

UNIVERSITY OF HAWAII
CODE REQUEST FORM FOR ACADEMIC PROGRAM CODES

REQUESTOR CONTACT INFORMATION	
Date: 7/31/12	Effective term of request (Semester-Year): Fall 2012
Name: Richard Fulton / Erin Mattos Harrell	Title: Vice Chancellor Vice Chancellor for Academic Affairs / Secretary
Campus: Windward Community College	Office/Department: Office of Academic Affairs
Phone: 235-7443 / 235-7445	Email: mattose@hawaii.edu

1. PROGRAM CODE, MAJOR CODE, CONCENTRATION CODE		Banner forms: SMAPRL, SOACURR, STVMAJR
Institution: Windward CC (WIN) <input checked="" type="checkbox"/>	College: IN	Department: NATS
<input checked="" type="checkbox"/> New program code <input type="checkbox"/> Change/replace existing program code:		
Level: <input checked="" type="checkbox"/> Undergraduate <input type="checkbox"/> Graduate <input type="checkbox"/> First-Professional <input type="checkbox"/> Post-Baccalaureate <input type="checkbox"/> Other:		
Degree:	Certificate: CA Certificate of Achievement <input type="checkbox"/>	
If requesting an existing Major code and/or Concentration code in Banner:		
Existing Major:	Existing Concentration:	
<small>Code</small>	<small>Description</small>	<small>Code</small>
If requesting a new <input checked="" type="checkbox"/> Major code or <input checked="" type="checkbox"/> Concentration code that does not exist in Banner:		
New Code [4 char/space limit]: AGPT	Description [30 char/space limit]: Agripharmatech Track 2: Ethnopharmacognosy	
If a similar major/concentration code exists in Banner, please list the code: We would like concentration code to be EPC (code not in Banner)		
Is this major/concentration code being used the same way at other UH campuses? Not sure.		
Is 50% or greater of the classes in this program offered at a location other than the Home Campus? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <small>(Please consult your Financial Aid Officer on Program Participation Agreement impact)</small>		
Is this program/major/certificate financial aid eligible? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <small>(Financial Aid Officer consultation required for all new program codes)</small>		
Should this program be available for applicants to select as their planned course of study on the online application? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <small>(If yes, students may select the code as their <u>only</u> program of study.)</small>		

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Replacing or eliminating an existing program code:

If replacing an existing program code, are current students "grandfathered" under the old code? Yes No

Should the old program code be available for use in Banner? Yes No

Will the old program code be available for:	Banner Module	Yes	No	Ending Term (Semester-Year)
	Online Application	<input type="checkbox"/>	<input type="checkbox"/>	_____
	Recruitment	<input type="checkbox"/>	<input type="checkbox"/>	_____
	Admissions	<input type="checkbox"/>	<input type="checkbox"/>	_____
	General Student	<input type="checkbox"/>	<input type="checkbox"/>	_____
	Academic History	<input type="checkbox"/>	<input type="checkbox"/>	_____

2. CERTIFICATES ONLY:

Does this certificate qualify as a Gainful Employment Program (Title IV-eligible certificate program)? Yes No
(Please consult your Financial Aid Officer or see: <http://www.ifap.ed.gov/GainfulEmploymentInfo/index.html>)

For new certificates approved by the Chancellor, the related BOR authorized academic program is:

3. NEW CAMPUS, COLLEGE, DIVISION, OR DEPARTMENT CODE

Banner forms: STVCAMP, STVCOLL, STVDIVS, STVDEPT

Campus code [3 char]:	Campus description [30 char/space limit]:
College code [2 char]:	College description [30 char/space limit]:
Division code [4 char/space limit]:	Division description [30 char/space limit]:
Department code [4 char/space limit]:	Department description [30 char/space limit]:

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4. NEW COURSE SUBJECT CODE (Subject Alpha)		Banner form: STVSUBJ
College:	Department:	
Subject code [4 char/space limit]:	Subject description [30 char/space limit]:	

5. NEW MINOR (Minor codes are listed on the Major code table)		Banner form: STVMAJR
Minor Code [4 char/space limit]:	Minor Description [30 char/space limit]:	

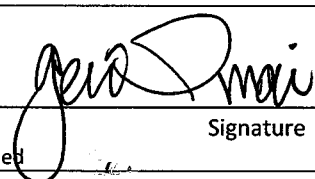
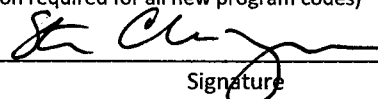
Please briefly describe your request and explain why you are requesting the code(s):

SUPPORTING DOCUMENTATION

Please see the **Code Request Guide** for the required supporting documents to be submitted. Documents submitted with this form:

- Board of Regents meeting minutes and supporting documents provided to the BOR
- Memo from UH President
- Memo from Chancellor
- Curriculum (required for requests for new programs/majors/minors/certificates)
- Gainful Employment Program notification to the US Department of Education
- Other: Memo from VC of Academic Affairs (indicating BOR requested changes)

UNIVERSITY OF HAWAI'I
CODE REQUEST FORM FOR ACADEMIC PROGRAM CODES

CAMPUS VERIFICATION		
Requestor Signature <u>Richard Fulton</u>	Date <u>7/31/12</u>	
Registrar (If different from Requestor)		
Geri Imai		7/31/12
Print name	Signature	Date
Email/memo in lieu of Registrar's signature may be attached		
Financial Aid Officer (Financial Aid Officer consultation required for all new program codes)		
Steven Chigawa		7/31/12
Print name	Signature	Date
Email/memo in lieu of Financial Aid Officer's signature may be attached		
For Community Colleges, verification of consultation with OVPC Academic Affairs:		
_____	_____	_____
Print name	Signature	Date
Email/memo in lieu of signature may be attached		

Send completed form and supporting documentation to:

Institutional Research and Analysis Office (IRAO)
 1633 Bachman Place Email: iro-mail@lists.hawaii.edu
 Sinclair Annex 2, Room 4 Fax: 808-956-9870
 Honolulu, HI 96822 Phone: 808-956-7532

After all required forms and supporting documents have been submitted, please allow at least two weeks for processing by IRAO and Banner Central.

FOR INTERNAL USE ONLY	Date form/docs received:
Program code [12]:	Program Description [30]:
CIP code [6]:	CIP description [30]:

Windward Community College

Approval of the Establishment of a Provisional Certificate of Achievement in Agripharmatech

Windward Community College Vice Chancellor for Academic Affairs, Richard Fulton, said that the proposed certificate is instrumental in the Community College's C3T Federal Grant. The program is part of a growing number of biological, science, and agriculture programs that are either in place or in development at Windward Community College. Initial support came from C3T, but the program has also received some support from the Perkins Vocational Education Grants for supplies, equipment, and planning help. The grant also supports some associated programs. Windward Community College has been expanding its current agricultural and biological programs, and the expansion has been driven by business and industry.

Other programs associated with the proposed certificate are in plant food certification, aquaponics, and agriculture technology, among others. The program merges well with the new Hawaiian Studies AA degree.

Regent Sullivan said that the C3T grant was used to evaluate and develop new programs, but when that grant money can no longer subsidize the program, what determines the continuation of the program. Vice Chancellor Fulton said that Windward Community College set measurable goals in terms of the number of students expected to move through the programs and the number of jobs in which the graduates are placed. For this program specifically, many of the courses are already offered in other degree programs, which will continue. The other costs (i.e. equipment and supplies) will be covered by the grant.

Regent Rasmussen asked about likely employers. Professor Inge White, who said that the proposed program is formerly an Academic Subject Certificate, said that 40% of graduates have gone into the workforce, for example, in biotechnology companies or plant nurseries. Additionally, Windward Community College partnered with biotechnology companies to provide internships.

VP Morton explained Academic Subject Certificates. It is not a Board-approved certificate, and therefore the courses, programs, and students are not eligible for Perkins funding. It is an area that the State wants to see grow, so the Administration thought that it was appropriate to move the Certificate from a specialization within an AA degree to a Board-approved certificate so that it can become eligible for continued support and count as the students successfully complete the degree programs.

Vice Chair Carlson moved and Regent Baxa seconded the motion, and Windward Community College's Establishment of a Provisional Certificate of Achievement in Agripharmatech was unanimously approved.

Chair Martinson announced that the agenda would be adjusted.



UNIVERSITY of HAWAII*
WINDWARD RECEIVED
COMMUNITY COLLEGE

UNIVERSITY OF HAWAII
OFFICE OF RECEIVING

12 MAY 10 11:07

April 20, 2012

'12 APR 25 AM 11:19

BOR APPROVED 5/17/12

**xc: Pearl Imada Iboshi
Joanne Itano
David Mongold**

MEMORANDUM

UNIVERSITY OF HAWAII
PRESIDENT'S OFFICE

To: Eric Martinson
Chairperson, Board of Regents

Via: M.R.C Greenwood
President

Via: John Morton
Vice President for Community Colleges

From: Douglas Dykstra
Chancellor, Windward Community College

Subject: WCC Program Proposal, Certificate of Achievement in Agripharmatech

ACTION REQUESTED:

Windward Community College requests Board of Regents approval to establish the provisional Certificate of Achievement in Agripharmatech.

ADDITIONAL COST:

Initial costs to implement the program are estimated at \$82,750, including salary for .65 FTE faculty member and .5 FTE laboratory technician (\$57,750) and supplies, equipment, service contracts (\$25,000). First year revenues from student tuition (\$101/SSH) is estimated to be \$38,784. In the second year, personnel costs will rise to \$63,448, while supplies, service contracts, and equipment will remain at about \$25,000.

It should be noted that the faculty position and lab tech identified for this programs will be funded through the first three years through a grant from the Department of Labor (C3T). The College is committed to continuing support for those two positions through internal reallocation of positions at the end of the grant.

RECOMMENDED EFFECTIVE DATE:

Fall 2012

PURPOSE:

The Certificate of Achievement in Agripharmatech will prepare students to work as skilled technicians in agricultural pharmacognosy and biotechnology industries, to create their own jobs as entrepreneurs, and to go on to advanced study in plant biological sciences. The program has grown out of the successful Academic Subject Certificate in Bio-resources and Technology, and has been developed with advice and guidance from the biotechnology industry on Oahu. It will help meet anticipated demand for technicians in this important and growing Hawai'i industry.

BACKGROUND

In accordance with Board of Regents policy governing Academic Affairs, Section 5-1a, and Executive Policy E5.201, Approval of New Academic Programs and Review of Provisional Academic Programs, Windward Community College requests the Board's approval to establish a provisional Certificate of Achievement in Agripharmatech starting Fall 2012.

This is the first of a series of agriculture-related certificate programs proposed in the UHCC Department of Labor C3T grant that WCC will develop. As described in the grant document, these certificates will be designed to "substantially boost food security and sustainability for the state, ensure the growth of viable farms, preserve and utilize productive agricultural land, and lessen the need for relocation to overtaxed urban areas for employment. Certification programs will offer both technical and in-field instruction, improve production efficiency, and share new marketing strategies needed to ensure the economic viability of food production in Hawaii."

Windward Community College has been offering an Academic Subject Certificate in Bio-resources and Technology—Plant Biotechnology for about 10 years. While the ASC program has been reasonably successful, it suffers from not having the structure and focus of a Board-approved Certificate of Achievement in a recognized workforce-oriented STEM field. In our judgment, the focused CA program makes better use of our resources than the current ASC, and focusing the curriculum prepares students more effectively for careers in plant biotechnology and ethnopharmacognosy. We also believe that students will be more likely to formally enroll in the proposed program than they have been in the ASC, and thus the effectiveness of the program will be more easily measured after they graduate and move on.

The proposed program draws on the resources of two of WCC's stronger programs: agriculture and biotechnology. As the proposal shows, the College's courses in ethnopharmacognosy have trained a significant number of students in doing research on native plants traditionally used for pharmaceutical purposes for their pharmaceutical and nutritional values. Students have produced a variety of pharmaceutical and nutraceutical products from such common plant byproducts as sweet potato leaves and honohono grass. Many of these products such as sweet potato leaf salves for skin cuts or infections, sweet potato soaps, and honohono grass cough drops have potential commercial possibilities. Students completing the biotechnology courses have been prepared to go to work immediately in the state's burgeoning biotechnology industry. Finally,

Chair Eric Martinson

April 20, 2012

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students completing the program will also be able to transfer most or all of the program credits to related baccalaureate programs at UH-Manoa and UH-Hilo

The proposed program shares existing facilities in the College's biology and agriculture complexes.

