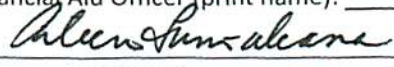


UNIVERSITY OF HAWAI'I  
CODE REQUEST FORM FOR ACADEMIC PROGRAM CODES

REQUESTOR CONTACT INFORMATION	
Date: January 9, 2012	Effective term of request (Semester-Year): Spring 2012
Name: Michael Reese	Title: Assistant Professor of Chemistry
Campus: Leeward Community College	Office/Department: Math & Sciences Division
Phone: 455-0263	Email: mreese@hawaii.edu

1. PROGRAM CODE, MAJOR CODE, CONCENTRATION CODE		Banner forms: SMAPRLE, SOACURR, STVMAJR
Institution/Campus: Leeward CC	College:	Department: Math & Sciences
<input checked="" type="checkbox"/> New program code <input type="checkbox"/> Change/replace existing program code:		
For new certificates approved by the Chancellor, the related BOR authorized academic program is: N/A		
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: Associate in Science in Natural Sciences w/ Concentrations...	Certificate:	
If requesting an existing Major code and/or Concentration code in Banner:		
Existing Major:	KCC AS-NS	Existing Concentration:
<small>Code</small>	<small>Description</small>	<small>Code</small> <small>Description</small>
If requesting a new <input type="checkbox"/> Major code or <input type="checkbox"/> Concentration code that does not exist in Banner:		
New Code [4 char/space limit]:	Description [30 char/space limit]:	
If a similar major/concentration code exists in Banner, please list the code:		
Is this major/concentration code being used the same way at other UH campuses? KCC's AS-NS with Concentrations in Life Sci and Physical ...		
Is this program/major/certificate financial aid eligible?	Financial Aid Officer (print name): Aileen Lum-Akana	
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <small>(Financial Aid Officer consultation required for all new program codes)</small>	 Signature	01-09-12 Date
<small>Email/memo in lieu of signature may be attached</small>		

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

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				
If changing/replacing an existing program code, are current students "grandfathered" under the old code? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Will the old program code be available for:	<b>Banner Module</b>	<b>Yes</b>	<b>No</b>	<b>Ending Term (Semester-Year)</b>
	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"/>	_____

<b>2. NEW COLLEGE, DIVISION, OR DEPARTMENT CODE</b>		Banner forms: STVCOLL, STVDIVS, STVDEPT
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]:	

<b>3. NEW COURSE SUBJECT CODE (Subject Alpha)</b>		Banner form: STVSUBJ
College:	Department:	
Subject code [4 char/space limit]:	Subject description [30 char/space limit]:	

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



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

Please briefly describe your request and explain why you are requesting the code(s):  
Associate in Science in Natural Sciences w/ Concentrations in Life Science, Physical Science, or Engineering

**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)
- Other: \_\_\_\_\_

**CAMPUS VERIFICATION**

Requestor Signature *Michael Revere* Date 1/9/2012

Registrar Warren Mau *Warren Mau* 1/9/12  
(If different from Requestor) Print name Signature Date  
Email/memo in lieu of Registrar's signature may be attached

For Community Colleges, verification of consultation with OVPCC Academic Affairs: Email/memo in lieu of signature may be attached

*Peter Quigley* *Peter Quigley* 1-10-12  
Print name Signature Date

**Send completed form and supporting documentation to:**

Institutional Research and Analysis Office (IRAO)  
1633 Bachman Place  
Sinclair Annex 2, Room 4  
Honolulu, HI 96822

Email: iro-mail@lists.hawaii.edu  
Fax: 808-956-9870  
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.



APPROVED BY BOR 11/30/11

c: J.Itano  
P.Imada Iboshi  
D.Mongold



RECEIVED  
UNIVERSITY of HAWAI'I\*  
**LEEWARD**  
COMMUNITY COLLEGE

Office of the Chancellor

UNIVERSITY OF HAWAII  
BOARD OF REGENTS

November 3, 2011 HAWAII  
PRESIDENT'S OFFICE

11 NOV 21 2011

MEMORANDUM

TO: Eric K. Martinson  
Chairperson, Board of Regents

VIA: John Morton  
Vice President for Community Colleges

VIA: M.R.C. Greenwood  
President

FROM: Manuel J. Cabral  
Chancellor

SUBJECT: Request to provisionally approve the establishment of the Associate in Science in Natural Science degree with a Concentration in Life Science, Physical Science, or Engineering at Leeward Community College

SPECIFIC ACTION REQUESTED:

Approval by the Board of Regents to establish an Associate in Science in Natural Science (AS-NS) degree with a concentration in Life Science, Physical Science, or Engineering, a new provisional degree program.

ADDITIONAL COST:

All classes within the proposed degree program are currently taught. Initially, it will not be necessary to add additional classes as the program will draw from students already enrolled in Science, Technology, Engineering and Mathematics (STEM). Hence there will be no additional cost in terms of facilities, equipment, and personnel. As the program grows, it may be necessary to add more classes. Costs for these additional classes would be met in part by the additional tuition generated and from the UH Community College Enrollment Incentive fund that provides for additional funding where the College demonstrates there has been enrollment growth.

96-045 Ala 'Ike  
Pearl City, Hawai'i 96782-3393  
Telephone: (808) 455-0215  
Fax: (808) 455-0641

RECOMMENDED EFFECTIVE DATE:

Spring 2012

PURPOSE:

The requested action will establish a 60 credit Associate in Science in Natural Science degree in order to provide the first two years of a baccalaureate program in STEM related fields. The degree program will allow the College to identify students interested in STEM fields, provide focused services in academic support and counseling to increase student success, and provide for smoother transfer for students into STEM majors at four year institutions.

BACKGROUND INFORMATION:

There are currently two UH colleges with similar degree programs: Kapiolani Community College and UH Maui College. Provisional programs were approved for KapCC in 2007 and UHMC in 2010. A permanent AS-NS degree was approved for KapCC in July 2011. The success of the KapCC and UMC programs has established that the AS-NS is a viable strategy for promoting student success and transfer for STEM fields. The Leeward Community College AS-NS proposal is patterned after these two degree programs but includes a third concentration in Engineering. This addition reflects a new emphasis in expanding student transfers to the UH Manoa College of Engineering. On May 12<sup>th</sup>, 2011, the ATP (Authorization to Plan) for Leeward Community College's AS-NS degree was submitted to the Council of Chief Academic Officers and endorsed by that body on July 13<sup>th</sup>, then by the Chancellor of Leeward Community College the same day. The AS-NS proposal itself was produced by the faculty of the Math & Sciences division, then reviewed and approved by the campus' Curriculum Committee and the Faculty Senate.

Because of the priority given to STEM education both at the national and state levels and the success of the AS-NS degree, there is strong interest from the other UH Community Colleges in establishing similar programs. The Office of the Vice President for Community Colleges has held discussions to facilitate this effort. The outcome was that the Community Colleges would work on coordinated AS-NS proposals to be submitted next year. However, it was decided that Leeward CC should proceed with its AS-NS proposal now since the proposal was farther along than the other colleges and students have been identified at LeeCC who would benefit immediately from an approved AS-NS degree.

In accordance with BOR policy governing Academic Affairs, Section 5-1a, Leeward Community College requests BOR approval to provisionally establish an Associate in Science in Natural Science degree with a concentration in Life Science, Physical Science, or Engineering.

The proposed AS Degree will directly address three of the five major goals of the UHCC Strategic Plan 2002-2010, Updated 2008-2015. Those include:

- **GOAL A: Promote Learning & Teaching for Student Success**  
B. Hawaii's Educational Capital - Increase the educational capital of the state by increasing the participation and completion of students, particularly low-income students and those from underserved regions.
- **GOAL B: Functions as a Seamless State System**  
B. Address critical workforce shortages and prepare students for effective engagement and leadership in a global environment.
- **GOAL C: Promote Workforce and Economic Development**  
C. Contribute to the state's economy and provide a solid return on its investment in higher education through research and training.

At Leeward CC, the demand for such a program has been expressed verbally by students to their instructors and demonstrated by enrollment numbers. From the years 2006 to 2010, between 260 to over 300 students have enrolled each year in upper level Math and Science courses at the College. Courses such as Chemistry 161B and 162B; Math 205, 206, 241, and 242; Physics 171 and 272; Biology 171 and 172; and others are not required for Leeward CC's Associate of Arts degree, but are required for students who intend on transferring into a STEM related discipline at a baccalaureate degree granting institution. The need, therefore, for an AS-NS degree is firmly established both in terms of a national, state and university mandate and student interest.

