

AUTHORIZATION TO PLAN (ATP) AN ACADEMIC PROGRAM (Revised 5/20/08)

Please complete all sections with an **emphasis** on items 7, 8, 9 and 10. The ATP is not to exceed 5 pages.

1. School/College and Department/Unit

Maui Community College – Science Technology Engineering and Math Department
Electronics and Computer Engineering Technology Program

2. Chair/Convener of Planning Committee

Program Coordinator – Asst. Professor Mark Hoffman (9/23/2008)

3. Program Category: XX__ New ___Modified ___ Interdisciplinary

4a. Degree or Certificate Proposed:

Applied Engineering Technology Bachelor of Applied Science

Bachelor of Applied Science degrees are accredited by the Accreditation Board for Engineering and Technology (ABET)

PROGRAM CRITERIA FOR
ELECTRICAL/ELECTRONIC(S) ENGINEERING TECHNOLOGY
AND SIMILARLY NAMED PROGRAMS

Lead Society: Institute of Electrical and Electronics Engineers

Applicability

These program criteria apply to engineering technology programs that include electrical or electronic(s) and similar modifiers in their titles.

Objective

An creditable program in Electrical/Electronic(s) Engineering Technology will prepare graduates with the technical and managerial skills necessary to enter careers in the design, application, installation, manufacturing, operation and/or maintenance of electrical/electronic(s) systems. Graduates of associate degree programs typically have strengths in the building, testing, operation, and maintenance of existing electrical systems, whereas baccalaureate degree graduates are well prepared for development and implementation of electrical/electronic(s) systems.

Outcomes

Graduates of associate degree programs must demonstrate knowledge and hands-on competence appropriate to the goals of the program in:

- a. the application of circuit analysis and design, computer programming, associated software, analog and digital electronics, and microcomputers to the building, testing, operation, and maintenance of electrical/electronic(s) systems.
- b. the applications of physics or chemistry to electrical/electronic(s) circuits in a rigorous mathematical environment at or above the level of algebra and trigonometry.

Given the breadth of technical expertise involved with electrical systems, and the unique objectives of individual programs, some baccalaureate programs may focus on preparing graduates with in-depth but narrow expertise, while other programs may choose to prepare graduates with expertise in a broad spectrum of the field. Therefore, the depth and breadth of expertise demonstrated by baccalaureate graduates must be appropriate to support the goals of the program. In addition to the outcomes expected of associate degree graduates, graduates of baccalaureate degree programs must demonstrate:

- a. the ability to analyze, design, and implement control systems, instrumentation systems, communications systems, computer systems, or power systems.
- b. the ability to apply project management techniques to electrical/electronic(s) systems.
- c. the ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in support of electrical/electronic(s) systems.

4b. List similar degrees or certificates offered in UH System:

Hawai'i CC and Kauai CC will have Electronics Technology degree programs with similar lower division courses. No similar applied engineering technology BAS degree offered in UH System.

5. Planning

a. Planning period (not to exceed one year or reapplication is necessary)

Fall 2008 – Fall 2009

b. Activities to be undertaken during the planning phase

Identification of prospective program partners and employers in Maui County and throughout the State. Research into similar programs offered at other institutions around the country and throughout the world. Survey of the prospective position descriptions and skill sets required by industry. Exploration of inter-and multi-disciplinary curricular strategies to meet broad range and dynamic fields of study. Development of graduate roles and program learning outcomes. Mapping of program learning outcomes into student learning outcomes and course descriptions. Preparation of experiments and inquiry activities. Procurement of laboratory supplies. Hiring of personnel.

The National Science Foundation has funded a collaboration between the Center for Adaptive Optics (CfAO) at University of California, Santa Cruz, the University of Hawai'i Institute for Astronomy (IfA) – Maui Division, the Maui Economic Development Board, and Maui Community College. The "Akamai Workforce Initiative" (AWI) steering committee and curriculum working group will research engineering technology curriculum and accreditation standards. The AWI curriculum-working group will help to identify program and student learning outcomes and assist in curriculum development.