ACTION RECOMMENDED:

It is recommended that the Board of Regents approve the establishment of a provisional Certificate of Achievement in Agripharmatech to be effective Fall 2012.

Attachment

Provisional CA Proposal dated March 2012

c: Keith Amemiya, Executive Administrator and Secretary of the Board of Regents



UNIVERSITY OF HAWAII
WINDWARD
COMMUNITY COLLEGE

New Program Proposal

Certificate of Achievement in Agripharmatech

Track 1: Plant Biotechnology
and
Track 2: Ethnopharmacognosy

Date of Proposal: Spring 2012

Proposed Date of Program Implementation: Fall 2012

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1. Program Objectives

Windward Community College proposes to begin offering a Certificate of Achievement (CA) in Agripharmatech, beginning in Fall 2012. This Science, Technology, Engineering, and Math (STEM) program will prepare students to work as skilled technicians in agricultural pharmacognosy and biotechnology industries, to create their own jobs as entrepreneurs, and to go on to advanced study in plant biological sciences. The program addresses UHCC strategic outcomes 4.1 and 4.4 (both focused on increasing the number of STEM university transfers or graduates prepared to work in high wage industries) and WCC strategic outcomes 4.1, 4.5, and 4.8 (also focused on increasing both the number of STEM graduates by 3%/yr., the number of STEM transfers by 3%/yr., and the college's commitment to establish at least one new specific, career-focused degree or certificate annually). The new CA program with a focused curriculum prepares students more effectively for careers in plant biotechnology and ethnopharmacognosy than the Academic Subject Certificate in Bio-Resources and Technology – Plant Biotechnology (ASC BRT-PB).

Plant biotechnology in the broadest sense deals with developing and improving plant production in order to supply the world's need for healthier (decreased use of pesticides) and more nutritious (higher vitamin and protein content) food crops, novel ornamentals (unique colors, disease resistant), and plant-derived pharmaceuticals (<http://en.wikipedia.org/wiki/Biotechnology>). Ethnopharmacognosy is the study of traditional medicines derived from natural sources (medicinal/nutritious plants) (<http://en.wikipedia.org/wiki/Pharmacognosy>). Existing coursework will be scheduled in such a way that students will be able to complete the certificate in 2 - 3 semesters with coursework flexible enough to prepare them for employment in agricultural biotechnology or pharmacognosy, and for entrepreneurship in agribusiness or plant-based product manufacturing, as well as for seamless credit transfer to higher degree institutions for the study of agriculture, horticulture, biotechnology, microbiology, ethnobotany, pharmacognosy, pharmacy, nutrition and medicine.

The two specializations in the Agripharmatech* program share the same program facilities, the three required courses that meet the program student learning outcomes, and a pool of electives to provide program specialization flexibility (see Table 1, p. 6). Students planning a career in biotechnology will take the capstone class BOT 210. Students planning a career in pharmacognosy will take BOT 205 as the capstone class.

In 1998, after prompting from the United States Congress, the National Institute of General Medical Sciences (National Institute of Health) initiated funding for biotechnology training. Under this program, universities nationwide received funds to establish biotechnology training programs. University of Hawaii - Windward Community College received Millennium Workforce Development Initiative (MWDI) grants to provide Plant Biotechnology – Tissue and Cell Culture Training Courses in Summer 2000 and 2001. The success of these training courses led to the offering of the ASC BRT-PB and the establishment of four plant biotechnology program facilities: the Tissue Culture and Plant Biotech Laboratory, the Bioprocessing Medicinal Garden Complex, the Climate-Controlled Greenhouse, and the Kuhi La'au – Tropical Plant and Orchid Identification Facility (see Appendix 1). The facilities (including equipment) and the program were developed and supported through grants from the USDA-NIFA**, USDA-SPEC**, HI-BRIN**, EPSCoR**, and PCATT**. The ASC BRT-PB has been offered and fully supported through grants from USDA-NIFA since 2002. The ASC BRT-PB will be replaced with CA in Agripharmatech in Fall 2012.

* The term "Pharmatech" is used and can be found in the following websites: <http://www.pharmatech.com/>, <http://www.pharmatec.be/new/>, and <http://pharmtech.findpharma.com/>

** USDA-NIFA (United States Department of Agriculture-National Institute of Food and Agriculture), USDA-SPEC (Secondary and Two-Year Postsecondary Agriculture Education Challenge), HI-BRIN (Hawaii-Biomedical Research Infrastructure Network), EPSCoR (Office of Experimental Program to Stimulate Competitive Research), and PCATT (Pacific Center for Advanced Technology Training)

The Plant Biotechnology program has generated a total of forty-five ASC BRT-PB graduates (29% are Native Hawaiians, 31% Caucasians, 24% Asians, 13% Mixed, 2% Pacific Islanders). 40% of the graduates have entered the agribiotech workforce, 78% have transferred and/or received higher degrees and have been employed, and 22 % have become agribusiness or bioproduct entrepreneurs (the total percentage exceeds 100% because different categories overlap). See careers, businesses and academic majors chosen by the ASC BRT-PB graduates in Appendix 2.

The Agripharmatech program learning outcomes:

Students will be able to:

- Apply knowledge gained in plant sciences: identify plants, propagate/cultivate/maintain plants in vivo and in vitro
- Apply knowledge gained in microbial sciences: prepare/maintain bacterial cultures for genetic transformation and bioassay tests
- Conduct plant biotech and/or pharmacognosy research

In addition, students opting for the biotechnological track will focus on plant molecular genetics, and will:

- Identify, propagate, and cultivate economic plants in vitro and in vivo
- Operate laboratory equipment: autoclave, gel electrophoresis, PCR machine, Particle Delivery/1000 Helium System, spectrophotometer, fluorescent microscope, Gel Doc System
- Perform genetic engineering techniques: DNA/RNA extraction, electrophoresis, PCR reaction, DNA sequencing, gene transformation via bacteria and particle bombardment, alignment and analyzing DNA sequence results using Sequencher, PAUP, Finch TV software systems
- Conduct plant biotech research

Note: See student research activities and results from track 1. Posters titled “Morphological and DNA analysis of a wild-collected and a cultivated Epidendrum O’Brienianum on Oahu, Hawaii: preliminary study” (see Appendix 3a), and “Agrobacterium mediated transformation of Brassolaetlocattleya Raye Holmes ‘Mendenhall’ protocorm-like-bodies to confer resistance to Cymbidium Mosaic Virus” (See Appendix 3b).

Students opting for the ethnopharmacognosy track will focus on plant pharmacognostical study, and will:

- Identify, propagate, and cultivate medicinal/nutritious plants in vitro and in vivo
- Operate laboratory equipment: autoclave, spectrophotometer, stereo microscope, anaerobic transfer chamber, rotary evaporator, distiller, Biacore Q system
- Conduct pharmaceutical and nutraceutical research

Note: See student research activities and results from track 2: Publications of Ethnopharmacognosy Series I, II and III (see Appendix 4.)

2. Relationship of Objectives to WCC Mission and Strategic Plan

Windward Community College mission

Windward Community College offers innovative programs in the arts and sciences and opportunities to gain knowledge and understanding of Hawai‘i and its unique heritage. With a special commitment to support the access and educational needs of Native Hawaiians, we provide O‘ahu’s Ko‘olau region and beyond with liberal arts, career and lifelong learning in a supportive and challenging environment - inspiring students to excellence.

The proposed Certificate of Achievement addresses the following UHCC and WCC Strategic Goals:
UHCC

4.1, Increase by 3% per year the number of degrees awarded, and or transfers to UH baccalaureate programs that lead to occupations where there is a demonstrated state shortage of qualified workers and where the average wage is at or above the U.S. average.

4.3, Increase by 3% per year the number of degrees and certificates awarded in Science, Technology, Engineering, and Math (STEM) fields.

Annual wages for people in plant biotechnology fields range from \$30,000 - \$52,000; that wage increases significantly for students who eventually complete an advanced degree in one of these specialties. See data for occupational employment and wage in Agripharmatech related fields in Hawaii (Oahu, Big Island, Maui, Kauai) provided by the Bureau of Labor Statistics in May 2010 (http://www.bls.gov/oes/current/oes_HI.htm) in Appendix 5: Technicians earn from \$14.71 - \$25.01 per hour in Hawaii, while students who go on to earn a Baccalaureate degree or higher can earn \$29.32 - \$38.35.

Enrollments in the CA program are conservatively projected at 16 for the first year and 18 for the second. Projecting a 70% completion rate based on WCC's experience with other certificate programs, 11 students should complete after the first year and 13 after the second (assuming that students who do not complete do not return). Thus, this program will contribute significantly to UHCC goal 4.1, adding 11-13 people annually to degrees awarded in this key STEM field.

WCC

4.1, Contribute to the development of a high-skilled, high-wage workforce through the establishment of at least one new, specific, career-focused degree, certificate or career pathway per year that leads to employment in emerging fields.

4.6, Increase the number of degrees awarded, and/or transfers to UH baccalaureate programs that lead to occupations where there is a demonstrated state shortage of qualified workers and where the average wage is at or above the U.S. average by 3% per year.

4.8 Increase the number of degrees and certificates awarded in Science, Technology, Engineering, and Math by 3% per year.

The proposed CA will be one of at least three career-focused degrees or certificates to be proposed this year, joining the Associate in Science (AS) in Veterinary Technology (already approved by the Board) and a Certificate of Completion in Sustainable Agriculture, which should be ready to be offered in fall, 2012. Thus, WCC will be slightly ahead of its goal of one degree, certificate, or career pathway for this year. Currently the only BoR-approved STEM degree or certificate being awarded is the CA in Veterinary Assisting, which granted 7 certificates last year. The CA in Agripharmatech is projected to more than match that number in its first year, far outstripping the College's earlier goals. As noted above, the certificates will allow graduates to take jobs at wages at or above the national average.

Agripharmatech program goals (see the alignment of intended workforce and student learning outcomes for both tracks with the institutional mission, action outcomes and program mission in Appendix 6):

A. Provide a skilled workforce

- **Plant Biotechnology focus**

Graduates will be skilled as plant biotechnicians, microbial biotechnicians, tissue culturists, assistant researchers in plant biological sciences, orchid molecular phylogenetic technicians, orchid hybridizers, plant biology teachers, plant nursery managers, plant conservationists, horticulturists, and agriculture inspectors.

- **Ethnopharmacognosy focus:**

Graduates will be skilled as plant-based product technicians, pharmacognosy research technicians, nutraceutical specialists, plant biology teachers, plant nursery managers, organic farmers, plant conservationists, ethnobotanists, agriculture inspectors, food product managers/inspectors, and dietician/health food specialists.

B. Facilitate student transfer to higher degree institutions

- **Plant Biotechnology focus:**

Graduates should be able to transfer their credits to any higher degree institution and major in plant/microbial/general biotechnology, plant molecular taxonomy, agriculture, botany, horticulture, biology, bioinformatics, and pre-med.

- **Ethnopharmacognosy focus:**

Graduates should be able to transfer their credits to any higher degree institution and major in ethnobotany, agriculture, horticulture, biology, pharmacognosy, and pharmacy.

Note: The course alignment and articulation agreement was discussed and finalized in Spring 2002, Spring 2004, Fall 2008 and Spring 2012 with the College of Tropical Agriculture and Human Resources at University of Hawaii, Manoa; the College of Agriculture, Forestry and Natural Resource Management at University of Hawaii, Hilo; and the Department of Botany at University of Hawaii, Hilo in Spring 2006 (see Appendix 7a to 7e and <http://www.hawaii.edu/gened/articulation/wincc.htm>). The course alignment was also created with the University of Alaska at Fairbanks in 2009 (see Appendix 8).

C. Promote agribusiness/bioproduct entrepreneurship

- **Plant Biotechnology focus:**

Graduates should be able to operate their own agribusiness enterprises such as tissue culture laboratory, plant/orchid nursery, and agriculture farm.

- **Ethnopharmacognosy focus:**

Graduates should be able to operate their own bioproduct enterprises such as plant-based product manufacturing, green pharmacy laboratory, food pharmacy enterprise, organic health food product/store, and organic hydroponic/farm.

Note: WCC Chancellor, Vice Chancellor, Dean Division II and CA Agripharmatech Program Coordinator became members of the National Association for Community College Entrepreneurship (NACCE) in August 2011. NACCE supports entrepreneurship education and entrepreneurial leadership at the community college level. NACCE members have access to NACCE National Conferences, Resource Library, Press Promotion Services, Online Networking, Monthly Webinars etc. to promote the program and entrepreneurship careers nationwide.