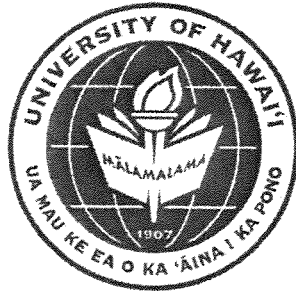
**ACTION RECOMMENDED:**

Approval is recommended for the provisional establishment of the Associate in Science in Natural Science degree with a concentration in Life Science, Physical Science, or Engineering at Leeward Community College effective Spring 2012.

**Attachment**

*Leeward Community College's New Program Proposal for an Associate in Science in Natural Science Degree with a Concentration in Life Science, Physical Science, or Engineering.*

c: Executive Administrator and Secretary of the Board Amemiya



**UNIVERSITY of HAWAII  
LEEWARD COMMUNITY COLLEGE**

**New Program Proposal**

**Associate in Science (A.S.) Degree  
in Natural Science  
with a concentration in  
Life Science,  
Physical Science  
or  
Engineering**

Date of Proposal: Fall 2011  
Proposed Date of Implementation: Spring 2012



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## 1. What are the objectives of the Program?

The proposed new A.S. degree in Natural Science with concentrations in Life Science, Physical Science or Engineering at Leeward Community College will prepare students to transfer to baccalaureate STEM (Science, Technology, Engineering and Mathematics) programs with a recognized and supported pathway. The degree will allow Leeward Community College to better serve STEM students, as well as align our college's degree offerings with those of the other community college campuses.

### A. A STEM pathway for Leeward CC students

Leeward Community College currently teaches the majority of required classes for the first two years of study towards most four-year STEM degrees. Evidence of a large number of students at Leeward CC pursuing a baccalaureate STEM degree is found in the substantial enrollment in those classes. In addition, anecdotal evidence suggests that many of our students are pursuing four-year STEM degrees as each Math/Science faculty member knows of many students who have successfully transferred and completed their baccalaureate studies in STEM fields.

Several classes are required for all baccalaureate STEM degrees but not for the two-year AA degree offered by Leeward CC. Those courses include: Biology 171 and 172, Chemistry 161B and 162B; Math 205 and 206; Physics 272; and others. Enrollment in these classes, as shown below, is indicative of a substantial number of students who intend on pursuing a four-year STEM degree.

### Enrollments in STEM Classes-Leeward CC Academic Years 2006 -2010

Subject	Course	2006	2007	2008	2009	2010	Total
BIOL	171	15	40	30	36	39	160
	172	14	9	10	5	7	45
<b>BIOL Total</b>		29	49	40	41	46	205
CHEM	161B	89	102	94	106	97	488
	162B	37	42	33	34	44	190
<b>CHEM Total</b>		126	144	127	140	141	678
MATH	205	122	140	127	153	155	697
	206	90	76	64	64	75	369
<b>MATH Total</b>		212	216	191	217	230	1,066
PHYS	272	13	21	16	16	10	76
<b>Total</b>		380	430	374	414	427	2,025

The preceding table does not show the total number of students pursuing a four-year STEM degree, since many students were enrolled in more than one of these classes each semester. Shown below is the unduplicated number of students served each year. The true total number of students pursuing these STEM pathways is

greater, since there are students who have completed these introductory STEM courses and are currently only taking some of the more advanced courses, such as Engineering, Chemistry 272/273, and other classes fulfilling requirements for four-year STEM degrees.

<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
261	304	254	278	301

Many students spend several years at Leeward CC preparing to transfer to a STEM program. Eliminating the students who enrolled in subsequent years shows that between AY 2005-2006 and AY 2009-2010 Leeward Community College served more than 1,000 students in these courses appropriate for transfer to a four-year baccalaureate STEM program.

<b>Total STEM Students enrolled 2006 to 2010:</b>	1,093
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It is clear that from this data there are a substantial number of students pursuing this pathway.

There are also national trends that show the importance of a strong STEM program at the community college level. It is reported that an impressive 44% of students who successfully completed a bachelor's or master's degree in science or engineering at the beginning of this decade, attended a community college at some point in their education (C&EN, Chemical and Engineering News, Nov. 15, 2010). This was derived from analysis of the National Science Foundation NSF "Characteristics of Recent Science and Engineering Graduates: 2006" (<http://www.nsf.gov/statistics/nsf10318/start.cfm>) shown in Appendix C.

Students pursuing a four-year STEM program at Leeward CC have traditionally obtained an AA degree or transferred before obtaining any degree. While the Leeward CC AA degree does fulfill UH Mānoa General Education requirements, it requires a student to complete their entire baccalaureate Foundation and Diversification requirements during their first two years of study. STEM students entering at a four-year institution such as Mānoa typically complete their Foundation requirements during the first two years and Diversification requirements in years 2, 3, and 4. Students benefit from taking Diversification classes throughout their academic career rather than squeezing them into the first two years of study. STEM students benefit by being able to take more math and science courses during their first two years of study.

Former students have expressed to their Leeward CC professors that they had to take too many classes at Leeward CC that were not needed for their degree. They also state that they didn't have a variety of Diversification classes to take to balance their class schedule during the last years of study when they were enrolled in

demanding 300 and 400 level classes in their STEM field. STEM students on Financial Aid who transfer to a baccalaureate institution are required to take electives to fill their schedule and those non-STEM electives are a welcome change to the demands placed on those students by higher-level STEM courses in their later years of undergraduate studies.

Other specific groups of students will also benefit from an AS degree including those returning for a baccalaureate STEM degree after obtaining an AA or BA in other fields. In order to obtain financial aid, returning students who wish to change careers to a STEM field have found that they are not eligible for assistance unless they are pursuing a new degree. An AS degree would allow those students to be eligible for financial aid while they prepare to transfer to a four-year STEM program.

The following list shows many of the four-year STEM degrees available at UH Mānoa for which the proposed Leeward Community College AS degree is an appropriate first two years of study. The School of Ocean and Earth Science and Technology and the College of Tropical Agriculture and Human Resources require courses during the first two years of study that are not currently offered, such as a Meteorology course, MET 200, and others. As the AS-NS degree matures, we expect to identify the courses students need and will offer them if there is demonstrated demand.

#### College of Natural Sciences

Biology	Botany	Chemistry
Ethnobotany	Marine Biology	Mathematics
Microbiology	Molecular and Cellular Biology	
Physics	Zoology	

#### College of Engineering

Civil Engineering	Computer Engineering
Electrical Engineering	Mechanical Engineering

#### School of Ocean and Earth Science and Technology

Geology	Geology and Geophysics
Global Environmental Science	Meteorology

#### College of Tropical Agriculture and Human Resources

Animal Sciences  
Biological Engineering  
Food Science and Human Nutrition: Dietetics  
Food Science and Human Nutrition: Pre-Professional Option  
Food Science and Human Nutrition: Sports and Wellness Option  
Natural Resources and Environmental Management: Development and Policy  
Natural Resources and Environmental Management: Management and Conservation  
Plant and Environmental Biotechnology: Aquaculture and Animal Biotechnology  
Plant and Environmental Biotechnology: Environmental and Microbial Biotechnology

Plant and Environmental Biotechnology: General Biotechnology  
Plant and Environmental Biotechnology: Insect and Pathogen Biotechnology  
Plant and Environmental Biotechnology: Plant Biotechnology  
Plant and Environmental Protection Sciences  
Tropical Plant and Soil Sciences: Environmental Soil Sciences  
Tropical Plant and Soil Sciences: Genetics and Physiology  
Tropical Plant and Soil Sciences: Plant Production and Management  
Tropical Plant and Soil Sciences: Tropical Landscape Horticulture

### ***B. Student Learning Objectives***

Student Learning Objectives reflect the General Education Outcomes, Institutional Learning Outcomes, Program Outcomes, and Student Learning Outcomes found in the required general education courses, program courses, and natural science elective courses. The outcomes listed below are regularly assessed at the college, Division, Program, and course level.

