

UNIVERSITY OF HAWAI'I MAUI COLLEGE

COMPREHENSIVE PROGRAM REVIEW

**ELECTRONIC & COMPUTER
ENGINEERING TECHNOLOGY
PROGRAM**

DECEMBER 2010

OVERVIEW OF THE PROGRAM

A. Mission and Vision of the College:

Mission:

University of Hawai'i Maui College is a learning-centered institution that provides affordable, high quality credit and non-credit educational opportunities to a diverse community of lifelong learners.

Vision:

We envision a world-class college that meets current and emerging Maui County education and training needs through innovative, high quality programs offered in stimulating learning environments. The College mission, goals, and actions will be guided by the Native Hawaiian reverence for the ahupua`a, a practice of sustaining and sharing diverse but finite resources for the benefit of all.

B. Mission and vision of the ECET program

The ECET program complies with the mission and vision of UH-MC in that the program offers quality credit instruction to students looking for an affordable education in a supportive environment, promotes competence in the discipline, and aims to successful careers.

Mission:

The mission of the ECET program is to provide students relevant and rigorous training and education for entry-level engineering technology positions in Maui County. It aims also at giving graduates mobility within the field and the ability to adapt as the field changes.

The ECET program is designed to satisfy the workforce needs of the Maui local employers. The ECET program works closely with its high-technology industry advisory board to insure students gain skills required for employment with local companies. In this respect, the program builds upon skills, duties and tasks considered critical by these prospective employers.

Vision:

The vision of the ECET program for the next five years can be summarized as follows:

- A continuous improvement of the program through a documented plan incorporating relevant data to regularly assess the program educational objectives and program outcomes, and to evaluate the extent to which they are being met;
- A curriculum that develops effectively the subject areas in support of the program objectives;
- An alignment of the program with the needs of industry partners; and
- The development of an appropriate sustainable Bachelor in Applied Science in Engineering Technology degree (BAS ENGT).

Program Student Learning Outcomes:

The program must demonstrate that graduates have:

- an appropriate mastery of the knowledge, techniques, skills, and modern tools of their disciplines;
- an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering, and technology;
- an ability to conduct, analyze and interpret experiments, and apply experimental results to improve processes;
- an ability to apply creativity in the design of systems, components, or processes appropriate to program educational objectives;
- an ability to function effectively on teams;
- an ability to identify, analyze and solve technical problems;
- an ability to communicate effectively;
- a recognition of the need for, and an ability to engage in lifelong learning;
- an ability to understand professional, ethical and social responsibilities;
- a respect for diversity and a knowledge of contemporary professional, societal and global issues; and
- a commitment to quality, timeliness, and continuous improvement

Faculty:

Mark Hoffman, ECET Assistant professor

Jung Park, ECET and ENGT Instructor

Elisabeth Reader, Student Programs Coordinator

Dan Kruse, ICS Assistant Professor

ECET position (vacant)

ICS position (vacant)

Facilities:

Adequate facilities are provided to the students and faculty in the form of:

- suitable classrooms, laboratories, and associated equipment necessary to accomplish the program educational objectives in an atmosphere conducive to learning;
- laboratory equipment characteristic of that encountered in the industry and practice served by the program;
- modern computing equipment and software, characteristic of that encountered in the industry and professional practice served by the program; and
- Internet and information infrastructures, including electronic information repositories, equipment catalogs, professional technical publications, and manuals of industrial processes and practices adequate to support the educational objectives of the program and related scholarly activities of students and faculty.

Support:

The ECET program receives financial support from:
NSF (National Science Foundation); and
RDP (Rural Development Project)

C. Relation to UH-MC strategic plan 2003- 2010

The program objectives are appropriate functions of the College and University, as they are consistent with:

- the mission, vision, and Strategic Plan objectives of the University of Hawai'i System, the UH Community Colleges, and UH-MC;
- approved academic development priorities of UH-MC;
- the initiatives to diversify the economic base by providing a skilled workforce for the state and county and to provide greater employment opportunities for state and county workers;
- the need for a local and regional workforce with the skills that are taught by the program.

UH-MC Mission Statement: *“Maui Community College is a learning-centered institution that provides affordable, high quality credit and non-credit educational opportunities to a diverse community of lifelong learners”.*

UH-MC Vision Statement: *“We envision a world-class college that meets current and emerging Maui County education and training needs through innovative, high quality programs offered in stimulating environments. The College mission, goals, and actions will be guided by the Native Hawai'ian reverence for the ahupua`a, a practice of sustaining and sharing diverse but finite resources for the benefit of all.”*

UH-MC Strategic Plan, Goal 2- Objective 1:

“Engage in intellectual and educational activities that enable the county of Maui and the state of Hawai'i to flourish.”