Faculty from the IfA - Maui will help develop 300 and 400 level courses. Lab exercises that utilize the IfA – Maui Advanced Technology Research Center laboratories and equipment will be developed.

UH-Manoa Engineering will be consulted for guidance on program and courses, delivery options, and articulation where appropriate.

c. Submission date of program proposal

Fall 2008

d. Workload/budget implications during planning period

Maui Community College has secured 2 FTE upper division electro-optics general funded positions. Additionally, funding for one replacement ICS position has been dedicated as a link between the two-year and four-year programs. In addition, there is

extramural funding (eg. NSF) to support the planning activities for the part of the planning period. There is faculty available to fill behind any re-assigned time.

6. Program Description (Objectives and relationship to campus mission and strategic plan)

The proposed BAS program will build upon the foundation of Electronic and Computer Engineering Technology (ECET) AS degrees to provide students with access to higher paying jobs within the technology industry on Maui and potentially other parts of the state including Kauai and the Big Island (Hawai`i). This BAS degree will provide training in technologies directly related to Maui's telescope and remote sensing industry. Training will be provided in electro-optics technology and the software tools used in local jobs.

The proposed BAS degree will also enhance the computer engineering technology degree to provide the hands-on training required by local companies to design, implement, and manage high performance computer networks.

The program and courses will be designed using inquiry- and problem-based learning models that are proven to provide high quality educational experiences to diverse learners. The upper division BAS program will be available to graduates of the 2-year ECET AS degree programs and upper division courses will be delivered as certificate offerings for local employees of high technology companies.

This will address the Maui CC mission and vision statements:

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.

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.

Maui Community College Strategic Plan, Objective 1

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 program is aligned with the college Mission, Vision, and Strategic Plan. This program will be based on the technology assets on Maui that truly are world class. The U.S. Air Force telescope at the summit of Haleakala is the largest and most advanced telescope in the Department of Defense. The Computer at the Maui High Performance Computing Center is the 25th fastest computer on the planet, according to *top500.org*, a website that ranks high performance computers based on standardized test metrics. The BAS program will utilize laboratory facilities at the new UH Institute for Astronomy's

Advanced Technology Research Center on Maui and one the most advanced telescopes in the world for undergraduate education, the Faulkes.

7. Program Justification (Needs and Rationale. Include, as appropriate, internal and external factors driving need for this program; description of needs assessment; number of interested student per year; need for such a program in relation to workforce development, graduate studies, etc.)

The program is driven by the needs of local employers to hire a trained local workforce and the needs of local residents to participate in sustainable high wage careers. This Applies Engineering Technology BAS degree will provide workforce development for the Maui. The program will support federal, state, and county government initiatives to diversify the economy of the state by building upon the unmatched viewing conditions, geographic isolation, and mid-Pacific location that makes Hawai`i ideal for astronomical research, space surveillance, and missile defense testing. The project will create an alliance among researchers, industry, local educators, and national leaders to join with the local community to provide advanced technical education in an area of strategic importance to Hawai`i. A pipeline of local students will be developed to the benefit of island communities and residents, and local high technology companies.

The demand for engineering technicians on the islands of Maui, Hawai`i, and Kauai comes from the astronomical observatories at the summits of Haleakala and Mauna Kea, and the Pacific Missile Range Facility (PMRF) at Barking Sands. Maui has scientific and national defense assets and activities that tie it to each of the other outer islands.

The scientific observatories and the defense contractors on the advisory boards of these community colleges report a strong desire to hire, retain, and advance a local workforce. However, due to a lack of local residents with the highly specialized skills required for electro-optics, optics, photonics, and instrumentation, these companies currently import workers from the continental United States; the imported workers typically do not stay long in Hawai`i, due to the high cost of living and other limiting factors. At the same time, many talented local students hope for a career in high technology and have a strong desire to stay on their home islands, where they have family roots and cultural ties.