The three pathways of Life Science, Physical Science, and Engineering share much of their curriculum and outcomes. The General Education Outcomes are met in part through the required completion of the majority of their baccalaureate General Education requirements. The Institutional Outcomes permeate all courses taught at the Leeward CC campus. The Program Outcomes are directly supported by the Student Learning Outcomes of the courses required in the AS-NS program. All are regularly assessed and reviewed.

#### **General Education Outcomes**

The following outcomes and academic skill standards represent the minimum outcomes expected of students who have completed their general education experiences. Each course included in the general education curriculum should address at least one of these academic skill standards.

#### **Critical Thinking**

Make critical judgments and apply critical reasoning to address challenges and solve problems.

1. Identify and state problems, issues, arguments and questions contained in a body of information.
2. Identify and analyze assumptions and underlying points of view relating to an issue or problem.
3. Evaluate a problem, distinguishing between relevant and irrelevant facts, opinions and assumptions through the use of appropriate evidence.
4. Synthesize information from various sources, drawing appropriate conclusions.
5. Demonstrate fundamental concepts intrinsic to aesthetic appreciation.
6. Demonstrate the understanding of the relationship between cause and effect.



### **Technology and Information Literacy**

Make informed choices about uses of technology and information literacy for specific purposes.

1. Identify and define an information need.
2. Access information effectively and efficiently.
3. Make informed choices about technology.
4. Evaluate information and its sources for accuracy and authenticity.
5. Incorporate information into their knowledge base to accomplish a specific purpose.
6. Collect and present information ethically and legally, with an understanding of socio-economic issues.

### **Oral Communication**

Gather information appropriately and communicate clearly both orally and in writing.

1. Identify and analyze the audience and purpose of any intended communication.
2. Gather, evaluate, select, and organize information for the communication.
3. Use language, techniques, and strategies appropriate to the audience and occasion.
4. Speak clearly and confidently, using the voice, volume, tone, and articulation appropriate to the audience and occasion.
5. Summarize, analyze, and evaluate oral communications and ask coherent questions as needed.
6. Use competent oral expression to initiate and sustain discussions.

### **Quantitative Reasoning**

Use numerical, symbolic, or graphical reasoning to interpret information, draw valid conclusions, and communicate results.

1. Apply numeric, graphic, and symbolic skills and other forms of quantitative reasoning accurately and appropriately.
2. Demonstrate mastery of mathematical concepts, skills, and applications, using technology when appropriate.
3. Communicate clearly and concisely the methods and results of quantitative problem solving.
4. Formulate and test hypotheses using numerical experimentation.
5. Define quantitative issues and problems, gather relevant information, analyze that information, and present results.
6. Assess the validity of statistical conclusions.

### **Written Communication**

Use writing to discover, develop, and communicate ideas appropriately.

1. Use writing to discover and articulate ideas.
2. Identify and analyze the audience and purpose for any intended

communication.

3. Choose language, style, and organization appropriate to particular purposes and audiences.
4. Gather information and document sources appropriately.
5. Express a main idea as a thesis, hypothesis, or other appropriate statement.
6. Develop a main idea clearly and concisely with appropriate content.
7. Demonstrate mastery of the conventions of writing, including grammar, spelling, and mechanics.
8. Demonstrate proficiency in revision and editing.
9. Develop a personal voice in written communication.

### **Arts, Humanities, and Sciences**

Understand the content and use the methodology of the major areas of knowledge: arts, humanities, natural sciences, and social sciences.

1. Participate in intellectual and aesthetic pursuits which encourage a creative and self-fulfilling existence.
2. Understand the humanities as a collection of disciplines that study human nature, culture, attitudes, and accomplishments.
3. Analyze the various attempts to explore the ethical and fundamental questions of life.
4. Understand basic, general scientific laws, theories, concepts, and terminology from the biological and physical sciences, including their origins and universality.
5. Use scientific laws, theories, concepts, mathematics, and data sufficiently well to determine the validity of experimental procedures, devise experiments to test hypotheses, and interpret results of experimentation.
6. Understand the scientific method, and that experimental results used to support theories, concepts, and laws must be repeatable.
7. Possess the knowledge and ability to use the tools of science.
8. Understand the scientific nature of the social sciences.
9. Describe the alternative theoretical frameworks used to explain social phenomena.
10. Analyze select units of the social sciences using various analytical or theoretical models: social interactions, individuals, families, organizations, communities, spatial relations, (geography), economies, governments, cultures, or societies.

### **Cultural Diversity and Civics:**

Appreciate the values and beliefs of diverse cultures and recognize responsibility for local, national, and global issues.

1. Enhance diversity and promote cross-cultural understanding.
2. Examine critically and appreciate the values and attitudes of one's own culture and of other cultures.
3. Evaluate the ethics of select issues in relation to various groups and cultures.

4. Make informed and principled decisions with respect to individual conduct, the community, and the environment.
5. Appreciate common human bonds that encourage a sense of civic purpose and responsible citizenship.
6. Assume responsibility for one's own creations, assertions, decisions, and values.

## **Institutional Learning Outcomes**

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

Our graduates are able to examine, integrate, and evaluate the quality and appropriateness of ideas and information sources to solve problems and make decisions in real world situations.

### **Written, Oral Communication and Use of Technology**

Our graduates are able to use written and oral communication and technology to discover, develop, and communicate creative and critical ideas, and to respond effectively to the spoken, written, and visual ideas of others in multiple environments.

### **Values, Citizenship, and Community**

Our graduates, having diverse beliefs and cultures, are able to interact responsibly and ethically through their respect for others using collaboration and leadership. Our graduates are able to engage in and take responsibility for their learning to broaden perspectives, deepen understanding, and develop aesthetic appreciation and workforce skills.

## **Program Learning Outcomes**

Upon graduation, students will be able to:

1. analyze effectively
2. communicate scientific ideas and principles clearly and effectively
3. evaluate the aims and methods of science
4. analyze and apply fundamental mathematical, physical, and chemical concepts and techniques to scientific issues
5. analyze and apply fundamental concepts and techniques in their chosen field of study, such as biology, chemistry, geology, engineering, etc.
6. use computer technology to analyze and to present experimental results

## 2. Are the program objectives appropriate functions of the college and University?

### A. UHCC and Leeward CC Strategic Plan Goals

The proposed AS Degree will directly address three of the five major goals of the UHCC Strategic Plan 2002-2010, updated 2008-2015. The *Leeward CC Strategies*, cited from the Leeward CC Strategic Plan 2002-2010, updated 2008-2015, are action plans that the campus will implement to achieve those stated outcome goals. Following the Goals and Strategies are explanatory remarks in italics.

### **GOAL A: Promote Learning & Teaching for Student Success**

- B. Hawaii's Educational Capital - Increase the educational capital of the state by increasing the participation and completion of students, particularly low-income students and those from underserved regions.
  - B5. Increase by 3% per year the number of students who successfully progress and graduate, or transfer to baccalaureate institutions, while maintaining the percentage of transfers who achieve a first year GPA of 2.0 or higher at the transfer institution.

#### ***Leeward CC Strategies***

- a. Increase student awareness and use of campus support services to facilitate student engagement, progress, graduation, and transfer.
- b. Develop non-traditional learning environments to support students.
- c. Develop a comprehensive intervention strategy for students on academic warning and unsatisfactory academic progress.

*The AS-NS program allows the college to identify STEM students and to provide them with the assistance and support they need for academic success. STEM programs are an excellent place to implement non-traditional learning environments such as peer tutoring, community based learning, and problem based learning.*

### **GOAL B: Functions as a Seamless State System**

- B. Address critical workforce shortages and prepare students for effective engagement and leadership in a global environment.
  - 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 of Hawai'i shortage of qualified workers, or where the average annual wage is at or above the U.S. Average.

**Leeward CC Strategies**

- b. Articulate associate degrees with baccalaureate programs in shortage areas at UH and other 4-year campuses to shorten time to degree.
- c. Increase the number of students earning degrees or certificates by developing an advising model that closely monitors student academic progress and facilitates student access to advising information and assistance.

*The AS-NS program provides a clear pathway to properly prepare students for transfer to a baccalaureate STEM program. This will reduce the number of credits a student typically takes before transfer. The program will increase the number of degrees awarded by Leeward CC since STEM students often transfer before obtaining a degree at Leeward CC.*

- 3. Increase by 6% per year degrees/certificates awarded in Science Technology, Engineering, and Math (STEM) fields.