“Support the county and state economy, workforce development, and improved access to lifetime education for all by building partnerships within the UH System and with other public and private educational, governmental, and business institutions.”

The ECET AS program directly addresses the Maui CC Strategic plan Goal 2 – Objective 1:

- The ECET program will expand training and workforce development programs in coordination with the county, state, and industry economic initiatives. The degree builds upon the significant infrastructure investment already in place for Maui County at the summit of Haleakala and the Research and Technology Park in Kihei, Maui. The program curriculum has been developed in close collaboration with industry advisors. These advisors have made input to the program learner outcomes, course content, and skill requirements. County and state officials have been consulted in regards to the economic initiatives for development of technology industries on Maui and related industries throughout the state. The \$250M Advanced Technology Solar Telescope planned for construction on Haleakala, the \$100M Advanced Laser Facility planned for the Pacific Missile Range Facility, and the \$1B+ Thirty Meter Telescope under consideration for the Big Island are examples of national scientific and engineering projects that are served by the ECET AS degree program.

- Include liberal arts education as the foundation for an educated community and a competent workforce:

The ECET degree has a liberal arts educational component as well as a targeted technology component.

- Maximize opportunities for students to enroll and transfer among campuses in order to achieve their educational objectives in a timely manner

The Community Colleges Program Coordination Council (PCC) has coordinated ECET courses with program on Kauai and Hawaii. UH-MC, Hawai'i and Kauai community colleges are aligning electronics, optics, and electro-optics classes such that graduates may transfer from Hawai'i and Kauai to Maui. Courses have been identified that are appropriate for articulation with Manoa Engineering. Articulation agreements will be put in place such that students may transfer some of the technical classes from Maui to Manoa.

- Cooperate, as appropriate, with other higher education institutions to provide high quality educational services to the county and to the state through such programs as the University of Hawai'i Center, Maui:

The ECET program has been designed in very close collaboration with the University of Hawai'i – Institute for Astronomy (UH-IfA), Maui Division and the University of California, Santa Cruz – Center for Adaptive Optics (CfAO). These higher education intuitions have provided research and funding to establish the required skill standards for engineering technicians throughout the state, particularly on Maui, Hawai'i, and Kauai. They have provided laboratory activity designs based on inquiry methods and teaching teams of graduate students to facilitate these designs. This process has proven to be effective at the Associate degree level during over 7 years of collaborative educational design and facilitation.

- Facilitate dialogue and discussion with business and community partners to better serve workforce needs:

The ECET program has been designed with input from business and community partners to insure the program will serve current and future workforce needs. 7 years of internship projects have been reviewed with the industry hosts to define the content and process skill requirements to insure the successful participation in the workforce for graduates. The Chancellor's business advisory committee convened to review their independent analysis of workforce requirements for Maui. Their findings for Maui echo the key findings of a separate independent report commissioned by the State of Hawai'i legislature and a survey done by the Maui Economic Development Board (MEDB).

- Determine the need for emerging specializations in the workplace; create partnerships between college and community representatives to address new program initiatives:

The National Science Foundation funded the Akamai Workforce Initiative (AWI) in 2007-2008. This partnership between Maui CC, UH – IfA, MEDB, and the CfAO researched detailed workforce requirements for the emerging remote sensing high technology industries on Maui, Hawai'i, and Kauai. This effort was carried out under the leadership of the Center for Adaptive Optics and Institute for Astronomy education and workforce development director, Lisa Hunter. The AWI was a follow up grant after of 7 years of CfAO funded collaboration to train graduate student science and engineering researchers in education and to place college level interns at observatories and other high technology companies throughout the state.

•Reevaluate existing college programs to ascertain relevancy and effectiveness:

The Electronic and Computer Engineering Technology (ECET) Associate in Science degree program has been evaluated for relevancy and effectiveness. Several courses have been modified and added to insure the lower division of the proposed BAS will adequately prepare students for the courses that follow in the upper division.

•Seek external funding sources, e.g. National Science Foundation, to develop programs that promote economic diversification and high-end technology:

There is currently a 5-yr proposal funded by the National Science Foundation to provide funding for program improvement, internships, and course development. This funding would be used to enhance the ECET curriculum with inquiry based activities developed and facilitated by UH graduate students in Engineering and Astronomy. The Directed Energy Professional Society (DEPS) has and will continue to provide funding for curriculum development. Private funding is also available for the program development.

•Partner with the community to identify educational and training needs and to determine how the College can best meet those needs:

Develop appropriate sustainable baccalaureate degrees.

The ENGTEC BAS program proposal identifies educational requirements from the community, and is a appropriate response to these workforce needs. This new Bas program builds on the ECET AS program foundation.

