1. **Program Objectives**

**Maui Community College** proposes to develop a Bachelor of Applied Science in Applied Engineering Technology. Bachelor of Applied Science degrees are accredited by the Accreditation Board for Engineering and Technology (ABET). The accreditation criteria is shown below:

**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 accreditable 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.

The major objectives of this program are:

To provide a highly skilled workforce with the specialized training required for a career in local high technology industries on Maui.

To help diversify the economy of Maui by providing a local pool of trained workforce.

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-
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.

Definition of Electronics and Photonics

2. Relationship of Objectives to Appropriate Functions of the College and University

The ECET AS program works closely with its high-technology industry advisory board to ensure that students gain skills required for employment in local companies. The program provides internship and job placement opportunities in a variety of engineering technology positions.

The ECET program offers a career-ladder with three levels of competency: 1) a Certificate of Completion (C.C.) for course work in Electronics and Computer fundamentals; 2) a Certificate of Achievement (C.A.) with math, physics, and computer science basics; and 3) an Associate in Science (A.S.) degree that provides training in:

- Electronic Engineering Technology, which includes electro-optics instrumentation, adaptive optics for astronomical applications, detectors, amplifiers, power supplies, computer hardware, and robotics; and

- Computer Engineering Technology, which includes Windows and Unix system administration, routers, hubs, switches, and High Performance Computing (HPC) Technology, which focuses on installation, maintenance, and programming of HPC cluster.

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).

The proposed BAS program will build upon the foundation of Electronic and Computer Engineering Technology 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.

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.
3. Needs Assessment

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.

Insert EMSI data here
4. Curriculum

BAS Total = 120-140 credits, ABIT 127
BAS Upper Division =

Gen Ed Requirements: (combined lower and upper division)
MCC ABIT = 30 Credits + 6 Cr. Capstone + 7 Cr. Natural Science
UHWO = 40 Credits

Describe BAS requirements in detail.
ECET Lower Division = 75 Credits
Humanities (3)
Communication (3)
Social Science (3)
Quant (4)
Eng (3)
Natural Science (4)
ICS (3)
Total Gen Ed lower Division = 23

BAS Upper Division
Applied Engineering Technology = 48 Credits (Three 4 credits courses per semester)
Upper Division Gen Ed = From 7 to 24, needs more research.

Upper Division Courses

Circuit Design
Introduces design concepts. Uses design simulations. Produce printed circuit boards. Design robotic components.

Control Systems
Introduces electronic control system applications and theory. Active and adaptive optical systems. Mount controls, tracking algorytms, robotics.

Opto-Electronic and Photonic Devices
Studies lasers, LED, and broad spectrum light sources. Characterization of light sources. Design and troubleshoot photo-electronic devices; photo-diodes, photo-transistors, photo-resistors, Avalanche photo-diodes, quad cells, linear displacement devices, etc. Radiometric and photometric measurement concepts; irradiance, radiance, radiant intensity, luminance, radiant exitance.

Optics
Studies advanced optical concepts. Surface measurements and abberations, Zernicke Polynomials, Kolmogorov Turbulence models, tomography, holography, multi-conjugate sytems, LIDAR

Remote sensing
Re-enforces radiometric and photometric principles. Introduces satellite sensing concepts. Analyzes data. Uses GIS application and data.
Applied Calculus and Linear Algebra
The application of mathematics to electro-magnetic fields, light and photons, wave theory, a remote sensing and control systems. Studies Euler’s theorem, complex numbers, imaginary numbers, and transforms. Vector Calculus

Applied Differential Equations

Electro-Magnetism (Physics)
Studies Electromagnetism, Differential calculus of vector fields, gradient operators, vector integrals, flux of vector fields, curl of vector fields, electrostatics and divergence, application of Guass’ Law, Electric Fields, Electrostatic Energy, Dielectrics and polarization, vector potential and Maxwell’s Equations

Advanced Engineering Computing
Programming to solve electronics and optical system problems. Uses Matlab, Labview, Zemax, Acrview, databases, irfanview, and other scientific and engineering software tools.