Local, national and global needs

According to the USDA - NASS (United States Department of Agriculture – National Agricultural Statistics Service), there are 2296 farms on Oahu; 250 of which are certified plant/orchid nurseries, including tissue culture labs (http://hawaii.gov/hdoa/pi/pq/nema_cert/nurseries-in-hawaii). Over 45 commercial biotechnology companies are operating in the Islands of Hawaii, and employ 1,700 Hawaii residents (http://www.iowabiotech.com/econ_dev_reports/HawaiiBiotech99.pdf). Plant biotechnology has become a source of skilled jobs that pay higher than average wages. It is estimated that agricultural positions account for 70% of the State's biotechnology employment (<http://www.ctahr.hawaii.edu/biotech/economic.html>). The ASC Plant Biotechnology graduates have been employed in local biotech companies (i.e. Syngenta, Pioneer HI-Bred International, Hawaii Agriculture Research Center), pharmaceutical companies, and agribusiness enterprises.

An O NET OnLine Summary Report for Agripharmatech related occupations nationwide (including agribiotechnicians, microbial biotechnicians, bioprocessing technicians, nutraceutical technicians, food pharmacists) in the United States projected a need of 41,000 additional employees by 2016 (<http://online.onetcenter.org/link/summary/19-4021.00>). At the 9th Congress of Italian Society of Pharmacognosy, it was stated that in 1998, the total over-the-counter market in Europe for herbal medicinal products reached a figure of \$6 billion (with consumption for Germany of \$2.5 billion, France \$1.6 billion and Italy \$600 million). In the US, the market for all herb sales reached a peak in 1998 of \$700 billion. There are large numbers of plants containing medicinal substances, which have yet to be discovered for use in pharmaceuticals. Plant-based product enterprises would meet the critical needs of indigenous populations and provide a positive impact on the State's economy.

3. Curriculum

Each Certificate of Achievement in Agripharmatech: Plant Biotechnology (track 1), and Ethnopharmacognosy (track 2) consists of 30 - 32 credits. Each track requires a unique capstone class: BOT 210 (Phytobiotechnology) for track 1, and BOT 205 (Ethnopharmacognosy) for track 2. Besides the two General Education: MATH 103 (College Algebra) and ENG 100 (Expository Writing) or SP 151 (Personal and Public Speech), three of the six required classes (AG 152 – Orchid Culture, MICRO 130 - General Microbiology and MICRO 140 – General Microbiology Lab) are shared. Students desiring to take both tracks, must, in addition to the required and capstone courses, also select at least two different elective classes from each track for a total of 16 – 17 elective credits. All classes are currently offered. See course descriptions in Appendix 9.

Table 1. Courses for CA in Agripharmatech track 1 and track 2

CA program with 2 tracks	CA Agripharmatech (30 - 32 credits)	
	Plant Biotechnology	Ethnopharmacognosy
1 capstone class (4 credits)	BOT 210 Phytobiotechnology (4)	BOT 205 Ethnobotanical Pharmacognosy (4)
6 required classes (18-19 credits)	1). AG 152 Orchid Culture (3) 2). MICRO 130 General Microbiology (3) 3). MICRO 140 General Microbiology Lab (2) 4). MATH 103 College Algebra (4) or equivalent 5). ENG 100 Expository Writing (3) or SP 151 Personal and Public Speech (3) 6). BOT 160 Identification of Tropical Plants (3) or BOT 101 General Botany (4) or BIOL 172/L General Biology II/L (4)	
2 - 3 elective classes (8-9 credits)	CHEM 161/L General Chemistry I/L (4)	CHEM 161/L General Chemistry I/L (4)
	CHEM 162/L General Chemistry II/L (4)	BOT 105 Ethnobotany (3)
	BIOL 171/L General Biology I/L (4)	BOT 130 Plants in the Hawaiian Env (4)
	BOT 199/299* (1 - 4 credits)	BOT 199/299** (1 - 4 credits)
		AG 149 Plant Propagation (3)
	FSHN 185 Human Nutrition (3)	

**BOT 199/299 in track 1 involves in plant biotechnology research. **BOT 199/299 in track 2 involves in pharmaceutical/ nutraceutical research. The BOT 199/299 experience will help students intending to pursue AS in Natural Sciences and higher degrees in the STEM program.*

All required courses and some electives (BOT 105, BOT 130, BOT 199/299, CHEM 161/161L, CHEM 162/162L and BIOL 171/171L) for both tracks are offered every semester. Capstone courses are offered in alternate semesters. Lab practicum, hands-on bioproduct manufacturing, field trips to job sites, collaborative research/internship programs with industry partners, are major parts of student learning and facilitate students' access to job markets. Course alignment and transfer agreements are coordinated with 4-year degree institutions to facilitate student transfer. Research results are presented by students at scientific conferences and published in conference proceedings and/or the Ethnopharmacognosy series. The series is sold to community members during school events and also used as supplementary textbooks in BOT 105, BOT 205 and BOT 199/299 classes. Proceeds from the sales are used to support student travel to attend scientific

conferences. The exposure and experience gained from these activities should benefit students in their agribusiness and plant-based product entrepreneurial endeavors.

4. Enrollment

It is projected that the head count enrollment for Agripharmatech program will continue to increase from 16 in FY 12 – 13, 18 in FY 13 – 14, 20 in FY 14 – 15 to 22 in FY 15 – 16 due to aggressive marketing and recruiting efforts by program faculty and/or student interns. A continuous increase in student enrollment will not impact other science programs. The program is introduced by the program coordinator through Power Point presentations in botany and microbiology classes, campus/off campus public events and advertisements (Hoolaulea, Frosh Camp, Bioprocessing Medicinal Garden Complex tours, UHHA day, orchid society meetings, Ka Ohana newspaper, UH and Windward Malamalama journals. Student recruitment is also done by one or two special program counselors. Application submission and registration guidelines are listed in WCC website (http://windward.hawaii.edu/Admissions_Records/index.php). Student advising and counseling are done via program coordinator and counselors. Selection of elective courses takes place in consultation with the program coordinator based on students' career and/or academic goals.

5. Resources

In the existing ASC BRT-PB, there is 1 Botany/Microbiology professor, who is also the Coordinator of the Plant Biotechnology Program (.6 FTE), 1 Botany lecturer (.6 FTE), and 1 Microbiology lecturer (.6 FTE). The program coordinator's assigned time, student research internships and some lab supplies needed to operate all plant biotech facilities have been supported through USDA-NIFA grants. Some other smaller items (disposable or non-reusable chemicals) and undergraduate lab assistants have been funded through campus general funds.

Resources required

- 1). A Plant Molecular Biology Instructor (\$55,344)

A request of 1 FTE Plant Molecular Biology Instructor to teach a capstone class BOT 210 (Phytobiotechnology), and courses (BOT 101, MICRO 130, MICRO 140) required to fulfill the CA in Plant Biotechnology. This person will also teach BIOL 275/275L (Cell & Molecular Biology) when the AS in Natural Sciences becomes available. These classes are transferable to UHM and other higher degree institutions, fulfilling biological requirements for Plant Biotechnology, General Biotechnology, Microbial Biotechnology, Molecular Biosciences and Bioengineering, Plant Molecular Phylogenetics, Horticulture, Biology and Pre-med.

- 2). A full time Lab Technician (\$45,000)

Highly complex lab preparations and tremendous time are required to prepare laboratories for courses such as BOT 210, BOT 205, MICRO 140, AG 152 and BIOL 275L. A lab technician with molecular biology, chemistry, plant tissue culture and microbiology work experience/training background is needed to help prepare labs.

- 3). Lab equipment and supplies (\$100,000)

Request to purchase cellometer, RT-PCR, DNA profile imaging system, DNA sequencer software system upgrade/maintenance fees.

Note: Full funding is available through the Trade Adjustment Assistance Community College and Career Training (C3T) grant for the first three years of the proposed program for a faculty position in Plant Molecular Biology and the Lab Technician, as well as for a substantial amount of lab equipment and supplies.

Commitment/support

The required courses, including capstone courses listed in both tracks of the CA in Agripharmatech, are

botany/agriculture and microbiology courses that have been developed and offered since 2002 by the ASC - PB Program Coordinator, who is a Professor of Botany and Microbiology and also a Co-Project Director of the USDA-NIFA Consortium grant. This individual will continue to be responsible for the CA. Eventually, a second faculty member will be appointed to help staff the program, funded initially by the Department of Labor C3T grant. The CA Agripharmatech program proposal has gone through the approval process of the WCC Natural Sciences faculty, the Department Chair, the Administration, the Credit Curriculum and Academic Affairs Committees, and the Faculty Senate in Fall 2011.

Student transfer across the UH system has been established with the Department of Molecular Biosciences and Bioengineering (MBBE), the Department of Tropical Plant and Soil Sciences (TPSS), the Botany Department, the Department of Cell and Molecular Biology, and the Department of Biology at UHM. This collaboration also exists with the College of Agriculture, Forestry and Natural Resource Management (CAFNRM) at UHH. Research partnerships/internships have also been developed with biotech companies including the Hawaii Agriculture Research Center (HARC), the Pioneer Hi-Bred International Inc., Monsanto Inc., Cardax Pharmaceuticals and many other plant/orchid nurseries/farms. See letters of support from HARC, Pioneer Hi-Bred International Inc. and a student in Appendix 10a, 10b and 10c.

6. Program Efficiency

Table 2. Academic cost - revenue for provisional years 2012 – 2014 (see the signed form in Appendix 11)

		Year 1	Year 2
ENTER ACADEMIC YEAR (i.e., 2011-2012)		2012-13	2013-14
Students & SSH	A. Headcount enrollment (Fall)	16	18
	B. Annual SSH	384	432
Direct and Incremental Program Costs Without Fringe	C. Instructional Cost without Fringe	\$35,750	\$40,788
	C1. Number (FTE) of FT Faculty/Lecturers	0.65	0.72
	C2. Number (FTE) of PT Lecturers	-	-
	D. Other Personnel Costs	\$22,000	\$22,660
	E. Unique Program Costs	\$25,000	\$25,000
	F. Total Direct and Incremental Costs	\$82,750	\$88,448
Revenue	G. Tuition	\$38,784	\$45,792
	Tuition rate per credit	\$101	\$106
	H. Other	\$95,851	\$103,730
	I. Total Revenue	\$134,635	\$149,522
J. Net Cost (Revenue)		-51,885	-61,074
Program Cost per SSH With Fringe	K. Instructional Cost with Fringe/SSH	\$126	\$127
	K1. Total Salary FT Faculty/Lecturers	\$35,750	\$40,788
	K2. Cost Including Fringe of K1	\$48,263	\$55,064
	K3. Total Salary PT Lecturers	\$-	\$-
	K4. Cost Including fringe of K3	\$-	\$-
	L. Support Cost/SSH	\$304	\$304
	Non-Instructional Exp/SSH	\$264	\$264
	System-wide Support/SSH	\$40	\$40
	Organized Research/SSH	\$-	\$-
	M. Total Program Cost/SSH	\$430	\$431
N. Total Campus Expenditure/SSH	\$439	\$439	
Instruction Cost with Fringe per SSH	K. Instructional Cost/SSH	\$126	\$127
	O. Comparable Cost/SSH	\$243	\$243
Program comparison	LCC Plant Biosci Tech program		

Cost and revenue narrative from Table 2:

A. Headcount enrollment

Enrollment of 16 in first year and 18 in second year is based on current estimated enrollments in the ASC program in Plant biotechnology, which ranges from 12 - 20. WCC projected growth in the program is based

on assumption that a BoR recognized - Certificate of Achievement will encourage students to enroll in the program in their first semester and follow through on a planned program.

B. Annual SSH

Since all courses associated with the program may also be taken in conjunction with other programs (CC in Agriculture, AS in Veterinary Technology, the AA Liberal Arts) it is impossible to separate out unique Agripharmatech course SSHs. Rather, the annual SSHs are estimated based on students enrolling for 12 program credits/semester (24 annually) leading to the Certificate.

C. Instructional cost without fringe

C1. Because courses associated with this program will enroll both majors and non-majors, the allocation of faculty time to this program has been estimated based on the total SSHs generated by the CA majors annually divided by the total SSHs taught by a full time faculty member annually. Thus, at WCC one FTE faculty member annually teaches nine sections (3 credits each) enrolling an average of 22 students, generating 594 SSH. The 16 students in the first year of the program will each take 24 credits, and thus generate 384 SSH; in the second year 18 students will generate 432 credits. The number of credits generated by the students divided by the number of credits taught by one FTE faculty member gives the faculty FTE associated with the program.