Part 1. QUANTITATIVE INDICATORS FOR PROGRAM REVIEW

• Program Demand

1. Annual new and replacement positions for the State

Year	2003	2004	2005	2006	2007
State	N/A	N/A	N/A	129.7	6

2. Annual new and replacement positions for the County

Year	2003	2004	2005	2006	2007
County	N/A	N/A	N/A	12.7	1

3. Number of majors

Year	2003	2004	2005	2006	2007
Number of majors	45	51	58	59	62

4. Student semester hours for program majors in all program classes

Year	2003	2004	2005	2006	2007
SSH	90	141	173	215	135

5. Student semester hours for non-program majors in all program classes

Year	2003	2004	2005	2006	2007
SSH	N/A	N/A	N/A	N/A	625

6. Student semester hours for all program classes

Year	2003	2004	2005	2006	2007
SSH	N/A	N/A	N/A	951	760

7. FTE program enrollment

Year	2003	2004	2005	2006	2007
FTE	N/A	65	70.33	63.40	50.67

8. Number of classes taught

Year	2003	2004	2005	2006	2007
Number of classes taught (ETRO & ICS)	13	18	21	20	12

● Program Efficiency

10. Average Class Size

Year	2003	2004	2005	2006	2007
Average class size	N/A	14.47	14.13	12.89	19.92

11. Class Fill Rate

Year	2003	2004	2005	2006	2007
Class fill rate	N/A	61.77	N/A	45.20	87.87

(Fill is determined using all ETRO and ICS classes. Not all ICS classes are required by the program)

12. FTE of BOR appointed faculty

Year	2003	2004	2005	2006	2007
FTE	N/A	N/A	N/A	3	2

13. Student/Faculty Ratio

Year	2003	2004	2005	2006	2007
Student/faculty ratio	N/A	N/A	N/A	19.7	31.00

14. Major per FTE faculty

Year	2003	2004	2005	2006	2007
Majors/FTE	N/A	54	N/A	19.7	23.85

15. Program Budget Allocation

Data not Available

16. Cost per SSH

Data not Available

17. Number of classes less than ten students

Year	2003	2004	2005	2006	2007
Number	N/A	4	N/A	7	1

● Program Effectiveness

19. Persistence of majors fall to spring

Year	2003	2004	2005	2006	2007
Persistence (%)	N/A	77.78	N/A	74.56	58.06

20. Number of degrees and certificates earned

Year	2004	2005	2006	2007	2008
AS Degrees	7	5	3	4	11

Certificates of Achievement	0	1	2	4	4
Certificates of Completion	0	0	1	1	1

21. Number of students transferred

Year	2003	2004	2005	2006	2007
Students transferred	N/A	77.78	N/A	2	0

22-28. Perkins core indicators (in %)

Year	2003	2004	2005	2006	2007
1P1 Academic Attainment	N/A	N/A	N/A	87	100
1P2 Technical Skill Attainment	N/A	N/A	N/A	100	100
2P1 Completion rate	N/A	N/A	N/A	13	14.29
3P1 Place in Employment, Education, and military	N/A	N/A	N/A	225	N/A
3P2 Retention in Employment	N/A	N/A	N/A	100	N/A
4P1 Non Traditional Participation	N/A	N/A	N/A	28	19.64
4P2 Non Traditional Completion	N/A	N/A	N/A	33	25.00

29. Determination of program's health

Year	2004-2005	2005-2006	Spring 2006	Spring 2007	Fall 2007	Fall 2007-2008
Demand		Cautionary	Healthy	Healthy	Healthy	Unhealthy
Efficiency		Healthy	Cautionary	Healthy	Healthy	Healthy
Effectiveness		Cautionary	Cautionary	Cautionary	Healthy	Unhealthy

Overall	Cautionary	Cautionary	Cautionary	Healthy	Healthy	Cautionary
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Part II. ANALYSIS OF THE PROGRAM

Overall, between spring 2006 and fall 2007, the ECET program switched from healthy to cautionary. A more detailed look at the program indicators reveals that only the last semester shows some weakness.

A. Strengths and weaknesses in terms of demand, efficiency, and effectiveness based on an analysis of data.

The student *demand* has increased since 2003, and then remained quite stable between 2005 and 2007. On the other hand, the annual new and replacement positions for the state as well as for the county dropped dramatically since 2006 prompting the program indicator to switch from healthy to unhealthy: however, the EMSI crosswalk of Department of Labor occupations to the ECET program is still not accurate.

In terms of *efficiency*, the program remains healthy: student to faculty ratio and class fill rate are up.