A needs survey published by the Center for Occupational Research and Development (CORD) indicates that 1800 photonics technicians are needed per year in the United States; currently there are only 110 graduates per year, nationally. The State of Hawai`i Department of Business, Economic Development, and Tourism (DBEDT) has identified "aerospace" as a strategic industry for the state. DBEDT notes astronomy and adaptive optics, biophotonics and photodetection, laser research, molecular imaging, optical communications and sensors, remote sensing, and space imaging and tracking as Hawai`i's diverse foci in applied optics. These fields all require a basic understanding of optics and photonics. In addition, the Maui and Kauai Economic Development Boards have identified these industries as a significant opportunity for economic diversification. Federal, state, and county governments have funded major infrastructure projects to help this strategic industry grow.

The Standard Occupational Classification (SOC) code jobs are predicted to provide over 300 new positions in Maui County from 2006 to 2017. Employment statistics from The

Maui Economic Development Board surveys of local companies reveal that 50% of the tech companies on Maui are looking for Unix/Linux server and network administration skills, 39% are demanding GIS and Electro-Optics skills, 33% are demanding Linux cluster and image processing skills, 22% laser/photonics, telescope operator/technician, 16% fiber optics. Data developed by Economic Modeling Specialist, Inc. in 2005 show that these are the type of skilled technical jobs that provide the high wages of \$67,000-\$69,000.

The communities of the outer Hawai`ian Islands are rural and isolated. The large numbers of jobs that exist in tourism and hospitality are not found in other business areas. However, local Hawai`i employers involved with the telescopes and related industries report a need of a minimum of 30 skilled technicians per year. Industry partners estimate that 100 technical workers will be needed on Maui within the next five years. Kauai industry advisors report they are employing 15 engineering technicians per year for PMRF. Other industrial sectors also require electronics engineering workers with specialized training in optics and photonics. The telecom industries on the islands of Maui, Hawai`i, and Kauai have a workforce that is nearing retirement age at the same time the telecom infrastructure is being upgraded from copper to fiber optics. This industry will require an additional 10-15 workers per year. The photovoltaic home energy industry is demanding 15 skilled workers per year on Maui. These industries all report that a shortage of skilled local workers will significantly slow growth and that a skilled local workforce will not only fill current job openings, but will also create a need for more workers.

A report from the Arizona Department of Commerce business development division shows that the optics and photonics industry in Arizona has grown significantly in response to an effort by the University of Arizona to provide a competitive research enterprise and an accompanying skilled workforce. The report notes the difficulty in obtaining comprehensive information about the optics industry "because the sector cannot be discretely identified within the Standard Industrial Classification (SIC) system, an intricate hierarchy used to organize almost all business and industry statistics." Data generated by two optics industry surveys, conducted four years apart, in 1995 and 1999, show the growth of this strategic industry. Employment grew by 64.6% from 3793 to 6245 employees. The average company size rose from 33 to 51 employees.

Students' interviews indicate a demand of approximately 16 students per year for this program. There is a good match with the number of students, the number of jobs available, the number of faculty required, and the amount of facilities and equipment available to support the program. Graduates of this program will be able to support local telescope operations, provide the technical expertise to build and maintain information technology infrastructure, networks, PCs, servers, fiber links etc. and will be able to create visualization applications that are directly related to the research and tasks being done by Maui's industry base.

Description of resources required

a. Faculty (existing and new FTEs)

2 FTE faculty are required to start one cohort of 16 students each year. Each teaching load will be 12-16 credits per semester. Innovative teaching approaches will be explored including: Institute for Astronomy PhD level faculty will teach upper division BAS courses that are directly related to the instrumentation installed on Haleakala. Industry experts can teach course “modules.” This has been successfully completed in the past at Maui Community College, working with Textron.

b. Library resources (including an evaluation of current resources and an estimate of the cost of additional resources required)

Library resource evaluation will be completed as a part of the planning process. A great deal of information is available on-line. The program will focus on hands-on activities, software models and tools, and utilizing the infrastructure in place.

c. Physical resources (space, equipment, etc.)

A new optics lab is required. Maui Community College is planning for this in the design of the new science building. Several candidates for a temporary optics lab space have been identified. The existing electronics laboratory will support upper division electronics engineering technology courses.