**Leeward CC Strategies**

- a. Develop degrees and/or certificates conferred in STEM fields.
- b. Articulate associate degrees and/or certificates with baccalaureate programs in STEM fields at UH and other 4-year campuses to shorten time to degree.
- c. Enhance partnerships with high schools to attract students interested in STEM fields.
- d. Increase the number of students earning degrees or certificates in STEM fields by developing an advising model that closely monitors student academic progress and facilitates student access to advising information and assistance.

*The AS-NS program directly addresses the need for the development and awarding of STEM degrees. Program requirements were designed with UH Manoa and UHCC faculty to ensure articulation. Identifying STEM students allows the college to properly advise and to monitor student progress.*

**GOAL C: Promote Workforce and Economic Development**

- C. Contribute to the state's economy and provide a solid return on its investment in higher education through research and training.
  - 1. Increase by 3% per year the level of extramural fund support expended.

**Leeward CC Strategies**

- b. Identify areas that would generate extramural funds.
- c. Implement strategies to increase targeted extramural funds.
- d. Develop partnerships with business and industry.

*The AS-NS degree program allows the college to apply for funding currently available through government and private entities to support STEM programs.*



## **B. Leeward CC Mission Statement**

The proposed AS-NS program addresses the majority of the Mission Statement of Leeward Community College. Following each Mission Statement are explanatory remarks in italics.

### **MISSION**

**Access:** To broaden access to post-secondary education in Hawai'i, regionally, and internationally by providing open-door opportunities for students to enter quality educational programs within their own communities.

*The program provides "Access" (Mission Statement #1) by providing pathways towards baccalaureate science degrees for Leeward Community College Students.*

**Learning and Teaching:** To specialize in the effective teaching of remedial/developmental education, general education, and other introductory liberal arts, pre-professional, and selected baccalaureate courses and programs, with the goal of seamless system articulation and transfer, where appropriate. To structure our programs in such a way that they reflect not only academic rigor but also student development, learning outcomes and student goals.

*The program provides "Learning and Teaching" (Mission Statement #2) with "seamless system articulation and transfer" by providing pathways towards baccalaureate science degrees for Leeward Community College Students.*

**Work Force Development:** To provide the trained workforce needed in the State, the Asia-Pacific region, and internationally by offering occupational, technical, and professional courses and programs, which prepare students for immediate and future employment and career advancement.

*The program provides "Work Force Development" (Mission Statement #3) by providing pathways towards baccalaureate STEM degrees for Leeward Community College Students.*

**Personal Development:** To provide opportunities for personal enrichment, occupational upgrading, and career mobility through credit and non-credit courses and activities.

*The program provides "Personal Development" (Mission Statement #4) by providing pathways towards baccalaureate STEM degrees for Leeward Community College Students.*

**Community Development:** To contribute to and stimulate the cultural and intellectual life of the community by providing a forum for the discussion of ideas; by providing leadership, knowledge, problem-solving skills, and general informational services; and by providing opportunities for community members to develop their creativity and an appreciation for the creative endeavors of others.

*This program provides "Community Development" (Mission Statement #5) by graduating STEM majors who will provide leadership, knowledge, and problem-solving skills.*

**Diversity:** To build upon Hawaii's unique multicultural environment and geographic location, through efforts in curriculum development, and productive relationships with international counterparts, students' learning experiences will prepare them for the global workplace, with particular emphasis on Asia and the Pacific Rim.

*This program provides "Diversity" (Mission Statement #6) by providing supported pathways for the unique and diverse student body of Leeward CC, preparing them to become capable employees for the local and global workplace.*

### 3. How is the program organized to meet its objectives?

#### A. Leeward CC's Proposed AS in Natural Science Degree

The proposed AS in Natural Science degree at Leeward CC is designed to match the requirements found in the AS degrees at Kapi'olani CC and UH Maui College. The common requirements will provide continuity through the UH system while also serving the needs of Leeward CC STEM students. While the Kapi'olani AS-NS degree offers two pathways, Life Science and Physical Science, the proposed Leeward CC AS-NS degree also includes an Engineering pathway to address the needs of engineering students. The general outline is presented below with the details found in the Graduation Checklist in Appendix D.

<b>General Education Requirements</b> Foundation 13 credits FW – 3 cr. FS – 4 cr. FG – 6 cr. Diversification 10 - 13 credits DS – 3 cr. DA/DH/DL – 3 cr. DB – 3 cr. (not for Engineering) DP –CHEM 161 - 3 cr. DY – CHEM 161L - 1 cr.	<b>23 - 26 credits</b>
<b>Additional Requirements</b> ICS 101 - 3 cr. CHEM 162 - 3 cr. CHEM 162L 1 cr. (not for Engineering)	<b>6-7 credits</b>
<b>Concentration Requirements</b> Life Science - 5 credits Physical Science - 13 credits Engineering – 22 or 23 credits	<b>5 - 23 credits</b>
<b>Natural Science Electives</b>	<b>8 - 22 credits</b>
<b>Focus</b> 1 Hawaiian/Asian Pacific (HAP) course 2 Writing Intensive Courses	
<b>Total Minimum Credits</b>	<b>60 credits</b>

The proposed AS-NS Degree will fulfill most of the General Education Core Requirements at UH Mānoa. The curriculum will require a minimum of 60 credits of

100- and 200- level courses as specified below. Students must have a minimum 2.0 grade point average (GPA) in courses required for the degree.

The Leeward CC AS-NS degree will use the same Diversification (Dx) and Foundation (Fx) designations already in use and articulated with UH Mānoa. The Foundation and Diversification requirements are designed to correspond to any Mānoa qualified course and the actual courses accepted will change as new courses are developed and qualified for the Foundation and Diversification categories.

The Foundation requirements will be met in full, including Symbolic Reasoning (FS, 3 credits/1 course), Written Communication (FW, 3 credits, 1 course), and Global & Multicultural Perspectives (FG, 6 credits, 2 courses).

The majority of Diversification Requirements will be met, including Biological (DB, 3 credits, 1 course except Engineering), Physical (DP, 3 credits, 1 course), and Laboratory (DY, 1 credit, 1 course). Half of the Diversification Arts, Humanities, and Literature (DA/DH/DL, 2 courses, 6 credits) and Social Sciences (DS, 2 courses, 6 credits) will be met with 1 course required of each. This leaves 2 Diversification courses (1 DA/DH/DL and 1 DS) to be completed during the last two years of study towards the completion of a STEM baccalaureate degree.

All AS-NS students must complete Additional Requirements including a second semester of Chemistry and a Computer Competency requirement fulfilled by ICS 101. Students will also take specific Concentration Requirements appropriate for their major depending on their Pathway (Life Science, Physical Science, or Engineering).

Life Science		Physical Science		Engineering	
Biol 171L	1 cr.	Math 206	4 cr.	Math 206	4 cr.
Biol 172	3 cr.	Phys 170	4 cr.	Phys 170	4 cr.
Biol 172L	1 cr.	Phys 170L	1 cr.	Phys 170L	1 cr.
		Phys 272	3 cr.	Phys 272	3 cr.
		Phys 272L	1 cr.	Phys 272L	1 cr.
				Math 231	3 cr.
				Math 232	3 cr.
				EE 211 or CE 270	4 cr./3 cr.

Students will also complete Natural Science Elective courses appropriate for their field of study to earn the 60 credits needed to fulfill the requirements for an AS-NS degree. Natural Science Elective courses are those that transfer to Mānoa and are appropriate for their baccalaureate STEM major. It is expected that this list will change over time just as the Foundations and Diversification qualified courses

change as courses are added, deleted, qualified and unqualified for transfer. A current list and further details are found in the Graduation Checklist in Appendix D.

### *B. Kapi'olani CC and UH Maui College AS-NS Degrees*

Kapi'olani CC currently offers an AS-NS degree (Appendix A) and Maui College has a recently approved AS-NS degree (Appendix B) to address the needs of four-year STEM students. The Kapi'olani AS-NS degree contains two pathways, a Physical Science and a Life Science concentration. Maui College has an AS-NS degree of similar structure. Both degrees require 60 credits of study with similar and comparable class requirements.

Kapi'olani CC found that more than 100 students declared themselves as AS in Natural Science majors during 2009-2010, the second year of their program. They expect further increases in subsequent semesters and believe that there are even more students following these pathways and pursuing a four-year STEM degree without formally declaring a major as a community college student. Simply having the program in place allows students to more easily follow pathways towards their desired STEM degree. Kapi'olani CC has also found that the AS degree provided a framework on which a large NSF grant proposal could be built to support STEM students, ultimately leading to a STEM Education Center with dedicated counseling, advising, and tutoring.