Cluster Computing
Uses high performance computing and parallel algorithms to solve science and engineering problems. Image analysis, statistical trends, and data integrity.

Digital Signal Processing
Studies signal processing using a variety of hardware and software tools. Produces experimental data for analysis.

Advanced Instrumentation
Case studies on advanced instruments in Hawaii and throughout the world. Introduces students to the instrumentation packages installed on various systems. Discussion system integration and testing. Measure Point Spread Functions and Strehl Ratios.
Proposal Budgets

Budget Overview:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>FY 10</th>
<th>FY 11</th>
<th>FY 12</th>
<th>FY 13</th>
<th>FY 14</th>
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<td><strong>PROGRAM COSTS</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Faculty w/o fringe</td>
<td>128,202</td>
<td>138,066</td>
<td>143,589</td>
<td>149,332</td>
<td>155,305</td>
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<td>Other personnel costs w/o fringe</td>
<td>74,880</td>
<td>77,875</td>
<td>80,990</td>
<td>84,230</td>
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<tr>
<td>Library</td>
<td></td>
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<tr>
<td>Equipment/Supplies</td>
<td>118,200</td>
<td>71,200</td>
<td>114,200</td>
<td>82,200</td>
<td>115,200</td>
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<tr>
<td>Other</td>
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<td></td>
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<tr>
<td>TOTAL Expenses</td>
<td>321,282</td>
<td>287,141</td>
<td>238,779</td>
<td>315,762</td>
<td>358,104</td>
</tr>
</tbody>
</table>

| **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 |
Program Proposal DRAFT September 23, 2008

Budget Details

Applied Engineering Technology 9/23

<table>
<thead>
<tr>
<th>CAMPUS/Program</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
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<tr>
<td>Students &amp; SSH</td>
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<tr>
<td>A. Headcount enrollment (Fall)</td>
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<td>26</td>
<td>26</td>
<td>28</td>
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<td>28</td>
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<td>B. Annual SSH</td>
<td>304</td>
<td>513</td>
<td>532</td>
<td>589</td>
<td>608</td>
<td>646</td>
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<td>Direct and Incremental Program Costs Without Fringe</td>
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<tr>
<td>C. Instructional Cost without Fringe</td>
<td>$128,202</td>
<td>$138,066</td>
<td>$143,589</td>
<td>$149,332</td>
<td>$155,305</td>
<td>$161,518</td>
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<td>C1. Number (FTE) of FT Faculty/Lecturers</td>
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<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
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<td>C2. Number (FTE) of PT Lecturers</td>
<td>0.12</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
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<tr>
<td>D. Other Personnel Costs</td>
<td>$74,880</td>
<td>$77,875</td>
<td>$80,990</td>
<td>$84,230</td>
<td>$87,599</td>
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<td>E. Unique Program Costs</td>
<td>$118,200</td>
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<td>$114,200</td>
<td>$82,200</td>
<td>$115,200</td>
<td>$68,200</td>
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<tr>
<td>F. Total Direct and Incremental Costs</td>
<td>$321,282</td>
<td>$287,141</td>
<td>$338,779</td>
<td>$315,762</td>
<td>$358,104</td>
<td>$320,821</td>
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Revenue

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<tbody>
<tr>
<td>G. Tuition</td>
<td>$169</td>
<td>$191</td>
<td>$213</td>
<td>$235</td>
<td>$235</td>
<td>$235</td>
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<td>Tuition rate per credit</td>
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<td>$237,600</td>
<td>$243,360</td>
<td>$236,602</td>
<td>$242,241</td>
<td>$180,797</td>
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<td>H. Other</td>
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<td>$335,583</td>
<td>$356,676</td>
<td>$375,017</td>
<td>$385,121</td>
<td>$332,607</td>
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<tr>
<td>I. Total Revenue</td>
<td></td>
<td></td>
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<td>J. Net Cost (Revenue)</td>
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<td>-$48,442</td>
<td>-$17,897</td>
<td>-$59,255</td>
<td>-$27,016</td>
<td>-$11,786</td>
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Program Cost per SSH With Fringe