C2. Although it is possible that PT lecturers may be associated with these classes, we have chosen to use costs associated with FT faculty since, as shown below, the Department of Labor C3T grant which is providing the majority of funding for the first three years of the program is funding one FTE faculty member whose primary responsibility will be to teaching in this program.

D. Other personnel costs

The Department of Labor C3T grant has funded a lab technician, about half of whose time will be associated with the CA program. The dollar amount for the first and second year reflects the amount of funding for this position in the grant.

E. Unique program costs

The College has estimated that ideally \$100,000 would be made available over 4 years for equipment for this program (\$25,000/year).

G. Tuition

Tuition rate per credit comes from the UHCC system projection of tuition charges over the next two years.

H. Other Revenue

The other revenue is all included in the Department of Labor C3T grant, which includes funding for faculty (plus fringe), lab tech (plus fringe), and \$16000/year for equipment. Percentages of the two salaries plus fringe directly associated with the program are included here.

K. Instructional Costs

K1. Total Salary FT Faculty/Lecturers. These amounts are based on the grant allocation for faculty multiplied by the percent of FTE associated with the program. Thus, in year one the grant allocates \$55,000 for faculty salary X .65 FTE associated with the program. In the second year the grant allocates \$56,650 X .72 FTE.

K3. As noted above, we have chosen not to try to calculate the cost of lecturers in the program costs.

L. Support Costs/SSH

Because non-instructional and system-wide support costs have gone up and down over the last several years, we have used the 2010-11 report for projections of both provisional years.

N. Total campus expenditures

Because expenditures/SSH have gone up and down over the last several years, we have used the 2010-11 report for projections of both provisional years.

O. Comparable program

Leeward CC has a Plant Bioscience Technology program included in its technology line under the “occupational and vocational” category; that program appears to be comparable to WCC’s proposed program.

Note: Official signed copy of the cost revenue template is included as Appendix 11, p. 30.

Program efficiency will be measured using the following indicators. Goals for each indicator are listed in parentheses:

- Number of students registering for the certificates (22 by fourth year)
- Course fill rate (85%)
- Number of core courses (capstone and required classes for both tracks) taught per year (13)
- Percent of graduates entering workforce (50%)
- Percent of graduates transferring to higher degrees (50%)
- Percent of graduates becoming agribusiness and plant-based product entrepreneurs (20%)
- Number of students meeting certificate requirements within 18 months (70 %)

7. Program Effectiveness

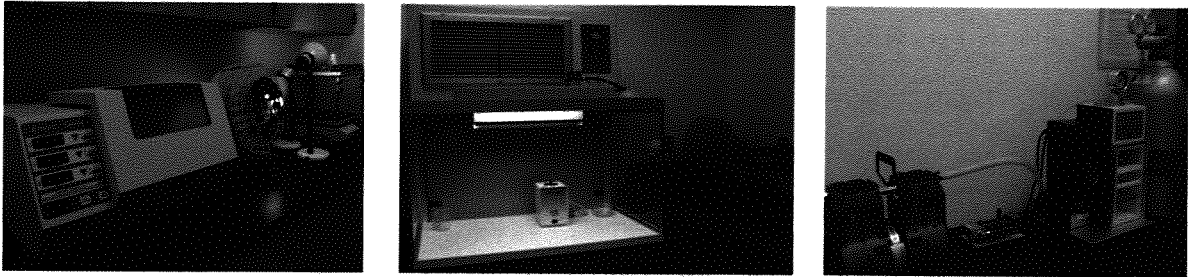
Program effectiveness will be measured by the following indicators. Goals for each indicator are listed in parentheses:

- Placement of certificate-holders into industry related positions (50%) or
- Increase in mean wage for those already working in the field (mean wage > 20% within 12 months of program completion) or
- Performance and retention of certificate-holders in industry related fields as reported by employers, or
- Satisfactory rating of certificate-holders, and employers with the quality of the program (80% satisfied with the program) or
- Transfer retention in higher degree institutions in program related field (50%)

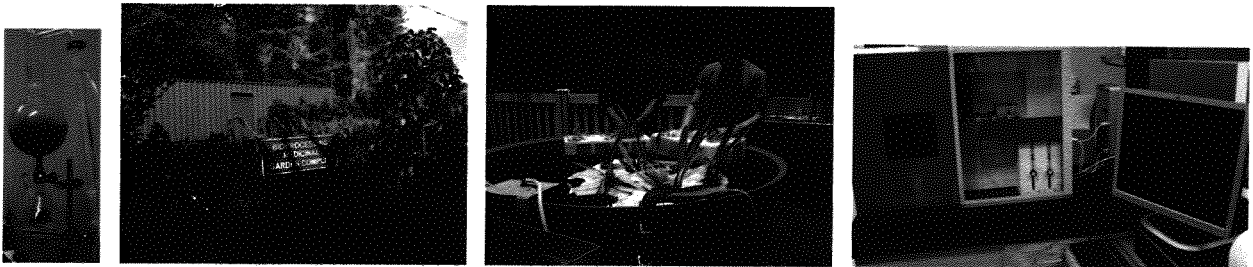
Program outcomes will be measured by:

- Student learning outcomes assessment
- Program (review) outcome assessment
- Student evaluations
- Course completion rates
- Follow-up surveys of students and employers

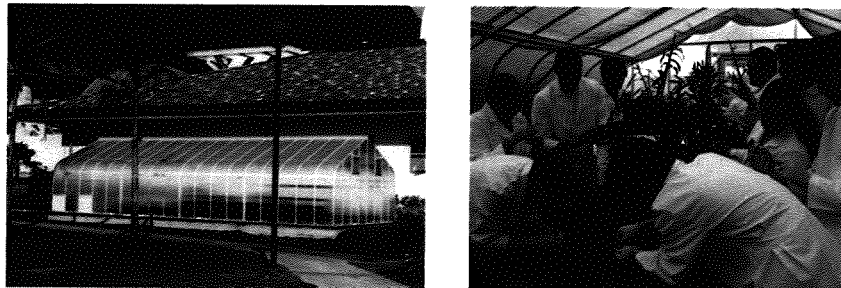
Appendix 1. Four plant biotechnology facilities and lab equipment



Tissue Culture and Plant Biotechnology Laboratory was dedicated on February 5, 2003. It is an aseptic room used for in vitro culture and gene transformation operations.



Bioprocessing Medicinal Garden Complex was dedicated on June 18, 2007. It consists of three sub-facilities: the medicinal garden (containing plants from Asia, the Pacific, and America), the aquaponic system, and the bioprocessing facility. The medicinal plants grown in the garden and in the aquaponic system are processed into bioproducts in the bioprocessing facility.



The climate-controlled greenhouse was dedicated on October 3, 2001. It provides a controlled atmosphere for mericlones and seedlings to thrive out of their post-in-vitro culture. It also houses orchid species for identification purposes.



The Kuhi La'au – Tropical Plant and Orchid Identification Facility was dedicated on February 9, 2000. It provides a free plant identification service, focusing on plants of Hawai'i, tropical plants of Asia, the Pacific, and orchids.

Appendix 2. Academic Subject Certificate – Plant Biotechnology graduates, Spring 2002 – Spring 2012

Number	Name	4-Year Degrees	Occupations
1	(Names withheld to protect identity)	Received M.Sc MBBE - UHM	WCC lecturer, Botany/Microbiology
2		Received MSc MBBE & Doctor of Medicine - UHM	Resident/Intern
3		Received Doctor of Pharmacy-Loma Linda Univ.	Workforce: Pharmacist
4		Received B.Sc Biology - UHH	Workforce: Plant Nursery Manager
5		Received M.D.	Entrepreneur: Tissue culturist
6			Entrepreneur: Agribusiness
7			Entrepreneur: Plant Nursery
8		Pursuing B.Sc Botany - UHM	Entrepreneur: Agribusiness
9		Pursuing B.Sc TPSS - UHM	Entrepreneur: Agribusiness
10		Pursuing B.Sc Biology - UHM	
11		Pursuing B.Sc Bioinformatics - UHM	
12			Entrepreneur: Plant landscape maintenance
13		Pursuing B.Sc Forensic Science - Chaminade U.	
14			Workforce: Plant Nursery Manager
15		Pursuing B.Sc Horticulture - California	Workforce: Vineyard/winery
16			Workforce: Syngenta Co.
17		Received B.Sc Microbial Biotech - UHM	Workforce: Pioneer HI-Bred Int.
18		Pursuing B.Sc Nursing	Workforce: Nurse
19		Pursuing B.Sc Dental Hygiene - UHM	
20		Received B.Sc Biology - UHM	Workforce: Secretary (Educational Institution)
21			Workforce: School teacher, FL
22		Pursuing B.Sc Botany - UHM	
23		Received B.Sc TPSS - UHM	Workforce: Research intern/Entomologist
24		Received B.Sc Art & Education - UHM	Entrepreneur: Natural Therapist
25		Received B.Sc Biochemistry - HPU	
26		Pursuing B.Sc TPSS- UHM	Workforce: Natural Therapist
27			Workforce: WCC Hawaiian Studies consultant
28			Entrepreneur: Herbal product manufacturer
29		Received B.A. Accounting	Workforce: Nurse
30		Pursuing B.Sc Ethnobotany & Nursing, UHM	
31		Pursuing B.Sc, TPSS, UHM	Workforce: Plant maintenance worker
32		Pursuing B.Sc. TPSS, UHM	
33		Pursuing B.Sc. MBBE, UHM	Entrepreneur: Herbal product manufacturer
34		Pursuing B.Sc. MBBE, UHM	Workforce: USDA – Agriculture Inspector
35		Pursuing B.Sc in Pharmacy, UHH	
36		Pursuing pre-med, UHM	Workforce: Kaiser Medical Center
37		Pursuing Horticulture, TPSS - UHM	Entrepreneur: Herbal product manufacturer
38		Pursuing Microbiology, MBBE - UHM	
39		Pursuing AG Business/Social Science, UHM	
40		Pursuing Horticulture degree, UHH	
41		Pursuing Biotechnology, Oregon	
42			Workforce: Ko'olau Farmers
43		Pursuing TPSS degree, UHM	Workforce: WCC Student Lab Assistant/intern
44		Pursuing Ethnobotany & Hawaiian Studies, UHM	
45			Workforce: Herbal product manufacturer



Fig. 1. *Epidendrum O'brienianum* growing on hillside at Nuuanu, Pali, Oahu.

Morphological and DNA analysis of a wild-collected and a cultivated *Epidendrum O'brienianum* on Oahu, Hawaii: preliminary study

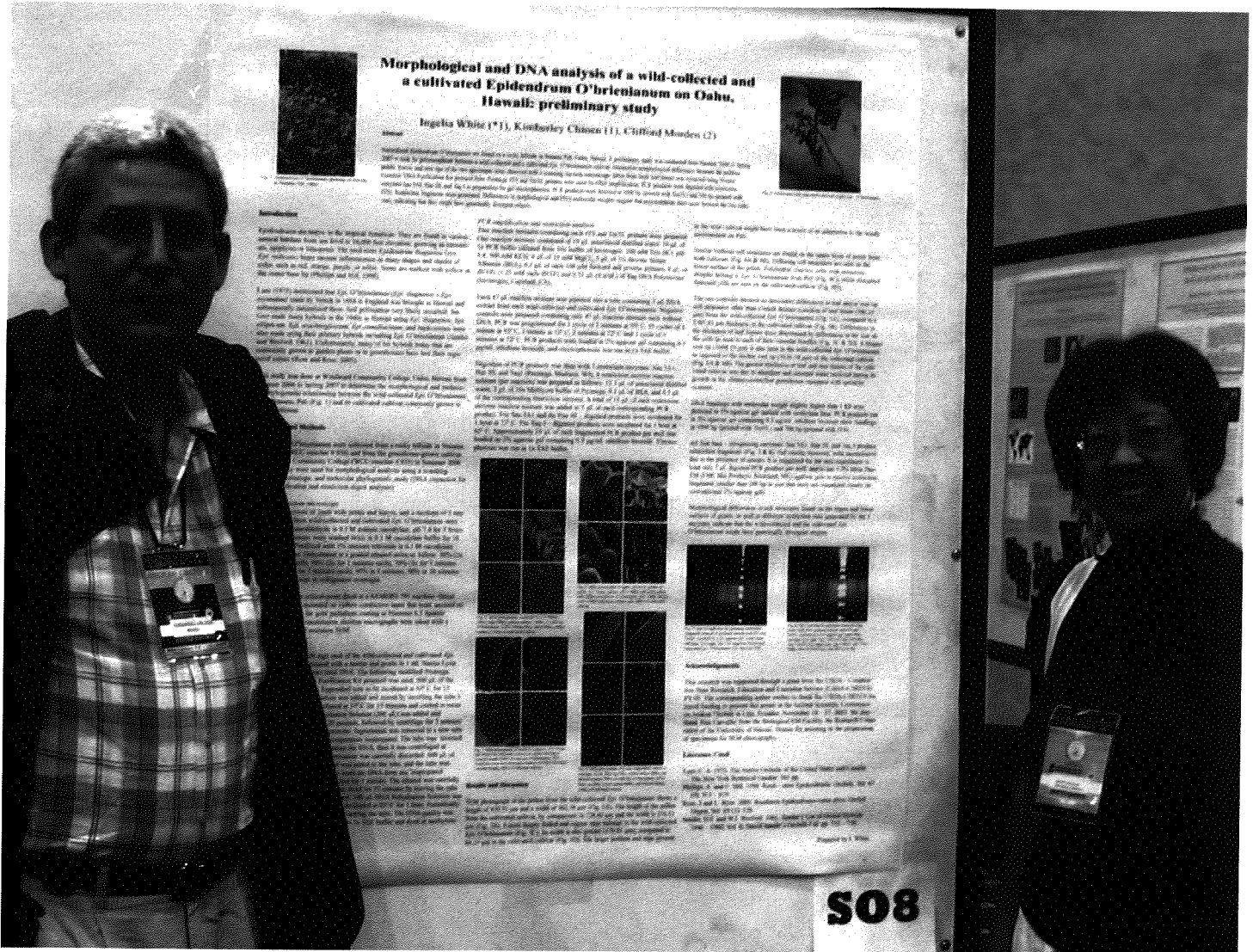
Ingelia White (*1), Kimberley Chinen (1), Clifford Morden (2)