The requirements and outcomes of the proposed Leeward CC AS-NS degree are essentially the same as those of the AS-NS degree offered at Kapi'olani CC and UH Maui College. All AS-NS degrees meet the same General Education requirements.

The Kapi'olani CC AS-NS degree and the proposed Leeward CC AS-NS degree do not meet all of the UH Mānoa Gen. Ed. requirements, but this is to be expected. Students will have to take one DA/DH/DL course and one DS course during their final two years of study to complete the General Education requirements, as well as additional specific college and program requirements.

The proposed Leeward AS-NS degree is presented below with comparisons to the Kapi'olani CC AS-NS degree and the UH Mānoa General Education requirements. As shown, the proposed AS in Natural Science degree for Leeward CC matches that offered by Kapi'olani CC. The requirements are outlined in detail in Appendix D the Graduation Checklist.



		Kapi 'olani CC AS-NS	Leeward CC AS-NS	UH Mānoa Gen. Ed. Requirements
Requirements		Foundations 13 cr.	Foundations 13 cr.	Foundations 12 cr.
	Credits	Diversification 10-13 cr.	Diversification 10-13 cr.	Diversification 19 cr.
Foundation 13 credits	4	FS – Math 205	FS – Math 205	FS
	3	FW	FW	FW
	3	FG	FG	FG
	3	FG	FG	FG
Diversification 10 - 13 credits	3	DS	DS	DS
	3	DA/DH/DL	DA/DH/DL (Speech 251 for Engineering)	DA/DH/DL (Speech 251 for Engineering)
	3	DB	DB (Not required for Engineering)	DB (Not Required for Engineering)
	3	DP – Chem 161	DP – Chem 161	DP
	1	DY – Chem 161L	DY – Chem 161L	DY
		not required	not required	DA/DH/DL
		not required	not required	DS
Additional 6 - 7 credits	3	CC – ICS 101	CC – ICS 101 (EE 150 for Engineering)	Not Required
	3	Chem 162	Chem 162	Major Requirement
	1	Chem 162L	Chem 162L (Not required for Engineering)	Major Requirement (Not required for Engineering)
Natural Science Concentration and Electives 27 - 31 credits	3	Natural Science	Natural Science	Major Requirement
	3	Natural Science	Natural Science	Major Requirement
	3	Natural Science	Natural Science	Major Requirement
	3	Natural Science	Natural Science	Major Requirement
	3	Natural Science	Natural Science	Major Requirement
	3	Natural Science	Natural Science	Major Requirement
	3	Natural Science	Natural Science	Major Requirement
	3	Natural Science	Natural Science	Major Requirement
	3	Natural Science	Natural Science	Major Requirement
	0-4	Natural Science	Natural Science	Major Requirement
Total Minimum Credits		60	60	
Focus		WI (2)	WI (2)	WI (5, 2 of 300+)
		HAP	HAP	HAP
		not required	not required	OC
		not required	not required	E
		not required	not required	2 years Haw or SL

#### **4. Who will enroll in the program?**

A substantial number of students at Leeward CC are pursuing four-year STEM degrees, as shown previously in the enrollment of STEM program courses. These students commonly either obtain an AA degree or transfer without any degree. It is expected that many of these students would become AS-NS students. Informal conversations with students reveal a strong interest in the program. They would appreciate the clarity of a structured pathway as well as any additional support offered towards helping them achieve their goals.

The AS-NS program will recruit students from two general sources - incoming freshmen seeking a baccalaureate STEM degree and students enrolled in science courses to fulfill diversification requirements. Incoming freshmen will be recruited via counseling and Leeward CC's catalog containing degree descriptions. Students will also be recruited from the college's introductory science courses that non-science majors take to fulfill Gen Ed diversification requirements. Non-science majors are commonly inspired by introductory science courses to major in a science. The college's introductory course instructors will be able to counsel students using the pathways that correspond with the students' specific interest and goals. The Leeward CC counselors and advisors have been consulted throughout the planning of the program and are well aware of the requirements and benefits. The Graduation Checklist was designed to mirror the format of the AA degree checklist so that the counselors are familiar with the format and will be able to offer appropriate advising to STEM students.

It is expected that an increasing number of STEM students will choose to pursue the AS-NS degree each year after implementation. Current enrollment in courses such as Chemistry 161 and Math 205 indicates that there are about 50 STEM students each semester or about 100 a year. We anticipate awarding 20 AS-NS degrees in the first year of the program and expect to increase that by 20 each year to achieve 100 degrees awarded each year by the 5<sup>th</sup> year after implementation.

## 5. What resources are required for program implementation and first cycle operation?

Initially there will be no additional cost in terms of facilities, equipment, and personnel, as this program will use already existing courses. Currently Leeward CC's Math & Science Division has 14 full-time faculty and 14 lecturers teaching 55 Natural Science classes appropriate for this degree. Within the Math & Science Division itself, there is a total of 37 full-time faculty and 26 lecturers teaching science and math classes that includes many remedial and complimentary science and math classes necessary to offer as part of an AS in Natural Science degree.

As the program grows, it may be necessary to add more classes. Costs for these additional classes would be met in part by the additional tuition generated and from the UH Community College Enrollment Incentive fund that provides for additional funding where the college demonstrates there has been enrollment growth.

In the Academic Cost and Revenues Analysis below, expenditures and revenue are projected for three years, Fall 2012 through Spring 2016; the rationale for the projections is provided below.

The **headcount enrollment (A)** and **annual SSH (B)** is calculated based on the estimate that there will be approximately 20 declared AS-NS majors in the first year taking an average of 15 credits a semester (most STEM courses are 3 credits each; a few BIOL, CHEM, and ZOOLOGY courses are 4 credits each). We are planning for an increase in AS-NS majors of 20 students each year for the next 3 years.

Calculations of **instructional costs without fringe (C)** will require only the current fulltime instructors/lecturers. As the fulltime load of an AS major is estimated at 30 credits (or 10 classes) a year and a fulltime UHCC instructor has a teaching load of 27 credits (or 9 classes) a year, each 20-student cohort of AS-NS majors will be taught by 1.11 FTE. Salary is based upon average yearly salary of Math & Science instructors multiplied by the FTE and applying UHPA collective bargaining increases where appropriate. **Other personnel costs (D)** are calculated by total support staff costs multiplied by the program SSH, divided by the total Math & Science SSH then prorated by the percentage of lab courses. **Unique program costs (E)** were calculated in a similar fashion by taking total supply costs for the Math & Science division and multiplying that by the program SSH, then divided by the total Math & Science SSH prorated by the percentage of lab courses.

Revenue generated by **tuition (G)** is based on the number of SSH multiplied by the applicable tuition; the tuition was based on the *Proposed Tuition Schedule* for the UHCC's (<http://www.hawaii.edu/offices/app/>).

Academic Cost and Revenue Template - New Program (adjust template for appropriate number of years) (Updated 6/20/11)

ENTER VALUES IN YELLOW CELLS ONLY

CASHFLOW Program

Leeward CC/AS-116

Professional Years (2 yrs for Certificate, 3 yrs for Associate Degree, 5 yrs for Bachelor's Degree, 3 yrs for Masters Degree, 5 yrs for Doctoral Degree)

Year 1 Year 2 Year 3 Year 4 Year 5 Year 6

2010-2011 2011-2012 2012-2013 2013-2014 2014-2015 2015-2016 2016-2017

Student & SSH

A. Headcount enrollment (Full)

B. Annual SSH

Direct and Incremental Program Costs Without Fringe

C. Instructional Cost without Fringe

C1. Number FTEs of FT Instructors

C2. Number FTEs of PT Lecturers

D. Other Personnel Costs

E. Unique Program Costs

F. Total Direct and Incremental Costs

Revenue

G. Tuition

Tuition rate per credit

H. Other

I. Total Revenue

J. Net Cost (Revenue)

Program Cost per SSH With Fringe

K. Instructional Cost with Fringe/SSH

K1. Total Salary FT Instructors

K2. Cost Including Fringe of K1

K3. Total Salary PT Lecturers

K4. Cost Including Fringe of K3

L. Support Costs/SSH

Non-Instructional Expenses

System-wide Support/SSH

Organized Research/SSH

M. Total Program Cost/SSH

N. Total Campus Expenditures/SSH

Instructional Cost with Fringe per SSH

K. Instructional Cost/SSH

O. Comparable Cost/SSH

Program used for comparison

Leeward Community College

Reviewed by campus VC for Administrative Affairs

Signature and date

Mark Stone OCT 26 2011

Please include an explanation of this template in your narrative.