<p>| | | | | | | |</p>
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</thead>
<tbody>
<tr>
<td>K. Instructional Cost with Fringe/SSH</td>
<td>$565</td>
<td>$358</td>
<td>$359</td>
<td>$337</td>
<td>$340</td>
<td>$332</td>
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<tr>
<td>K1. Total Salary FT Faculty/Lecturers</td>
<td>$123,648</td>
<td>$128,594</td>
<td>$133,738</td>
<td>$139,087</td>
<td>$144,651</td>
<td>$150,437</td>
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<td>K2. Cost Including Fringe of K1</td>
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<td>$173,602</td>
<td>$180,546</td>
<td>$187,768</td>
<td>$195,278</td>
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<td>K3. Total Salary PT Lecturers</td>
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<td>$9,472</td>
<td>$9,851</td>
<td>$10,245</td>
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<tr>
<td>K4. Cost Including fringe of K3</td>
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<td>$10,343</td>
<td>$10,757</td>
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<td>L. Support Cost/SSH</td>
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<td>$214</td>
<td>$214</td>
<td>$214</td>
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<td>$214</td>
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<tr>
<td>Non-Instructional Exp/SSH</td>
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<td>$175</td>
<td>$175</td>
<td>$175</td>
<td>$175</td>
<td>$175</td>
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<tr>
<td>System-wide Support/SSH</td>
<td>$39</td>
<td>$39</td>
<td>$39</td>
<td>$39</td>
<td>$39</td>
<td>$39</td>
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<tr>
<td>Organized Research/SSH</td>
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<td></td>
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<tr>
<td>M. Total Program Cost/SSH</td>
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<td>$572</td>
<td>$573</td>
<td>$551</td>
<td>$554</td>
<td>$546</td>
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<tr>
<td>N. Total Campus Expenditure/SSH</td>
<td>$385</td>
<td>$385</td>
<td>$385</td>
<td>$385</td>
<td>$385</td>
<td>$385</td>
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</table>
Akamai Workforce Skills Project

The Akamai Workforce Initiative was funded by the NSF (#xxxxx) and included funding to gather workforce needs on Maui. The funding level was not at a level that would enable a professional workforce needs assessment, but allowed the Akamai team to gather and consolidate information, which could then be used in combination with planned statewide needs assessments.

Student internships are often representative of the types of projects and work that will be assigned to entry level technicians. The Akamai internship program has been running for many years, and thus was utilized to gather information about Maui workforce needs. Several sources from the Akamai program were used:

- Interviews with Akamai internship project hosts
- Past Akamai intern projects

1. Interviews with Akamai project hosts
Each year the Akamai program meets with prospective mentors to outline intern projects for the coming summer. The Akamai program staff meets with each mentor who will be working closely with an intern to learn about their ideas for projects, the skills and background needed to complete the project, as well as any additional information related to how to successfully match the intern and project. In January and February 2008 these meetings were conducted, and additionally, mentors were asked if they had new positions coming up and for information on skills that are important for their entry-level positions.

These companies and organizations included:
Oceanit
Hnu- Photonics
Textron
Trex
Maui High Performance Computing Center
Northrop-Grumman
Pacific Disaster Center
Akimeka
University on Hawaiʻi – Institute for Astronomy

2. Past Akamai Intern Projects
Data was compiled from five years of Akamai Internship projects in Maui high technology companies and on Hawaii Island observatories. The results from the other islands were incorporated to validate a common core of technical competencies for electronics engineering technicians with specialized skills in photonics, optics, and electro-optics.