Abstract

Naturalized *Epidendrum O'brienianum* are found on a rocky hillside in Nuuanu Pali, Oahu, Hawaii. A preliminary study was conducted from Summer 2006 to Spring 2007 to look for polymorphism between a wild-collected and a cultivated *Epi. O'brienianum* cultivar. Distinctive morphological differences between the pollinia, petals, leaves, and root tips of the two specimens were observed with a scanning electron microscope. DNA from fresh leaf tissues was extracted using Wizard Genomic DNA Purification Kit protocol from Promega. ITS and TrnTL primers were used for DNA amplification. PCR products were digested with restriction enzymes *Sau* 3A1, *Hae* III, and *Taq* I in preparation for gel electrophoresis. PCR products were detected at 1000 bp (primed with TrnTL) and 700 bp (primed with ITS). Restriction fragments were generated. Differences in morphological and DNA molecular weights suggest that polymorphism does occur between the two cultivars, indicating that they might have genetically divergent origins.



Fig. 2. Cultivated (left) and wild-collected (right) *Epi. O'brienianum*.



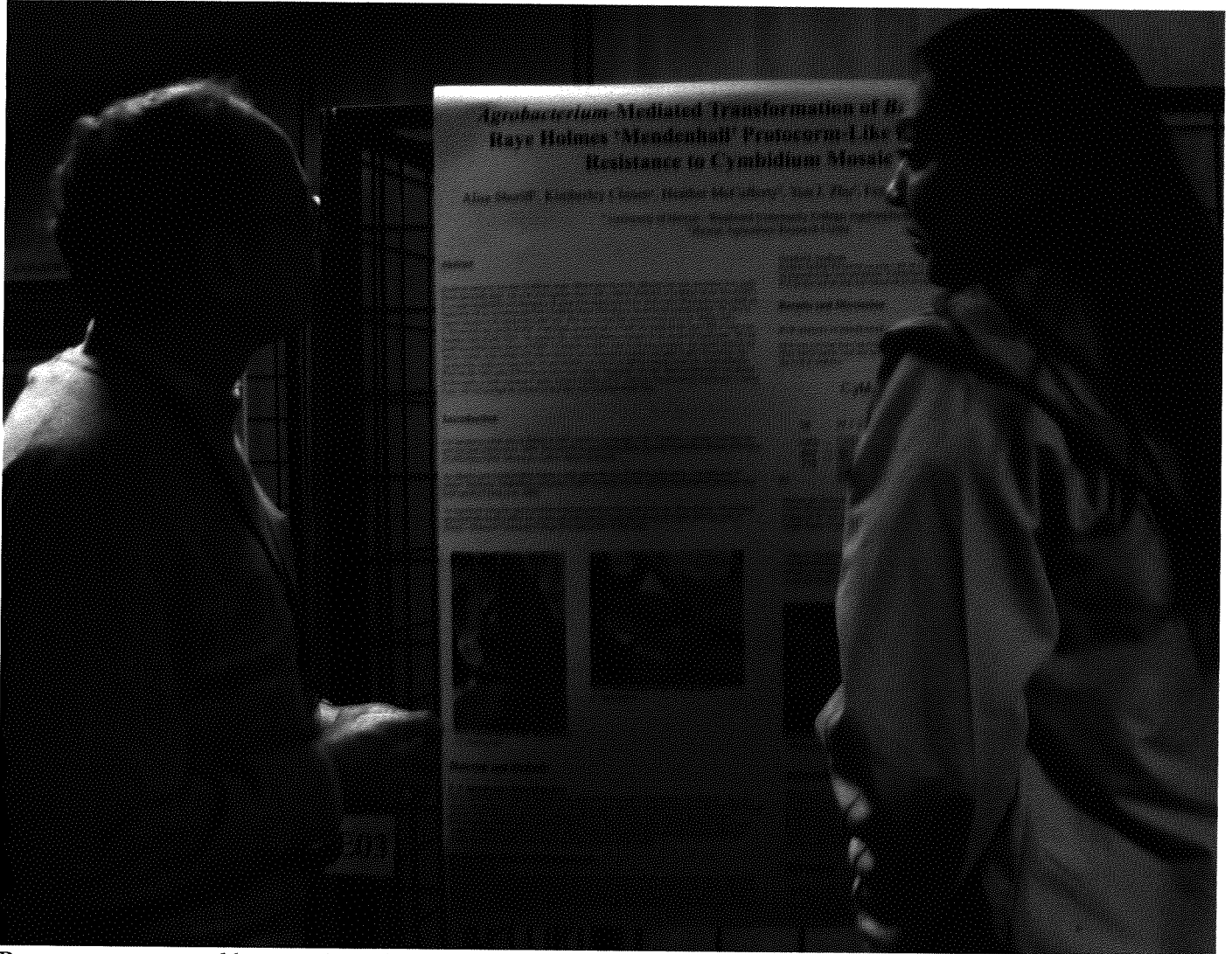
Poster was presented by Dr. Ingelia White at the Second Scientific Conference on Andean Orchids, Loja, Ecuador, November 14 – 18, 2007.

***Agrobacterium*-Mediated Transformation of *Brassolaeliocattleya* Raye Holmes 'Mendenhall' Protocorm-Like Bodies to Confer Resistance to Cymbidium Mosaic Virus**

Alisa Sheriff¹, Kimberley Chinen¹, Heather McCafferty², Yun J. Zhu², Fengyong Zhou², and Ingelia White*¹

¹University of Hawaii - Windward Community College, ingelia@hawaii.edu

²Hawaii Agriculture Research Center



Poster was presented by a student, Alisa Sheriff at the Third Scientific Conference on Andean Orchids, Quito, Ecuador, February 4 – 8, 2009.



Appendix 5. Occupational employment and wage in Agripharmatech related fields on Oahu, Big Island, Maui, Kauai - Bureau of Labor Statistics, May 2010

Occupation Code	Occupation Title	Employment Estimates		Wage Estimates	
		Employment *	Location quotient **	Mean Hourly	Mean Annual ***
19-1013	<u>Soil and Plant Scientists</u>	120	2.171	\$33.48	\$69,640
19-1022	<u>Microbiologists</u>	70	0.901	\$29.32	\$60,980
19-1029	<u>Biological Scientists, All Other</u>	270	2.005	\$30.85	\$64,160
19-1031	<u>Conservation Scientists</u>	90	1.111	\$31.54	\$65,600
19-1099	<u>Life Scientists, All Other</u>	****	****	\$38.35	\$79,780
19-4011	<u>Agricultural and Food Science Technicians</u>	240	3.122	\$17.87	\$37,170
19-4021	<u>Biological Technicians</u>	570	1.739	\$14.71	\$30,600
19-4092	<u>Forensic Science Technicians</u>	70	1.303	\$25.01	\$52,030
19-4093	<u>Forest and Conservation Technicians</u>	120	0.842	\$19.06	\$39,640

* Estimates for detailed occupations do not sum to the totals because the totals include occupations not shown separately. Estimates do not include self-employed workers.

** The location quotient is the ratio of the area concentration of occupational employment to the national average concentration. A location quotient greater than one indicates the occupation has a higher share of employment than average, and a location quotient less than one indicates the occupation is less prevalent in the area than average.

*** Annual wages have been calculated by multiplying the hourly mean wage by a "year-round, full-time" hours figure of 2,080 hours; for those occupations where there is not an hourly mean wage published, the annual wage has been directly calculated from the reported survey data.

**** Estimates not released.

Note: The Occupation Code 19-1013 through 19-1099 require a Baccalaureate degree or above, while 19-4011 through 19-4093 require a CA.

<p>Institutional Mission Statement</p> <p><i>Windward Community College offers innovative programs in the arts and sciences and opportunities to gain knowledge and understanding of Hawai'i and its unique heritage. With a special commitment to support the access and educational needs of Native Hawaiians, we provide O'ahu's Ko'olanui region and beyond with liberal arts, career and lifelong learning in a supportive and challenging environment - inspiring students to excellence.</i></p>	<p style="text-align: center;">Intended Roles (workforce)</p> <table border="1" style="width: 100%;"> <tr> <td data-bbox="277 779 732 1419"> <p style="text-align: center;">Plant Biotechnology</p> <p>Plant biotechnologist, microbial biotechnologist, tissue culturist, assistant researcher in plant biological sciences, orchid molecular phylogenetic technician, orchid hybridizer, plant biology teacher, plant nursery manager, plant conservationist, horticulturist, botanist, agriculture inspector.</p> </td> <td data-bbox="277 159 732 779"> <p style="text-align: center;">Ethnopharmacognosy</p> <p>Plant-based product manufacturer, pharmacognosy research technician, nutraceutical specialist, green pharmacist, plant biology teacher, plant nursery manager, organic farmer, plant conservationist, ethnobotanist, agriculture inspector, food product manager/inspector, dietician/health food specialist.</p> </td> </tr> </table>		<p style="text-align: center;">Plant Biotechnology</p> <p>Plant biotechnologist, microbial biotechnologist, tissue culturist, assistant researcher in plant biological sciences, orchid molecular phylogenetic technician, orchid hybridizer, plant biology teacher, plant nursery manager, plant conservationist, horticulturist, botanist, agriculture inspector.</p>	<p style="text-align: center;">Ethnopharmacognosy</p> <p>Plant-based product manufacturer, pharmacognosy research technician, nutraceutical specialist, green pharmacist, plant biology teacher, plant nursery manager, organic farmer, plant conservationist, ethnobotanist, agriculture inspector, food product manager/inspector, dietician/health food specialist.</p>
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<p style="text-align: center;">Institutional Action Outcomes</p> <ol style="list-style-type: none"> 1. Increase diversity of programs offered to underserved regions 2. Contribute to the development of a highly-skilled, and highly-wage workforce 3. Establish partnerships with employers to create internships 4. Promote knowledge/skills and certificates in STEM fields 5. Increase transfer to UH baccalaureate programs 	<p style="text-align: center;">Intended Learning Outcomes</p> <table border="1" style="width: 100%;"> <tr> <td data-bbox="776 779 1390 1419"> <p style="text-align: center;">Plant Biotechnology</p> <ol style="list-style-type: none"> 1. Cultivate and maintain plant growth 2. Identify plants (tropical plants and orchid species) 3. Demonstrate fluency in aseptic culture technique (microbial culture and plant tissue culture) 4. Operate laboratory equipment (autoclave, gel electrophoresis, PCR machine, Particle Delivery/1000 Helium System, spectrophotometer, fluorescent microscope, Gel Doc System) 5. Perform genetic engineering techniques (DNA/RNA extraction, electrophoresis, PCR reaction, DNA sequencing, gene transformation via bacteria and particle bombardment) 6. Perform alignment and analyze DNA sequence results (using Sequencher, PAUP, Finch TV software systems) </td> <td data-bbox="776 159 1390 779"> <p style="text-align: center;">Ethnopharmacognosy</p> <ol style="list-style-type: none"> 1. Cultivate organically grown plants and maintain plant growth 2. Identify medicinal and nutritious plants 3. Operate laboratory equipment (autoclave, spectrophotometer, stereo microscope, anaerobic transfer chamber, rotary evaporator, distiller, Biacore Q system) 4. Conduct pharmaceutical and nutraceutical research </td> </tr> </table>		<p style="text-align: center;">Plant Biotechnology</p> <ol style="list-style-type: none"> 1. Cultivate and maintain plant growth 2. Identify plants (tropical plants and orchid species) 3. Demonstrate fluency in aseptic culture technique (microbial culture and plant tissue culture) 4. Operate laboratory equipment (autoclave, gel electrophoresis, PCR machine, Particle Delivery/1000 Helium System, spectrophotometer, fluorescent microscope, Gel Doc System) 5. Perform genetic engineering techniques (DNA/RNA extraction, electrophoresis, PCR reaction, DNA sequencing, gene transformation via bacteria and particle bombardment) 6. Perform alignment and analyze DNA sequence results (using Sequencher, PAUP, Finch TV software systems) 	<p style="text-align: center;">Ethnopharmacognosy</p> <ol style="list-style-type: none"> 1. Cultivate organically grown plants and maintain plant growth 2. Identify medicinal and nutritious plants 3. Operate laboratory equipment (autoclave, spectrophotometer, stereo microscope, anaerobic transfer chamber, rotary evaporator, distiller, Biacore Q system) 4. Conduct pharmaceutical and nutraceutical research
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<p style="text-align: center;">Program Mission</p> <p><i>To prepare students for careers in plant biotechnology and to qualify them for transfer to BS degree programs in biosciences</i></p>				