A. Headcount enrollment: Headcount enrollment of majors each Fall semester. Located at url: <http://www.hawaii.edu/academic/cas/cas/cas-enrollment> Campus data may be used when majors are a subset of enrollment reported in FTD reports.

B. Annual SSH: Course Registration Report located at url: <http://www.hawaii.edu/academic/cas/cas/cas-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.

C. Instructional Cost without Fringe: (systemwide calculation): Direct salary cost for all faculty and lecturers teaching in the program. \*Formula for column D: =IF(OR(D32>=1,D33>D34),"")

C1. Number of full-time faculty and lecturers who are > .5 FTE

C2. Number of part-time lecturers who are < .5 FTE

D. Other Personnel Cost: Salary cost (part or full time) for personnel supporting the program (APT, clerical job 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.

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.

F. Total Direct and Incremental Cost: C + D + E \*Formula for column D: =IF(OR(D32>=1,D33>D34),"")

G. Tuition: Annual SSH x revised tuition rate/credit \*Formula for column D: =IF(D32>=1,D33>D34,"")

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.

I. Total Revenue: G + H \*Formula for column D: =IF(OR(D32>=1,D33>D34),"")

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(D32>=1,D33>D34),"")

K. Instructional Cost with Fringe/SSH: K2 + K4/B \*Formula for column D: =IF(D32>=1,D33>D34,"")

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.

K2. K1 X 1.36 \*Formula for column D: =IF(D32>=1,D33>D34,"")

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.

K4. K3 X 1.05 \*Formula for column D: =IF(D32>=1,D33>D34,"")

L. Support Costs/SSH: (The campus' non-instructional expenditures/ssh + systemwide support + organized research (UHM only) as provided by UH Expenditure Report (<http://www.hawaii.edu/budget/expand.html>)) \*Formula for column D: =IF(OR(D32>=1,D33>D34),"")

\*Formula for column D: =IF(OR(D32>=1,D33>D34),"")

For example, from the 2009-10 UH Expenditure Report, the support expenditures/ssh per campus is:

UHM	\$480.00 + \$85 = \$565
UHH	\$500.00 + \$42 = \$542
UHWO	\$210.00 + \$31 = \$241
Haw CC	\$164.00 + \$47 = \$211
Hon CC	\$235.00 + \$46 = \$281
Kau CC	\$178.00 + \$28 = \$206
Kau CC	\$360.00 + \$44 = \$404
Lea CC	\$123.00 + \$27 = \$150
Mau CC	\$163.00 + \$58 = \$221
Wai CC	\$277.00 + \$41 = \$318

M. Total Program Cost/SSH: K + L \*Formula for column D: =IF(OR(D32>=1,D33>D34),"")

N. Total Campus Expenditures/SSH: Taken from UH Expenditures Report For example, for 2009-2010: UHM = \$623-131 (organized research) = \$754, UHH = \$682, UHWO = \$501, HawCC = \$408, HonCC = \$505, KauCC = \$318, LeaCC = \$200, Mau CC = \$296, WaiCC = \$427

O. Comparable Program/Division Instructional Cost/SSH: Taken from UH Expenditures Report (<http://www.hawaii.edu/budget/expand.html>) or campus data, as available. Please note in the space provided, the program used for the comparison.

Rev: 09/08/11

The instructional cost with fringe (K1) is based on the average Math & Science instructor's salary multiplied by the FTE for the program. The support costs (L) and total campus expenditures (N) are from Leeward CC's page on the 2009 - 2010 UH Expenditures Report (<http://www.hawaii.edu/budget/expand.html>).

The program used for comparison (O), also taken for the above Expenditures Report, is General Academic Instruction. As the spreadsheet reflects, the cost for the AS-NS program is slightly higher than general instruction as to be expected for a STEM program with labs and support staff. However, there should be little additional cost to the college since the program will draw from existing students currently enrolled in STEM classes on campus.

Though we planned a cost/revenue projection from Fall 2012 to Spring 2015, we request that the AS-NS program be effective for Spring 2012, as there are a number of STEM students who would be eligible to receive the AS-NS degree at the end of that semester. As those students will be completing the proposed program requirements by Spring 2012, no additional resources are required.

## **6. How efficient will the program be?**

The proposed AS-NS degree at Leeward Community College will utilize existing faculty, staff, facilities, and equipment. As such, the college is unlikely to incur additional costs in offering the A.S. in Natural Science degree. If enrollment exponentially outgrows the projected numbers of students in the program, any extra costs will be offset by tuition.

## **7. How will effectiveness of the program be demonstrated?**

Program effectiveness is determined by looking at student achievement data and attainment of student learning outcomes. Student achievement data includes number of declared AS-NS majors, annual degree attainment, and number of students who transfer to UH four-year institutions. The attainment of the program's student learning outcomes will be assessed as part of the established and ongoing assessment process at Leeward CC.

Programs are also subject to the Leeward Annual Program Review (APR) process in which all programs participate. The APR process requires programs to report progress on student achievement data, perform an analysis of course and program student learning outcomes assessment, review current curriculum and recommend changes, and determine future need for additional resources. The assessment and APR processes at Leeward CC are evaluated annually to ensure effectiveness in reporting the health of programs.

## **Appendix A. Kapi'olani CC AS-NS Degree Requirements**

THE UNIVERSITY OF HAWAII - KAPI'OLANI COMMUNITY COLLEGE  
ASSOCIATE IN SCIENCE (AS) DEGREE IN NATURAL SCIENCE - 60 Credits minimum  
of 100-200 level courses: 2.0 grade point ratio (GPR) minimum  
Effective Fall 2009

### **I. FOUNDATION REQUIREMENTS (13 Credits)**

Written Communication (FW): (1 course) ENG 100 (Composition I) or ESL 100  
Symbolic Reasoning (FS): (1 course) MATH 205 (Calculus I)  
Global & Multicultural Perspectives (FG): (2 courses only, choose one course from  
two different groups below:)  
Group A. ANTH 151; HIST 151  
Group B. ANTH 152; GEOG 102; HIST 152  
Group C. GEOG 151; MUS 107; REL 150

### **II. DIVERSIFICATION REQUIREMENTS (10-13 Credits)**

Arts, Humanities, & Literature: (1 course only; choose one course from any group  
below:)

Arts (DA):  
ART 101, 189; DNCE 150; MUS 108; SP 251; THEA 101

Humanities (DH):  
AMST 201, 202; HIST 231, 232, 241, 242, 252, 281, 282, 284, 288; HUM 269; HWST  
100; HWST 107; LING 102; MUS 106; PACS 273; PHIL 100, 101, 102, 211 (formerly  
200), 213 (formerly 201), 250; REL 151, 202

Literature (DL):  
EALL 261, 262, 269, 271, 272; ENG 214, 256, 257C, 257P, 270B, 270E, 270F, 270M,  
270N, 271N, 272B, 272F, 272G, 272M, 272N, 272Q, 273C, 273N; HWST 261, 262;  
PACS 257

Natural Sciences: (2-3 courses) Biological (DB): ( 1 course)  
ANTH 215; BIOL 101, 103, 120, 124, 130, 171, 172, 270; BOT 101, 130; ESS 100;  
FSHE 185; MICR 130, 135, 230; PHYL 160; PSY 230; SCI 124; ZOOL 100; 101; 141;  
142; 200

\*DB (Diversification Biological) not required for LIFE SCIENCE concentration  
majors.

Physical (DP): (1 course) CHEM 161 (General Chemistry I)  
Laboratory Science (DY): (1 course) CHEM 161L (General Chemistry II)

Social Sciences (DS): (1 course) AMST 211, 212; ANTH 150, 200, 210; ASAN 100; BOT 105; COM 201; ECON 120; FAMR 230; IS 105B, 105C; JOUR 150; PACS 108; POLS 110, 120, 130, 171, 270; PSY 100, 170; SOC 100, 218, 231, 257; SSCI 260

### III. Kapi'olani CC ADDITIONAL REQUIREMENTS (7 Credits)

Computer Competence (CC): (1 course) ICS 101  
General Chemistry (GC:) (2 courses) CHEM 162 (General Chemistry II) CHEM 162L (General Chemistry II Lab)  
\*CHEM 162L not required for Engineering students, however 1 credit must be made-up in elective.