Results sorted by skill areas:

**Technical Skills in Hardware**

**Processes**
Telescopes:
operate and align
operate and align
test ability of 8" telescope to track satellites Test
assemble a telescope system for tracking objects in the sky Assemble
verify that a telescope meets specifications Verify w/specs

Optical devices and stages:
align, coat, and change optical devices
perform maintenance on optical stages (cleaning and oiling)
measure figure distortion of a primary mirror
measure mirror distortion

Lasers:
calibrate performance of laser receiver in the lab using a calibrated source Calibrate
calibrate performance of laser receiver using standard stars Calibrate

Diodes:
use of Schottky diodes
use of Schottky diodes for current limiting
Position Sensing Diodes
characterize Position Sensing Diode's temporal, spatial and power level sensitivity Characterize
compare Position Sensing Diodes to CMOS Compare devices
create mount for photodiodes
create mount for photodiodes to be inserted into cooling unit
create and set up device made of laser and photodiode to detect water level

CCD:
install, understand install
measure plate scale of CCD using two stars
mount CCD control hardware

Interferometer:
set up and test FT interferometer Test devices
characterize DM using an interferometer Characterize devices

Solar cells:
solar cell module
measure voltage output from a solar cell under varying conditions Test
test the effect of tracking on solar cell efficiency Design
design cooling system for solar cell Test performance

test solar cooling device's effect on solar cell performance Test performance
build portable solar cell module and test kit Build and test

Sensory devices:
receiver-transmitter system
use remote sensing
create sensory substitution devices
create prototype sensory substitution device Design prototype
convert from physical knob to remotely operated computer control
HVA cards

Pupil and blind deconvolution:
investigate how different pupil assumptions affect blind deconvolution results
study the effect of incorrect pupil information on blind deconvolution
Computers:
bring up, repair

integrate components with a computer
build resistive load box
interface
configure new hardware system

assess hardware system
design and build an inventory control database
set up wireless network on a bus and map the region where the bus can be found
upgrade power supplies for DM
proper configuration for new "hardware system"
assess what components of a "hardware system" do

write a list of requirements for a "hardware system"
compare network hardware and configurations to documented specs

Other:
compare cost and performance of piezoelectric devices and voice coil FSM
select camera appropriate to project
position, track and measure errors in pointing satellites
investigate errors in pointing determinations of modeled satellites

Technical Skills in Software

Create:
email form for webmaster feedback that is hidden from spambots
programs for stars
an application to visualize the positions of satellite
database and real time geospatial model of Avian Influenza outbreaks
programs to run Matlab in parallel
models of atmospheric distortion in Mathematica
visualizing code for weather model
3D topographic map of Hawai'i from a 2D array of elevations
software for tracking satellites with remote telescope
Web pages
data pipeline from weather model to 3D visualization software
program to calculate Ro based on images of stars
image scaling algorithm
create database of equipment
database of mile markers and images

Understand and Perform:
autocad
solidworks
GIS to investigate the effect of El Nino on coral bleaching
GIS to evaluate correlation of outbreaks of Avian Influenza and migratory patterns
asp.net
ArcGis
matlab
jTrack
power point
ArcMap
mapping tools
microsoft vivio
CPLD Xilinx
ZeMax
CAD modeling for mount design
oracle database
designed database

Identify:
global web services gateway
website security
web development
XML web security, and document validation

Implement:
Web programming
java programming
C++
XML document validation
port public domain software from Linux(written in C) to Windows (also C)
CPLD Xilinx programmable logic device

Analyze:
images in blind deconvolution
images
inventory analysis
cost analysis
eliminate image flicker caused by GUI
randomly access any frame in a video file
transfer video/produce video of electronic installation for training purposes
examine South Pole data set with helioseismic analysis
compile data from learning studies
reasearch how to store previously developed Java programs
convert blind deconvolution code from Matlab to Python
convert any video type to MP4
modify software to disregard errors in CCD camara
compare output of computer program to master file
compare network software to documented specifications
test satellite tracking software with remotely operated commercial telescope
compute residual error in tracking from images
run security scripts to verify security compliance
map mile markers into GIS system
test accuracy of GPS measurements using redundant measurements
update web pages make them more usable for portable devices

Employability Skills

project planning
attitude
motivation
teachable
Program Proposal DRAFT September 23, 2008

ability to follow instructions
ability to work on one's own
interest in astronomy
mechanically inclined
proactive
willingness to learn (new program, new software)
enthusiasm
proper presentation
be able to clarify a problem
read math books
apply theary with real parts
create training program for Marine Mobile Modular Command Center
investigate new ways to train Marine to use equipment
follow security procedures