Appendix 7a. Course alignment/articulation with CTAHR-UHM, CAFNRM-UHH, Biology Department-UHH and LCC Plant Bioscience Technology

Course title	PEB – MBBE, & TPSS UHM-CTAHR*	WCC ASC BRT-PB & CA Agripharmatech	UHH Biology	UHH-CAFNRM**	LCC ASC Plant Bioscience Tech
General Botany	BIOL 102/102L (4)	BOT 101 (4)	BOT 153/153L (4)		
General Microbiology	elective	MICRO 130 (3)	BIOL 275 (Fundamental of Microbiol) (3)		
General Microbiology Lab	elective	MICRO 140 (2)	BIOL 275L Fundamental of Micro Lab (1)		
Phytobiotechnology	elective	BOT 210 (4)		AG 405 (Plant Biotech) (3)	
Identification of Tropical Plants	elective	BOT 160 (3)			
Plant Propagation	TPSS elective	AG 149 (3)		HORT 264 (3)	
Orchid Culture	TPSS elective	AG 152 (3)			
Ethnobotany	BOT 105 (HAP /Soc. Sc. Focus) (3)	BOT 105 (HAP/Soc.Sc. Focus) (3)			
Pharmacognosy	Elective	BOT 205(Ethnobotanical Pharmacognosy) (4)			
Independent Study		BOT 199/299 (1-4)	BIOL299/399 (Directed Study) (1-3)	AG 195/395/399 (1-4)	
Cell & Molecular Biology	BIOL 275/275L (4)	BIOL 275/275L (4)	BIOL 270/270L (4)		
General Chemistry I	CHEM 161/161L (4)	CHEM 161/161L (4)	CHEM 124/124L (4)		
General Chemistry II	CHEM 162/162L (4)	CHEM 162/162L (4)	CHEM 125/125L (4)		
General Biology I/Lab	BIOL 171/171L (4)	BIOL 171/171L (4)	ZOOL 150/150L (4) or BIOL 175/175L (4)		BIOL 171/171L (4)
General Biology II/Lab	BIOL 172/172L (4)	BIOL 172/172L (4)	BIOL 176/176L (4)		BIOL 172/172L (4)
Human Nutrition	FSHN 185 (3) or elective	FSHN 185 (3)			

* PEB (Plant and Environmental Biotechnology), MBBE (Molecular Biosciences and BioEngineering), TPSS (Tropical Plant and Soil Sciences), CTAHR (College of Tropical Agriculture and Human Resources)

** CAFNRM (College of Agriculture, Forestry, and Natural Resource Management)

Appendix 7b. The First UH System Biotech Instructor Meeting at WCC, Spring 2002

“The First UH System Biotech Instructor Meeting” at WCC, Spring 2002, organized by Dr. Ingelia White, to introduce ASC BioResources and Technology - Plant Biotechnology and to build a collaboration and articulation across UH system (see photo below):



Clockwise from left to right: Sally Irwin (Agriculture, Maui CC), Pricilla Millen (Botany, LCC), Janice Ito (Microbiology, LCC), Dr. John Berestecky (Microbiology/Cell Molecular Biology, Kapiolani CC), Dr. Stephen Saul (Insect /Pathogen Biotechnology, UHM), Dr. David Christopher (Plant Biotechnology), Dr. Kabi Neupane (Plant Sciences, LCC), Brian Yamaguchi (Botany, Kauai CC), Dr. Anne Alvarez (General Biotechnology, UHM), Dr. Harry Ako (Coordinator of UHM Plant and Environmental Biotechnology. Today the name is changed to “Molecular Biosciences”), Dr. Dulal Borthakur (Environmental and Microbial Biotechnolog). Not seen in this photo are: Dr. Ingelia White (Plant Biotechnology, WCC), Dr. David Krupp (Bio-Resource Development and Management, WCC) and Dr. Angela Meixell (Chancellor, WCC).

U N I V E R S I T Y O F H A W A I ' I A T M Ā N O A

College of Tropical Agriculture and Human Resources
Department of Molecular Biosciences and Bioengineering

13 February 2012

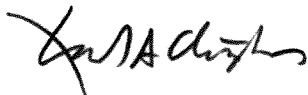
Dr. Ingelia White
Botany/Microbiology
Coordinator, Plant Biotechnology Program
Chair, Department of Natural Sciences
Windward Community College
45-720 Kealahala Road
Kaneohe, HI 96744

Dear Dr. White:

I write to confirm that the course, Botany 210, is an acceptable elective in our department's Plant and Environmental Biotechnology (PEB) program and your course, Phytobiotechnology, at Windward Community College would also serve as an acceptable elective in MBBE's PEB program and can substitute for Botany 210.

Best of luck with the Agripharmatech program.

Sincerely,



David A. Christopher
Professor and Chair

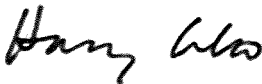
University of Hawaii at Manoa
College of Tropical Agriculture and Human Resources
Program in Biotechnology

Jan. 22, 2004

Igelia White, Ph.D.
Department of Natural Sciences
Windward Community College
45-720 Keaahala Rd.
Kaneohe, HI 96744

Dear Dr. White,

We have accepted your BOT 205 course (Ethnobotanical Pharmacognosy) to be included as an approved elective for the Bachelor's degree in Plant and Environmental Biotechnology. We believe that BOT 205 will round the students in their study of plant biotechnology. As you may recall from our statewide meeting we have petitioned to simplify and broaden the name of the program to Biotechnology.



Harry Ako, Ph.D.
Professor and Program Coordinator, Biotechnology Program
Chair, Dept. of Molecular Biosciences and Bioengineering

----- Original Message -----

From: william mautz <mautz@hawaii.edu>

Date: Wednesday, November 30, 2005 3:18 pm

Subject: Re: articulation of BOT210 and visitation to UHH

To: Ingelia Puspita White <ingelia@hawaii.edu>, Ingelia Puspita White <ingelia@hawaii.edu>

Cc: Donald Price <epscorpd@hawaii.edu>, sakaiw@hawaii.edu, shintaku@hawaii.edu, Don Hemmes <hemmes@hawaii.edu>

Dear Ingelia,

I have examined the proposed courses for an articulation agreement. In regard to biology courses, your General Microbiology courses, 130 and 140, may be considered equivalent to our Fundamentals of Microbiology biol 275 and biol 275L. Your Botany 101 would be equivalent to our former biol 153 course. However, please note that effective fall 2006, BIOL 153 and 153L (General Botany) will be dropped and re-structured to BIOL 175 and 175L. Parenthetically BIOL 150 and 150L Principles of Zoology are also being restructured to a BIOL 176, 176L. BIOL 175 will retain a botanical orientation. Here is the outline of lecture topics.

Principles of Cellular Life

Week 1 Characteristics of life, biological organization, evolution introduced, kingdoms of life, scientific method, intro to chemistry, carbon chemistry.

Week 2 Cell structure and function, cell membranes

Week 3 Metabolism Principles of Inheritance

Week 4 Cell division, mitosis, meiosis

Week 5 Mendelian genetics, human genetics

Week 6 DNA structure and function, transcription, translation

Week 7 Controls of genes, genetic engineering Principles of Evolution

Week 8 Microevolution, speciation, macroevolution

Week 9 The origin and evolution of life Biodiversity of Prokaryotes, Viruses, Fungi, and Plants; Plant Structure and Function

Week 10 Biodiversity of prokaryotes, viruses, plant-like protists, and thallophytes

Week 11 Biodiversity of vascular plants

Week 12 Biodiversity of vascular plants, plant structure and function

Week 13 Structure and function of plants

Week 14 Structure and function of plants

Week 15 Biodiversity, structure, and function of fungi

Sincerely,

William J. Mautz

Associate Professor and Chair,

Department of Biology

University of Hawaii at Hilo

Hilo, HI 96720

(808) 974-7357

Date

Monday, March 12, 2012 12:43 pm

Subject

Articulation with Community College Ag

From

Bruce W Mathews <bmathews@hawaii.edu>

Date

Monday, March 12, 2012 12:43 pm

To: Ron T Umehira <umehira@hawaii.edu> , Traci Sylva <tsylva@hawaii.edu> , Lynn MacLaren <lynn@uhwo.hawaii.edu> , joycei@hawaii.edu , witteman@hawaii.edu , David Ringuette <ringuett@hawaii.edu> , Ann Emmsley <aemmsley@hawaii.edu> , James Dire <dire@hawaii.edu> , Brian Yamamoto <byamamo@hawaii.edu> , Charles Kinoshita <cmkinosh@hawaii.edu> , Helen Cox <helencox@hawaii.edu> , Kabi Neupane <kabi@hawaii.edu> , Sharadchandra Marahatta <sharadch@hawaii.edu> , Ingelia White <ingelia@hawaii.edu>

APPROVED AGRICULTURAL COURSE ARTICULATION FOR THE UNIVERSITY OF HAWAII (UH) SYSTEM COMMUNITY COLLEGES BY THE UH HILO COLLEGE OF AGRICULTURE, FORESTRY, AND NATURAL RESOURCE MANAGEMENT (CAFNRM) - MARCH 9, 2012. UNLESS OTHERWISE NOTED, A GRADE OF C OR BETTER IS REQUIRED FOR THE LISTED DIRECT LOWER LEVEL (299 AND BELOW) COURSE TRANSFERS TO CAFNRM AND THE INDICATED IN LIEU OF SUBSTITUTIONS FOR UPPER LEVEL (300 AND ABOVE) CAFNRM COURSES. DUE TO UH SYSTEM POLICY THE STUDENT MUST SUBMIT A REQUEST TO THE CAFNRM CURRICULUM COMMITTEE FOR THE IN LIEU OF SUBSTITUTIONS TO BE RECOGNIZED. THIS REQUEST IS MADE IN WRITING USING THE UH HILO REQUEST FOR MODIFICATION OF ACADEMIC REQUIREMENTS FORM (http://hilo.hawaii.edu/registrar/documents/RevisedModification_ff.pdf). OTHER MODIFICATIONS AND EXCEPTIONS MAY ALSO BE PETITIONED THROUGH THE CAFNRM CURRICULUM COMMITTEE.

