assistant. One IT person to fully control the computer labs in the ECT and E/ET departments	Change all the existing electrical outlets on the walls and in the middle of the lab. Install pull down type extension codes and robber hole gas lines.	One full sized Solar Thermal system and five trainers. One water source heat pump and one geothermal heat pump. Five ice machines.	Ten ¾ horse power condensing units. Ten evaporators and ten metering devices.	Create Written Lab Projects, Lab Trainers for students to work on, Lesson Plans and Assessments tests,
Create a cleaner and safer environment for students		Renovate lab (see section 6, page 8-9 for specific measures needed)	See section 6, page 8-9 for a list of equipment needs		
Tutorial services for students at night					

## Laney College Facilities Needs Table

Please list needs in order of priority within a particular category.

### Maintenance

Deferred	Preventative	Ongoing	Emergency
		Fix the hand wash sink in Room B150	Fix Roof leaks in Room B120, B150 including the tool room and A192

### Reconstruction

Refurbish	Remodel	Renovate
Install and exhaust fan on a common plenum to vent all the furnaces properly.	Bring in new and larger gas line inside B150 to connect the existing boiler that not being used because the existing gas line is too small. New HVAC system for healthier and more productive students.	Change out the entire existing electrical outlet in B150 for safety reason.

### New Construction

Short Term 1-2 years	Mid Term 2-3 years	Long Term 3-5 years
New small building to be built on the tennis court behind the ECT, EET Departments.		The large 40-60 thousand square foot building to be built on the tennis court.