SKILL STANDARDS FOR ELECRO-OPTICS TECHNICIANS ON MAUI

Introduction

Given the infrastructure, the natural resources, and the needs of the growing and maturing technical industry on Maui, optical and electronic technologies will play a significant role.
To fulfill the economic engine of Maui County and take advantage of local opportunities, it is indispensable to train highly qualified electronics technicians with specialized skill in the area of optics and photonics

The Akamai Workforce Initiative (AWI) carried out a workforce skills assessment project with funding from the NSF (#________). The project reviewed five years of undergraduate internship projects to gather data on workforce needs. In addition, the Akamai program carries out interviews with prospective intern hosts each year to learn about coming projects. In 2008 notes from these interviews, and additional questions on workforce needs beyond specific Akamai projects, were compiled. Although not comprehensive, these two sources of information provided in depth information about entry-level tasks and skills needed to complete these tasks.

High Technology companies on the island of Kauai were interviewed in 2007. The results from the other islands were incorporated to validate a common core of technical competencies for electronics engineering technicians with specialized skills in photonics, optics, and electro-optics.

Other resources for the Maui skill requirements were researched. The work by Dr. Nicholas Massa, “Laser Manufacturing Technician Curriculum Development” is used as a framework for the Maui Skills document. Dr. Massa’s curriculum development work was shared at a photonics education conference sponsored by the New England Board of Higher Education’s PHOTON2 NSF-ATE project. This curriculum is implemented in Three Rivers Community College’s Laser Manufacturing Technician Associate in
Applied Science Degree. Dr. Massa’s work that cites competencies obtained from the National Skills Standard in Laser Machining (NSF-ATE: Machinetool Advanced Skills Technical Education Resources (MASTER) Project, 1997). The National Photonics Skill Standard for Technicians (CORD Communications, 2003) was provided by The National Center for Optics and Photonics Education, Op-Tec and was used as a resource. Both the MASTER Laser Machining Skill Standard and the CORD National Photonics Skills Standard detail the skills and knowledge required of the laser electro-optics engineering technician resulting from comprehensive DACUMs conducted on a national level with over 100 companies.

All the data were compiled, examined, and integrated into two sections: A “Competency Profile”, displaying the duties and general tasks an electro-optics technician should be able to perform; A “Competency Profile Subtask Outline”, listing the skills (or working knowledge) required to perform the specific tasks.

**Mission of the program**

The mission of the electro-optics engineering technology program has three main goals:

1. satisfy the needs of the Maui local employers
2. give graduates mobility within the field and the ability to adapt as the field changes
3. prepare graduates to further education

**Roles of the technicians**

Electronic, optical, photovoltaic, windmill, and home information-technology technicians
Computer, and telescope operators
System, and network administrators
Electro-optical mechanical system designers
Electro-optical software testers and developers

**Main Areas from The National Photonics Skill Standards for Technicians**

**Communication**

(Fiber optics, transmitters, and sensors)

Communication technicians may work for companies that use optical fiber to carry telephone services (voice) across local, regional, and/or nationwide networks. They may work for entities that depend on private networks to transmit digital information (data), or for companies that use optical fiber systems for transmitting signals to subscribers (video). They also may work in a variety of high-tech companies that manufacture fiber-optic cables and components. Technicians working in this field may work with a variety of optical and electronic test equipment.

**Imaging and remote sensing**

(Signal and image processing, environmental and aerospace)
Electro-optics technicians in this area work with engineers and scientists in the construction, testing, operation, and maintenance of all kinds of control systems. Their work may include the operation, installation, calibration, troubleshooting and repairing of equipment. Typical tasks include collecting and recording data, operating test equipment, performing laboratory test, devising tests to ensure quality control, modifying procedures to solve specific problems, laying out experimental circuits to test scientific theories, and evaluating data for practical applications.