<p>Hawaii Community College Ag 122* - Soil Technology (3) (with a B or better) Ag 175 + 175L - Agroforestry (3) + Agroforestry Lab (1) Ag 200* - Principles of Horticulture (3) Ag 230* - Agriculture Business Management (3) Ag 245 + 245L - Tropical Silviculture (3) + Tropical Silviculture Lab (1) Ag 250 + 250L - Sustainable Crop Production (3) + Sust. Lab (1) Ag 260* - Tropical Landscape Horticulture (3)</p> <p>Kauai Community College HORT 200* - Introduction to Horticulture (3) PBT 264* - Plant Propagation (3) PBT 275* - Introduction to Crop Improvement (3) (with a B or better)</p> <p>Leeward Community College PBT 200 + 200L - Introduction to Plant Sciences (3) + Plant Lab (1) PBT 264* - Introduction to Horticultural Plant Propagation (3) PBT 275* - Introduction to Crop Improvement (3) (with a B or better)</p> <p>Maui College Ag 122* - Soils Technology (3) (with a B or better) Ag 174* - Insects and Their Control (3) (with a B or better) Ag 200* - Principles of Horticulture (3) Ag 201* - Introduction to Plant Disease (3) (with a B or better) Ag 250* - Tropical Landscape Horticulture (3) Ag 251* - Sustainable Crop Production (3) Ag 263* - Flower & Foliage Crop Production (3) Ag 264* - Plant Propagation (3) Ag 266* - Greenhouse & Nursery Management (3) Ag 281* - Weed Science (3)</p> <p>Windward Community College Ansc 142 + 142L - Anat. & Phys. Domestic Animals (3) + Anat. Lab (1) Aqua 106 - Small Scale Aquaculture (with a B or better) Ag 120* - Plant Science (3) Ag 149 - Plant Propagation (3) Ag 152 - Orchid Culture (3)</p>	<p>Suggested UH Hilo CAFNRM Transfer Credit/Substitution Sub. in lieu of SOIL 304 - Tropical Soils (3) Credit for FOR 202 - Forestry & Natural Resources (3) Credit for HORT 262 - Principles of Horticulture (3) Sub in lieu of AGBU 320 - Agribusiness Management (3) Sub. in lieu of FOR 350 - Tropical Silviculture (3) (for UHH For. Cert.) Credit for AG 230 - Sustainable Agriculture (3) Sub. in lieu of HORT 350 - Tropical Landscape Horticulture (3)</p> <p>Suggested UH Hilo CAFNRM Transfer Credit/Substitution Credit for HORT 262 - Principles of Horticulture (3) Credit for HORT 264 - Plant Propagation (3) Sub. in lieu of AG 375 - Introduction to Genetic Analysis (3)</p> <p>Suggested UH Hilo CAFNRM Transfer Credit/Substitution Credit for HORT 262 - Principles of Horticulture (3) Credit for HORT 264 - Plant Propagation (3) Sub. in lieu of AG 375 - Introduction to Genetic Analysis (3)</p> <p>Suggested UH Hilo CAFNRM Transfer Credit/Substitution Sub. in lieu of SOIL 304 - Tropical Soils (3) Sub. in lieu of ENTO 304 - General Entomology (3) Credit for HORT 262 - Principles of Horticulture (3) Sub. in lieu of PPTH 301 - Tropical Plant Pathology (3) Sub. in lieu of HORT 350 - Tropical Landscape Horticulture (3) Credit for AG 230 - Sustainable Agriculture (3) Sub. in lieu of HORT 354 - Floriculture (3) Credit for HORT 264 - Plant Propagation (3) Credit for HORT 266 - Nursery Management (3) Sub. in lieu of HORT 481 - Weed Science (3)</p> <p>Suggested UH Hilo CAFNRM Transfer Credit/Substitution Sub. in lieu of ANSC 350 - Anat. & Phys. Farm Animals (3) Credit for AQUA 262 - Introduction to Aquaculture (3) Credit for HORT 262 - Principles of Horticulture (3) Credit for HORT 264 - Plant Propagation (3) Sub. In lieu of HORT 360 - Orchidology (3)</p>
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Ag 155 – Subtropical Aboriculture (3) Bot 210* – Phytobiotechnology (4)	Sub. in lieu of FOR 360 - Urban Forestry (3) (for UHH For. Cert.) Sub. in lieu of AG 405 – Plant Biotechnology (4)
*Note: Lecture and lab are combined like most CAFNRM courses	

Appendix 8. WCC Plant Biotech program course alignment with UAF

Course Alignment: ASC Plant Biotechnology (WCC) and AS Ethnobotany (UAF)

Course Title	ASC Plant Biotech	Credits	AS Ethnobotany	Credits
General Botany	BOT 101	4	BIOL 105, BIOL 116, BIOL 239	4
General Microbiology	MICRO 130	3		
General Micro Lab	MICRO 140	2		
Phytobiotechnology	BOT 210	4		
Identification of Tropical Plants	BOT 160	3		
Plant Propagation	AG 149	3		
Orchid Culture	AG 152	3		
Ethnobotany	BOT 105 (HAP focus)	3	EBOT 193, or 195, or 100, or 102, or 210	3
Plants in the Hawaiian Environment	BOT 130	4	EBOT 104 (Nat. Hist. of Alaska)	4
Ethnobotanical Pharmacognosy	BOT 205	4	EBOT 102 and EBOT 210	6
Independent Study	BOT 199/299	1 to 4	EBOT 201, or 210, ANTH 293	
Cell and Molecular Biology	BIOL 275/275L	4		
Elementary Survey of Chem/Lab	CHEM 151/151L	4	CHEM 103	4
Survey Organic & Bio-Org Chem/Lab	CHEM 152/152L	4		
General Chem I/Lab	CHEM 161/161L	4	CHEM 105	4
General Chem II/Lab	CHEM 162/162L	4	CHEM 106	
Human Nutrition	FSHN 185	3		
Introduction to GIS/GPS	GIS 150	3		
General Biology I/Lab	BIOL 171/171L	4		

Appendix 9. Course descriptions for CA in Agripharmatech

Course # and Title	Credits	Prerequisites	Course Description
BOT 101 - General Botany	4	High school biology	Introduction to plant structure, function, reproduction, and evolution; plants in relation to the environment and human activities. Lecture/laboratory/field trip course. DB/DY
BOT 105 - Ethnobotany	3	None	The scientific study of the interaction between human culture and plants, including the interrelationship of botany, socio-economics, belief systems and history that have shaped the cultural uses of plants in Hawaii, as well as Asia or the Pacific. Lecture/field trip course with service-learning option. DS
BOT 130 - Plants in Hawaiian Environment	4	None	Introduction to the evolution of plant communities and species of Hawaiian ecosystems; ecological interactions; observations, identification and systematics of native and introduced flora. Lecture/laboratory/field trip course. DB/DY
BOT 160 - ID of Tropical Plants	3	None	Nontechnical course in identification of common plants of tropics; includes native and introduced flora. DB
BOT 199/299V - Independent Study	1 - 4	Under supervising instructor's and/or co-advisor's expertise	An independent study project could take the form of directed reading, research, or fieldwork. It is designed to meet individual needs, and interests to continue an in-depth study of a particular topic that is appropriate to the student's program of study, or related to the existing college curriculum. DY
BOT 210 - Phytobiotechnology	4	BOT 101, or AG 152, or MICR 130 and MICR 140, or BIOL 171 and 171L	Introduction to practical aspects of Plant Biotechnology. Topics include micropropagation techniques, such as plant tissue, cell and protoplast cultures: DNA-based technologies, such as DNA extraction, DNA sequencing, PCR; and methods of plant genetic engineering. This course is designed to train students for careers in advanced agriculture technology and industry. DB/DY
AG 149 - Plant Propagation	3	None	Introduction to the principles and practices of propagation of fruit, vegetable, and ornamental crops by seed, cuttings, grafting, budding, layering and division.
AG 152 - Orchid Culture	3	None	An extensive study of orchid identification, breeding, growth, and culture. Students are required to write a 10 to 15 page research report.
MICR 130 - General Microbiology	3	None	Fundamentals of microbiology, growth, development, and classification of bacteria, viruses, protozoa, fungi and algae; roles of microorganisms in the environment and human affairs: medical microbiology, immunology, and applied microbiology for food sanitation and public health. DB
MICR 140 - General Microbiology Lab	2	MICR 130; placement into MATH 24 or higher	Laboratory course illustrating fundamental techniques and concepts of microbiology, such as microscopic observations, aseptic transfer, microorganism classification and identification, environmental factors influencing microbial growth, biochemistry of microorganisms, ecological microbiology, and medical microbiology. DB/DY
BIOL 171 - General Biology I	3	High school chemistry or college chemistry and registration in BIOL 171L	Introductory biology for all life science majors. Cell structure and chemistry, growth, reproduction, genetics, evolution, viruses, bacteria, and simple eukaryotes. DB
BIOL 171L - General Biology Lab I	1	Credit for or registration in BIOL 171	Laboratory to accompany BIOL 171. DY

BIOL 172 - General Biology II	3	Credit for BIOL 171 and 171L	Continuation of BIOL171. Anatomy, physiology, and systematics of plants and animals, behavior, ecosystems, populations, and communities. DB
BIOL 172L - General Biology Lab II	1	Credit for or registration in BIOL 172	Laboratory to accompany BIOL 172. DY
CHEM 161 - General Chemistry I	3	Registration in CHEM 161	Basic principles of inorganic chemistry with an emphasis on problem solving. First course of a two-course sequence designed to meet the one-year General Chemistry requirement for pre-med, science and engineering majors. Topics include chemical calculations, electronic structure, chemical bonding, states of matter and solutions. DP
CHEM 161L - General Chemistry Lab I	1	Credit for or registration in CHEM 161	Laboratory experiments illustrating fundamental principles of chemistry. DY
CHEM 162 - General Chemistry II	3	"C"/better in CHEM 161, credit for or registration in MATH 135, or consent of instructor	Second course of a two-course sequence designed to meet the one-year General Chemistry requirement for pre-med, science and engineering majors. Topics include thermochemistry, kinetics, acid-base equilibrium, solubility equilibrium and electrochemistry. Emphasis on problem solving. DP
CHEM 162L - General Chemistry Lab II	1	Credit for or registration in CHEM 162	Laboratory experiments illustrating fundamental principles of chemistry. DY
ENG 100 Expository Writing	3	"C"/better in ENG 22 or placement into ENG 100 or instructor's consent	A composition course on the writing process including description, narration, exposition, and argument. Course stresses unity, development, organization, coherence, and other basic writing skills necessary for college writing. FW
FSHN 185 - Human Nutrition	3	Placement into ENG 100 and MATH 25 or higher, or consent of instructor	An introductory level biological science course which integrates basic concepts of science with the study of human nutrition. Designed for students who want an introduction to nutrition, as well as those who later choose to major in it. DB
MATH 103 College Algebra	4	Grade of "C" or better in MATH 25 or MATH 29 or equivalent, satisfactory math placement test score, or consent of instructor	Linear equations, inequalities, systems of equations, polynomials, functions, fractional expressions and equations, exponents, powers, roots, quadratic equations and functions; rational, exponential and logarithmic functions. FS
SP 151 Personal and Public Speech	3	Placement in ENG 21 or higher	Introduction to major elements of speech. Enables students to acquire competence in two person, small group, and public situations. Models and concepts are used to explain the speech act. DA



Hawaii Agriculture Research Center

94-340 Kunia Road, Waipahu, HI 96797

Mailing address: P. O. Box 100, Kunia, HI 96759

Ph: 808-621-1266/Fax: 808-621-0399

August 11, 2011

Dear Dr. White:

This letter is to provide collaborative support for your continuing research project at Windward Community College (WCC).

I am a Research Scientist at Hawaii Agriculture Research Center (HARC) and my research interest at HARC is focused on the area of biochemical and molecular biology in tropical plant disease resistance and their interaction with microbes. Our lab is fully equipped to handle tissue culture, genetic transformation, pathogen isolation and culture, protein analysis, DNA/RNA isolation and characterization. My collaborations with Dr. White at WCC are: 1) to train and mentor students from WCC to learn new techniques, such as DNA/RNA isolation and characterization; 2) to develop tissue culture and genetic transformation system for orchids; 3) to evaluate the presence and expression of transgene transformed in the plant; 4) to develop bioassay for evaluation of transgenic orchid plants for virus resistance; and 5) to prepare the presentation of research findings in poster and/or paper for publication.