### IV. LIFE SCIENCE OR PHYSICAL SCIENCE CONCENTRATION

Life Science or Physical Science Concentration: (Select either life science or physical science concentration only)

#### Life Science

BIOL 171 (General Biology I) BIOL 171L (General Biology Lab)  
BIOL 172 (General Biology II) BIOL 172L (General Biology Lab II)

#### Physical Science

PHYS 170 (Physics I) PHYS 170L (Physics I Lab)  
PHYS 272 (Physics II) PHYS 272L (Physics II Lab)  
MATH 206 (Calculus II)

### V. CONCENTRATION ELECTIVES (20-27 Credits)

Concentration Electives (ELCT): (20 credits minimum; choose from courses below)  
ASTR 280; BIOC 241, 244; BIOL 171, 171L, 172, 172L, 275, 275L; CHEM 272, 272L, 273, 273L; CE 113, 270, 271; EE 160, 211, 260, 254, 254L, 263, 288; GEOL 101L, 103, ICS 111, 141, 211, 212, 241;  
MATH 206, 206L, 231, 232, MICR 130, 140, 161, 230, 240; OCN 201, PHYS 151, 151L, 152, 152L, 170, 170L, 272, 272L, 274; PHYL 160, ZOOL 141, 141L, 142, 142L, 200, 200L; ZOOL 141, 141L, 142, 142L, 200, 200L

Writing Intensive (W): (2 courses); May be shared with above areas.

Hawaiian, Asian, and Pacific (HAP): (1 course); May be shared with above areas.

## Appendix B. Maui College AS degree

### Organization of the Program

The curriculum will require a minimum of 60 credits of 100- and 200-level courses and a 2.0 grade point ratio (GPA) minimum for all courses required by the degree. The curriculum includes 24 credits of General Education requirements, 7 credits of additional program requirements, two writing intensive courses, 16-17 required credits in the Biological Science Concentration or 13 required credits in the Physical Science Concentration, and 12-16 credits of electives in STEM courses (see Appendix E. Associate Degree in Natural Science with Concentrations in Biological Science or Physical Science Program Requirements and Map).

### 1. General Education:

- a. Quantitative Reasoning (4 credits):  
Math 205(4)
- b. English/Communications (6 credits):  
English 100(3) and at least one of the following: English 106(3), 209(3), 210(3) or Speech 151(3), 251(3)
- c. Elective credits (14 credits): At least one course from each Humanities and Social Science. Applicable courses may be chosen from the following:
  - 1) Humanities (3 credits): Choose one from Art, Communication, Dance, Drama, East-Asian Languages, English 250-257, Hawaiian, Hawaiian Studies, History, Humanities, Japanese, Linguistics, Music, Philosophy, Religion, Spanish, Speech
  - 2) Natural Sciences: (8 credits): Chemistry 161/161L(4), choose any four credits from Agriculture, Anthropology 215, Astronomy, Biology, Biochemistry, Food Science & Human Nutrition, Geography 101/101L, Geology & Geophysics, Microbiology, Oceanography 201/201L, Physics, Science, Zoology
  - 3) Social Sciences (3 credits): Choose from Anthropology (*except 215*), Botany 105, Economics, Family Resources, Geography (*except 101/101L*), Political Science, Psychology, Social Science, Sociology

### 2. Additional Program Requirements (7 credits):

- a. Chemistry 162/162L(4)
- b. Information and Computer Science 101(3) or higher with approval  
NOTE: UHMC faculty members are developing a computer competency evaluation instrument that will allow students to receive credit-by-examination for this requirement. Once that examination has been tested, students in this degree program will be able to enroll in an additional three credits of STEM course electives if they pass the computer competency evaluation test.



- 3. Area of Concentration (choose one):**
- a. Biological Science (16-17 credits): Biology 171/171L(4), 172/172L(4) and Physics 151(4) and 152(4) or Physics 170(5) and 272(4)
  - b. Physical Science (13 credits): Mathematics 206(4), Physics 170(5), 272(4)
- 4. Concentration Electives (12-16 credits)**
- If not taken for Area of Concentration, choose from: Agriculture 200(4); Anthropology 210/210L, 215; Astronomy 110/110L(4); Biochemistry 241(3), 244(3); Biology 105(4), 124/124L(4), 151/151L(4), 171/171L(4), 172/172L(4), 200(4), 225(4), 226(5); Geography 101/101L(4); Geography Information Systems 150(4), 180(4); Geology & Geophysics 101(4), 103(3); Mathematics 206(4), 231(3)\*, 232(3)\*; Microbiology 130(3), 140(2); Oceanography 201/201L(4); Physics 170(5), 272(4); Zoology 141(4), 142(4), 200(4)
- \*Recommended for Physical Science Concentration*
- 5. Cumulative Grade Point Average:**  
2.0 or better
- 6. Information & Computer Science requirement may be satisfied with credit-by-examination.**
- 7. Writing Intensive:**  
Two (2) courses with "WI" designation.
- 8. Residence Requirement:**  
12 credits in the major must be completed at Maui College. May be waived for cause or credit-by-examination used with approval of the VCAA.
- 9. Graduation Requirement:**  
Students must complete the AS Application for Graduation form obtained from Student Services.

## Appendix C. NSF Report On Community College Attendance Among Recent Graduates

TABLE 1. Community college attendance among recent graduates with bachelor's degrees in science, engineering, and health, by major field of degree: April 2006

Major field	All graduates	Attended community college	
		Number	Percent
All fields	1,565,500	784,000	50
Science	1,159,900	553,000	48
Biological, agricultural, and environmental life sciences	230,100	103,800	45
Agricultural/food sciences	22,400	10,400	46
Biological sciences	191,400	84,500	44
Environmental life sciences	16,300	9,000	55
Computer and information sciences	164,000	90,900	55
Mathematics and statistics	44,000	18,500	42
Physical and related sciences	55,600	23,500	42
Chemistry, except biochemistry	29,100	12,000	41
Earth, atmospheric, and ocean sciences <sup>a</sup>	13,800	6,900	50
Physics/astronomy	12,700	4,600	36
Psychology	252,700	125,800	50
Social and related sciences	413,500	190,500	46
Economics	77,100	33,100	43
Political and related sciences	133,400	48,600	36
Sociology/anthropology	123,000	66,500	54
Other social sciences	80,000	42,200	53
Engineering	183,100	81,700	45
Chemical	14,000	5,800	41
Civil/architectural	24,700	10,900	44
Electrical/computer	61,600	30,300	49
Industrial	10,000	4,200	42
Mechanical	40,700	16,300	40
Other	32,200	14,300	44
Health	222,500	149,300	67

<sup>a</sup> Other physical sciences are included in earth, atmospheric, and ocean sciences.

NOTES: Numbers are rounded to nearest 100. Detail may not add to total because of rounding. Estimates are from a sample survey of college graduates who received bachelor's or master's degrees in science, engineering, and health fields in 2003–05 academic years; estimates may differ from degree counts published elsewhere.

SOURCE: National Science Foundation/Division of Science Resources Statistics, National Survey of Recent College Graduates, 2006.

TABLE 2. Community college attendance among recent graduates with master's degrees in science, engineering, and health, by major field of degree: April 2006

Major field	All graduates	Attended community college	
		Number	Percent
All fields	416,900	170,600	41
Science	204,700	76,500	37
Biological, agricultural, and environmental life sciences	29,400	12,700	43
Agricultural/food sciences	3,900	1,800	46
Biological sciences	21,500	9,000	42
Environmental life sciences	3,900	1,800	47
Computer and information sciences	52,300	15,300	29
Mathematics and statistics	11,800	2,700	23
Physical and related sciences	14,900	4,600	31
Chemistry, except biochemistry	5,000	1,300	26
Earth, atmospheric, and ocean sciences <sup>a</sup>	5,000	1,900	39
Physics/astronomy	4,800	1,300	27
Psychology	50,600	26,000	51
Social and related sciences	45,700	15,300	33
Economics	7,800	2,100	27
Political and related sciences	15,400	5,000	32
Sociology/anthropology	8,700	3,600	41
Other social sciences	13,800	4,700	34
Engineering	86,500	22,800	26
Chemical	3,200	600	18
Civil/architectural	9,900	3,000	30
Electrical/computer	32,600	8,400	26
Industrial	6,700	1,300	19
Mechanical	11,900	3,000	25
Other	22,200	6,600	30
Health	125,700	71,400	57

<sup>a</sup> Other physical sciences are included in earth, atmospheric, and ocean sciences.