In terms of *effectiveness*, half of the students drop after the first semester (they choose this program without knowing its implications), accounting for the low persistence rate; however, after two semesters into the program, very few students drop. Also, the number of majors enlisted in the ECET program does not reflect the number of actual active majors: this situation impacts the ratio of degrees earned to number of majors. These factors lead improperly to the weakness of this program indicator.

B. Significant Program Action

ECET faculty have taken the appropriate measures set forth in the previous program review as described below.

ECET faculty developed a new course (ETRO 102: Instrumentation for Engineering Technicians) in collaboration with faculty from the Institute for Astronomy to meet local industry requirements. The new course focuses on optics, adaptive optics, and telescope technology. Modern pedagogy such as inquiry and problem-based learning has been used to increase students' knowledge of the specialized content areas. The purpose of the course offered in fall 2008 (outside the scope of this review) is to recruit, motivate, and retain students by exposing them early on to engineering ways of thinking through exciting hands-on lab experiments and inquiry techniques.

In partnership with AWI (Akamai Workforce Initiative), the ECET program worked closely with its Akamai Internship Program component to provide excellent training and internship opportunities with local high tech companies in areas such as optics, computers, electronics, and astronomy.

ECET faculty remained attentive to retention and persistence while maintaining the rigor and standards expected by the profession: they focused on students learning outcomes, made themselves available to the students outside of the class, and encouraged the students to contact them should they have any problems.

ECET faculty developed and implemented a two-week program for high school students as part of the Po`okela summer bridge program. The program focuses on optics and aims at recruiting students for STEM programs.

C. Determination of program's overall health (Healthy, Cautionary, Unhealthy)

Overall, we feel the ECET program will become stronger with a better monitoring of its weaknesses. It is on the trend to become stronger and healthier, with continuing growth in the number of students, and more students earning degrees.

Part III. ACTION PLAN

1. The plan is to return to the original program structure with two AS degrees. The program map will be modified such that the two degrees will return to Electronic Engineering Technology (EET) and Computer Engineering Technology (CET). Each of these degrees has an action plan that will provide rigorous and relevant training directly related to technology job opportunities on Maui. The program map will include technical electives to allow for maximum flexibility in course scheduling, to insure maximized class enrollments, and to relieve overloaded faculty.
2. The Electronic Engineering Technology (EET) AS degree will add technical electives in Instrumentation, Photonics, and Fiber Optics as requirements for the new baccalaureate in Engineering Technology to be offered in fall 2010. Program improvement will take place by researching, adapting, and implementing national skill standards (one example being the National Photonics Skill Standards for Technicians from Op-Tec) and "project based learning" as developed under the National Science Foundation project PHOTON2.
3. The Computer Engineering Technology (CET) AS degree requires some modifications to meet the needs for entry-level employment as IT professionals in Maui's high technology. New software applications (such as Microsoft Office, Apache Web Servers, Arc View, My SQL), programming languages (such as PHP, C, and MATLAB), and wireless networking and VOIP technologies should be included in the curriculum.
4. ECET faculty will develop a curriculum for a baccalaureate degree in Engineering Technology. The UH Institute for Astronomy (IfA) in Pukalani will help in designing, developing, and teaching three courses as part of the baccalaureate degree.
5. ECET faculty will need to create an electro-optics lab that will support equipment for the new baccalaureate degree.
6. Recruitment will be a major focus of the faculty and its student counselor. It will intensify its participation at all available venues such as student fairs, student orientations, and high schools.

7. We will use all available modalities in advising students in the appropriate courses placement, insuring their persistence in the program and consistently tracking their progress. We will work in close consultation amongst faculty and the student counselor as we improve on our retention and persistence rates.

8. We will enlarge the pool of appropriate lecturers so as to be ready to cope with increasing enrollments envisioned in the next years.

9. We will work on hiring full time faculty (3), fill behind for program coordinator (1), and student lab assistants.

Part IV. RESOURCE IMPLICATIONS (physical, human, financial)

The ECET program is funded by NSF and RDP to support its development, improvement, and implementation.

A. Program Faculty

Reassign time for program coordinator (50%)

Hire immediate fill behind for program coordinator (\$ 36,000/year)

Hire full time faculty replacement for Sandra Swanson (\$70,000 / year)

Hire two full time tenure track faculty positions for program development (\$140,000/yr)

Professional development faculty, summer overload (3-6 credits/summer)

B. Program Interactions

Student stipends, travel, and housing for the Akamai Internship Program (\$100,000/ year)

Training travel and fees (30,000/year)

C. Staff support and Facilities

Hire full time administrative assistant (\$40,000 / year)

Hire full time student lab assistants (\$60,000/ year)

Replace computers and lab equipment in high technology areas (100,000 / year)

Software application licenses (30,000 / year)

Lecturers, casual overload (3 credits/semester)