In the past few years, the collaboration between HARC and WCC has generated tremendous impact in several students from WCC in terms of their learning modern biotechnology, finding employment, and advancing to institutes offering high degrees. The following is the list of ASC in Plant Biotechnology graduates from WCC who have been trained in a number of research projects through this collaboration and have been employed by HARC:

1. Natalie Kong: Worked on the project entitled 'Transgenic orchids', Fall 2002 (received M.Sc in MBBE and Doctor of Medicine from UHM).
2. Greg Osterman: 2003. Biology major at UHH and worked for HARC and USDA ARS as a biology technician.
3. Erin Yafuso: 2003. She has received M.Sc in MBBE and worked at HARC. Currently a lecturer at Windward Community College.
4. Waiete Williams: Researched in 'Transgenic Orchids via Gene Bombardment', 2003-2004, and worked at HARC.
5. Anolani Badua: 2004-2005. Researched on 'CyMV Resistant Gene Transformation in Orchids via Agrobacterium tumefaciens'. She has received B.Sc in Biology and B.Sc. in Pre-med from HPU, and Doctor of Pharmacy from Loma Linda University, San Diego.
6. Tracy Peters: 2004-2005. She is pursuing a B.Sc in Biology at UHM.
7. Kimberley Chinen: Researched on 'Agrobacterium-mediated Transformation of Blic. Raye Holmes Mendenhall Protocorm-Like Bodies to Confer Resistance to Orchid Cymbidium Mosaic Virus'. 2006-2007. She is pursuing Biology degree at UHM.
8. Alisa Sheriff: 2009. She presented a poster titled "Agrobacterium/-Mediated Transformation of Brassolaeliocattleya Raye Holmes 'Mendenhall' Protocorm-Like Bodies to Confer Resistance to Cymbidium Mosaic Virus" at the 3rd Scientific Conference on Andean Orchids, Quito, Ecuador, February 4-8, 2009. She received B.Sc in Biochemistry from HPU.

Best wishes!



Y. Judy Zhu



Cindy Goldstein, Ph D
Pioneer Hi-Bred International
Pioneer Waialua Parent Seed
PO Box 520
Waialua, HI 96791

August 1, 2011

To Whom It May Concern,

It is my pleasure to provide this letter of support on behalf of Pioneer Hi-Bred International as an industry partner affirming the importance of these proposed Windward Community College programs. Pioneer Hi-Bred sees great long-term value for Hawaii's seed industry, agriculture and technology sectors in development of the Plant Biotechnology program.

The seed industry is one of the few growth areas of our economy in Hawaii. Pioneer Hi-Bred International has expanded our operations and number of employees on Oahu and Kauai over the past decade and especially in the past 3 years. We have experienced difficulty in identifying and hiring employees with the educational background we seek for our positions and are very interested in having Windward Community College offer program that provides training to fulfill our demand for future job candidates in the area of agriculture science and plant biotechnology. Pioneer currently employees approximately 325 employees in Hawaii, with approximately 120 positions added in the past 3 years. We expect to recruit in the range of 40 to 50 full time employees in the next 3 years. Pioneer Hi-Bred is a committed industry partner that supports Windward Community College's goals and strategies. We feel that training a highly qualified, "home grown" workforce is key to developing a strong, sustainable economy in Hawai'i. To demonstrate our support, Pioneer Hi-Bred International is prepared to provide science-based presentations to students in classes offered as part of these programs as well as information and presentations about career opportunities and preparation for becoming well qualified job candidates. Pioneer is prepared to help place trained and qualified workers into our work force, especially students with an educational background in plant science, technology, and biotechnology.

We look forward to seeing course programs offered by Windward Community College and the opportunity to be involved as a community business partner and future employer of program graduates.

Sincerely,

Cindy Goldstein, Ph. D
Business and Community Outreach Manager
Pioneer Hi-Bred International, Inc

Donna "Sweetie" Kuehu
4473 Likini St.
Honolulu, HI 96818
dkuehu@hawaii.edu

August 10, 2011

Ingelia White, PhD
Prof. Botany/Microbiology
Coordinator, Plant Biotechnology Program
Chair, Department of Natural Sciences
Windward Community College
45-712 Keaahala Road
Kaneohe, HI 96744

Re: Certificate of Achievement in Agripharmatech

Dear Dr. White,

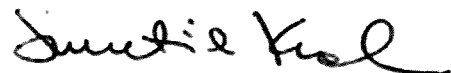
I would like to express my gratitude for your strong support and commitment to providing education, research and training at Windward Community College offered through the Plant Biotechnology Program. The Certificate of Achievement in Agripharmatech curriculum provides valuable exposure to opportunities beyond the community college, whether it is in the workplace, the market place, or an advanced educational pursuit.

The scientific training acquired in plant molecular genetics, and plant pharmacognosy studies provides a competitive edge in the workforce, and are the same skills required to operate a successful agribusiness for anyone interested in the challenges and rewards of entrepreneurship. It also provides a firm foundation for an advanced degree program at the University of Hawaii at Manoa, or any other four year program.

The program has been found to meet a wide variety of interests as indicated by the diversity of the students enrolled in the courses. Each student that I have met including myself have a vision of where the Certificate of Achievement will lead them in their future, and I have enjoyed the quality of instruction and student participation in the program.

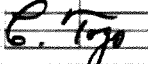
Thank you again for your devotion to providing a level of education that has a positive impact on peoples lives.

Sincerely,



Sweetie Kuehu

Appendix 11. Academic cost and revenue 2012 - 2014

	A	B	C	D	E	F	G	H	I	J	K	
1	Academic Cost and Revenue Template - New Program (adjust template for appropriate number of years) (Updated 09/06/11)											
2												
3	ENTER VALUES IN YELLOW CELLS ONLY											
4	CAMPUS/Program			Windward CC								
5	Provisional Years (2 yrs for Certificate, 3 yrs for Associate Degree, 6 yrs for Bachelor's Degree, 3 yrs for Masters Degree, 5 yrs for Doctoral Degree)											
6			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6				
7	ENTER ACADEMIC YEAR (i.e., 2011-2012)											
8	Students & SSH											
9	A. Headcount enrollment (Fall)			16	18							
10	B. Annual SSH			384	432							
11												
12	Direct and Incremental Program Costs Without Fringe											
13	C. Instructional Cost without Fringe			\$ 35,750	\$ 40,788							
14	C1. Number (FTE) of FT Faculty/Lecturers			0.65	0.72							
15	C2. Number (FTE) of PT Lecturers			-	-							
16	D. Other Personnel Costs			\$ 22,000	\$ 22,660							
17	E. Unique Program Costs			\$25,000	\$ 25,000							
18	F. Total Direct and Incremental Costs			\$ 82,750	\$ 88,448							
19												
20	Revenue											
21	G. Tuition			\$ 38,784	\$ 45,792							
22	Tuition rate per credit			\$ 101	\$ 108							
23	H. Other			\$ 95,851	\$ 103,730							
24	I. Total Revenue			\$ 134,635	\$ 149,522							
25												
26	J. Net Cost (Revenue)			-51,885	-61,074							
27												
28												
29												
30	Program Cost per SSH With Fringe											
31	K. Instructional Cost with Fringe/SSH			\$ 126	\$ 127							
32	K1. Total Salary FT Faculty/Lecturers			\$ 35,750	\$ 40,788							
33	K2. Cost Including Fringe of K1			\$ 48,263	\$ 55,064							
34	K3. Total Salary PT Lecturers			\$ -	\$ -							
35	K4. Cost Including fringe of K3			\$ -	\$ -							
36	L. Support Cost/SSH			\$ 304	\$ 304							
37	Non-Instructional Exp/SSH			\$ 264	\$ 264							
38	System-wide Support/SSH			\$ 40	\$ 40							
39	Organized Research/SSH			\$ -	\$ -							
40	M. Total Program Cost/SSH			\$ 430	\$ 431							
41	N. Total Campus Expenditure/SSH			\$ 439	\$ 439							
42												
43	Instruction Cost with Fringe per SSH											
44	K. Instructional Cost/SSH			\$ 126	\$ 127							
45	O. Comparable Cost/SSH			\$ 243	\$ 243							
46	Program used for comparison.			1 CC Technology Program			2/13/12					
47												
48	Reviewed by campus VC for Administrative Affairs: (signature and date) 											
49	Instructions											
50	Please include an explanation of this template in your narrative.											
51	A. Headcount Enrollment: Headcount enrollment of majors each Fall semester. Located at http://www.hawaii.edu/iro/maps.php?category=Enrollment Campus data may be used when majors are a subset of enrollment reported in IRO reports.											
52	B. Annual SSH: Course Registration Report located at uri: http://www.hawaii.edu/iro/maps.php?title=Course+Registration+Report Add the SSH for the Fall and Spring reports to obtain the annual SSH. This is all SSH taught by the program, including to non-majors. Adjust if majors are subset of SSH reported.											
53	C. Instructional Cost without Fringe (automated calculation): Direct salary cost for all faculty and lecturers teaching in the program. *Formula for column D: =IF(OR(D32<>"",D32+D34,""),D32+D34,"")											
54	C1. Number of full time faculty and lecturers who are >.5 FTE.											
55	C2. Number of part time lecturers who are <.5 FTE.											
56	D. Other Personnel Cost: Salary cost (part or full time) for personnel supporting the program (APT, clerical lab support, advisor, etc.) This includes personnel providing necessary support for the program who may not be directly employed by the program and may include partial FTEs. Add negotiated collective bargaining increases and 4% per year for inflation thereafter.											
57	E. Unique Program Cost: Costs specific to the program for equipment, supplies, insurance, etc. For provisional years, this would be actual cost. For established years, this would be projected costs using amortization for equipment and add 4% per year for inflation thereafter.											
58	F. Total Direct and Incremental Cost: C + D + E *Formula for column D: =IF(OR(D13<>"",D16<>0,D17<>0),SUM(D13,D16,D17,""))											
59	G. Tuition : Annual SSH X resident tuition rate/credit *Formula for column D: =IF(D10>0,D10*D22,"")											
60	H. Other: Other sources of revenue including grants, program fees, etc. This should not include in-kind contributions unless the services or goods contributed are recorded in the financial records of the campus and included in Direct and Incremental Costs in this template.											
61	I. Total Revenue: G + H *Formula for column D: =IF(OR(D21<>"",D23<>0),SUM(D21,D23,""))											
62	J. Net Cost: F - I This is the net incremental cost of the program to the campus. A negative number here represents net revenue (i.e., revenue in excess of cost.) If there is a net cost, please explain how this cost will be funded. *Formula for column D: =IF(AND(D18<>"",D24<>""),D18-D24,"")											
63	K. Instructional Costs with Fringe/SSH: (K2 + K4) / B *Formula for column D: =IF(D10<>""),(SUM(D33,D35)/D10,"")											
64	K1. Salaries without Fringe of Full Time Faculty and Lecturers who are > .5 FTE based on FTE directly related to the program. Add negotiated collective bargaining increases and 4% per year for inflation thereafter.											
65	K2. K1 X 1.35 Formula for column D: =IF(D32=""",D32*1.35)											
66	K3. Salaries without Fringe for Lecturers who are < .5 FTE based on FTE directly related to the program. Add negotiated collective bargaining increases and 4% per year for inflation thereafter.											
67	K4. K3 X 1.05 Formula for column D: =IF(D34=""",D34*1.05)											
68	L. Support Cost/SSH: The campus' non instructional expenditure/ssh + systemwide support - organized research (UHM only) as provided by UH Expenditure Report (http://www.hawaii.edu/budget/expense.html) *Formula for column D: =IF(OR(D37>0,D38>0,D39>0),D37+D38-D39,"")											
69												
70	For example, from the 2009-10 UH Expenditure Report, the support expenditure/ssh per campus is:											
71												
72	UHM \$450.00 + \$56 - \$131 for organized research = \$375											
73	UHH \$369.00 + \$42 = \$411											
74	UHWO \$210.00 + \$31 = \$241											
75	Haw CC \$164.00 + \$37 = \$201											
76	Hon CC \$233.00 + \$46 = \$279											
77	Kap CC \$119.00 + \$29 = \$148											
78	Kau CC \$359.00 + \$64 = \$423											
79	Lae CC \$123.00 + \$27 = \$150											
80	Maui CC \$163.00 + \$36 = \$199											
81	Win CC \$277.00 + \$41 = \$318											
82												
83	M. Total Program Cost/SSH: K + L *Formula for column D: =IF(OR(D31<>"",D36<>""),D31+D36,"")											
84	N. Total Campus Expenditure/SSH: Taken from UH Expenditures Report For example, for 2009-2010: UHM = \$923-131 (organized research) = \$792, UHH = \$682, UHWO = \$501, HawCC = \$408, HonCC = \$505, KapCC = \$316, KauCC = \$703, LaeCC=\$300, Maui CC=\$396, WinCC=\$457											
85	O. Comparable Program/Division Instructional Cost/SSH: Taken from UH Expenditures Report (http://www.hawaii.edu/budget/expense.html) or campus data, as available. Please note in the space provided, the program used for the comparison.											
86												
87	Rev. 09/06/11											