The Center for Adaptive Optics has loaned Maui Community College an Adaptive Optics workstation and a Quadrature Polarization Interferometer. IBM has donated a supercomputer valued at \$250,000 for use by the program. An 18 Dell linux cluster is installed at Maui Community College.

The Institute for Astronomy will make lab space and equipment available for BAS students. This would include instruments valued at \$300,000.

d. Other resources required (staff, graduate assistantships, etc.)

A part-time lab technician and clerical administrator are required to maintain lab status and coordinate extramural funding proposals. A fulltime APT student programs coordinator will be hired to work on skill requirements, recruitment, retention, internships, and job placement.

8. Five-Year Business Plan. Provide a five-year projected budget for the program that includes:

a. Annual costs to implement the program

Costs range from \$287,141 to \$358,104. Cost projections include requirements for extramural funding. If some of the grants do not get awarded, the cost and revenue structures change proportionally. Internal reallocation of resources will then be sought.

b. Projected enrollment and estimated tuition revenue

Enrollments grow from 16 to 28 over 6 years. Tuition revenues for the upper division courses grow from \$48,672 to \$156,060 per year over the first 6 years.

c. How will be program be funded?

The BAS will be funded from a variety of sources, including faculty positions in the general fund, direct extramural funding, and returned RTRF.

d. Does the current or proposed budget (Department/College/Campus) include funds or a request for funds for the proposed program? Please provide details.

No general fund requests will be required for the next biennium, as current and extramural support will be available. Beyond that point, program growth will determine the needs for reallocation and possible requests in future biennia.

e. Given a “flat budget” situation, how will the proposed program be funded?

If not funded, the program will seek support from the following entities/initiatives:

- IfA faculty will donate teaching resources
- Distance options with Manoa Electrical Engineering will be explored
- National Science Foundation funding will be sought
- Private funding will continue
- Tuition revenues will be returned to the program.

f. Mini Cost Revenue Template

ENTER VALUES IN HIGHLIGHTED CELLS ONLY					
YEAR	FY 10	FY 11	FY 12	FY 13	FY 14
PROGRAM COSTS					
Faculty w/o fringe	128,202	138,066	143,589	149,332	155,305
Other personnel costs w/o fringe	74,880	77,875	80,990	84,230	87,599
Library					
Equipment/Supplies	118,200	71,200	114,200	82,200	115,200
Other					
TOTAL Expenses	321,282	287,141	238,779	315,762	358,104
REVENUES					
Projected Enrollment	16	27	28	31	32
No. of Courses	5	10	10	10	10
No. of Credits	20	40	40	40	40
SSH	304	513	532	589	608
Tuition Rate/Credit	169	191	213	235	235
Total Revenue from Tuition	51,376	97,983	113,316	138,415	142,880
Other Sources of Income	285,865	237,600	243,360	236,602	242,241
TOTAL Revenues	337,245	335,583	356,676	375,017	385,121

9. Impact on current courses or programs.

Current courses and program are being prepared to become the foundation of the BAS. Internal and extramural funds have been obtained. Work with national centers has begun. New courses are being developed. Industry experts are advising on skill requirements.

10. If this program is multidisciplinary, provide evidence of commitment for support from the colleges, departments, programs, and/or individuals expected to participate.

Evidence is expected to be obtained from Lisa Hunter, Jeff Kuhn, Peter Crouch, Leslie Wilkins, Harvey Motomura, Francis Takahashi and others involved.

Reviewed by: *(The ATP has completed the campus approval process prior to review by Council of Chief Academic Officers)*

Campus Chief Academic Officer:
Comments and Recommendations:

Print Name	Signature	Date
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Council of Chief Academic Officers (Systemwide Consultation):
Comments/Recommendations:

Print Name	Signature	Date
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Chancellor: ___ Approved ___ Disapproved

Print Name	Signature	Date
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(Final signed copy is provided to the Vice President of Academic Planning and Policy for Program Action Report)

6/12/07