NOTES: Numbers are rounded to nearest 100. Detail may not add to total because of rounding. Estimates are from a sample survey of college graduates who received bachelor's or master's degrees in science, engineering, and health fields in 2003–05 academic years; estimates may differ from degree counts published elsewhere.

SOURCE: National Science Foundation/Division of Science Resources Statistics, National Survey of Recent College Graduates, 2006.

## Appendix D. Leeward CC AS – Natural Science Graduation Checklist

LEEWARD COMMUNITY COLLEGE				rev. 10/27/2011	
<b>ASSOCIATE IN SCIENCE - NATURAL SCIENCE (AS-NS) DEGREE REQUIREMENTS (Effective Fall 2011)</b>					
The Associate of Science Degree (A.S. - Natural Science) is awarded to students who complete the following:					
1) 60 credits, all in courses numbered 100 or above. 2) The last 12 Concentration and/or Natural Science Elective credits must be earned at Leeward Community College. 3) A maximum of 48 transfer credits earned at other colleges may be applied towards the degree.	4) Two writing intensive courses in any discipline. 5) One Hawaiian, Asian, Pacific (HAP) course. 6) Cumulative grade point average of 2.0 or higher for all courses numbered 100 or above completed at Leeward CC. 7) General education and program requirements, as indicated below.				
<b>Foundation Requirements (13 credits)</b>					
		Category	Course	Grade	Credits
<b>I. Foundation Written Communication (FW) (3 credits required)</b>					
English 100 or ESL 100/ENG 100E		FW			3
<b>II. Foundation Symbolic Reasoning (FS) (4 credits required)</b>					
Math 205		FS			4
<b>III. Foundation Global Multicultural Perspectives (FG) (6 credits required from 2 groups)</b>					
GROUP A: Anth 151, Art 175, Hist 151		FG			3
GROUP B: Anth 152, Art 176, Hist 152					
GROUP C: Geog 151, Mus 107, Rel 150		FG			3
<b>TOTAL FOUNDATION CREDITS (FW + FS + FG)</b>		<b>Total Foundation Credits</b>			<b>13</b>
<b>Diversification Requirements (10 - 13 credits)</b>					
<b>IV. Diversification Social Sciences (DS) (3 credits required)</b>					
American Studies 211, 212		Political Science 110, 120, 130, 180			
Anthropology 150, 200, 210,		Psychology 100, 180, 202, 240, 260			
Economics 120*, 130*, 131* ( <i>*Engineering students must choose one of these.</i> )		DS			3
Geography 102		Sociology 100, 214, 218, 231, 250, 251			
Interdisciplinary Studies 221		Women's Studies 151, 290			
<b>V. Diversification Arts, Humanities, and Literature (DA/DH/DL) (3 credits required)</b>					
<b>Diversification Arts (DA)</b>					
(Mainly Theory)		Art 101	Drama 101	Music 108, 253, 281, 282, 283, 284	
(Mainly Practice)		Art 104, 104D, 105B, 105C, 106, 107, 107D, 112, 113, 113D, 114, 115, 123, 202, 213, 243, 244			
		Dance 121, 131, 132, 160, 180			
		Drama 221, 222, 240, 260			
		Music 103, 104, 112, 113, 114, 121, 122, 180, 201, 221, 222, 232			
		Speech 251* ( <i>*Available for Engineering students only.</i> )			
<b>Diversification Humanities (DH)</b>					
American Studies 201, 202		History 231, 232, 241, 242, 260, 281, 282, 284			
Art 171, 172, 180		IS 250H			
Asian Studies 203, 204		Linguistics 102			
Geography 122		Music 106, 265, 266			
Hawaiian Studies 107					
<b>Diversification Literature (DL)</b>					
East Asian Language & Literature 271, 272		Humanities 261, 262			
English 250, 251, 252, 253, 254, 255, 256, 257H, 257N					3
<b>VI. Diversification Natural Science (DB/DP/DY) (4 - 7 credits required)</b>					
<b>Diversification Biological (DB) (3 credits required* **)</b>					
Anth 215		<i>*Not required for Engineering but Biol 101, 171, Micr 130 or Zool 101 suggested for CEE.</i>			
Biol 100, 101, 124, 130, 171, 172, 200, 201		DB* **			
Bot 101, 130		Sci 107			
Fshn 185		Zool 101, 200, 240, 241			
Micr 130		<i>**Life Science must choose Biol 171.</i>			3
<b>Diversification Physical (DP) (3 credits required)</b>					
Chem 161		(Chem 161B = 3 cr. 161 + 1 cr. 161L)			
<b>Diversification Laboratory (DY) (1 credit required)</b>					
Chem 161L		DY			1
<b>TOTAL DIVERSIFICATION CREDITS (DS + DA/DH/DL + D/B/DP/DY) (IV + V + VI)</b>		<b>Total Diversification Credits</b>			

VII. Additional Requirements (6 - 7 credits required)						Category	Course	Grade	Credits
Computer Competency (CC) (3 credits required)									
ICS 101						CC			3
EE 150*	(*Engineering students only and they must choose this course.)								
General Chemistry (GC) (3 - 4 credits required*)						GC			3
Chem 162	(Chem 162B = 3 cr. 162 + 1 cr. 162L)								
Chem 162L*	(*Not required for Engineering.)					GC*			
TOTAL ADDITIONAL REQUIREMENTS CREDITS (VII)						Total Additional Credits			
VIII. Concentration Requirements (5 - 23 credits required)						Semester	Course	Grade	Credits
Select one of the Natural Science Concentrations									
Life Science		Physical Science		Engineering					
Biol 171L	1 cr.	Math 206	4 cr.	Math 206	4 cr.				
Biol 172	3 cr.	Phys 170	4 cr.	Phys 170	4 cr.				
Biol 172L	1 cr.	Phys 170L	1 cr.	Phys 170L	1 cr.				
		Phys 272	3 cr.	Phys 272	3 cr.				
		Phys 272L	1 cr.	Phys 272L	1 cr.				
				Math 231	3 cr.				
				Math 232	3 cr.				
				EE 211 or	4 cr. or				
				CE 270	3 cr.				
TOTAL CONCENTRATION REQUIREMENTS CREDITS (VIII)						Total Concentration Credits			
Total Foundation (I, II, III) + Diversification (IV, V, VI) + Additional (VII) + Concentration Requirements (VIII)						60	-		Nat. Sci. Electives
IX. Natural Science Electives (8 - 22 credits required)						Semester	Course	Grade	Credits
Select classes required for your program which are <u>not</u> chosen above.									
Bioc 241	Bot 101	GG 101	Math 206	Phrm 203					
Bioc 251	Bot 101L	GG 101L	Math 206L						
	Bot 130	GG 103	Math 231	Phys 151 (Life Sci. only)					
Biol 171			Math 232	Phys 151L (Life Sci. only)					
Biol 171L	Chem 272B	Hort 110		Phys 152 (Life Sci. only)					
Biol 172	Chem 273B		ME 213	Phys 152L (Life Sci. only)					
Biol 172L		ICS 111		Phys 170					
Biol 265	CE 270	ICS 141	Micr 130	Phys 170L					
Biol 265L	CE 271	ICS 211	Micr 140	Phys 272					
Biol 275		ICS 212		Phys 272L					
Biol 275L	EE 150	ICS 241	OCN 201	Phys 274					
	EE 211		OCN 201L						
	EE 213			Zool 200					
	EE 260			Zool 240					
				Zool 241					
TOTAL NATURAL SCIENCE ELECTIVES CREDITS (IX)						Total Natural Science Credits			
Total Credits (Add I + II + III + IV + V + VI + VII + VIII + IX)									
Writing Intensive Courses (2 courses)						1.		2.	
Focus: Hawaiian, Asian, and Pacific (HAR, I Course)						1.			
Important note: Appropriate course substitutions may be made with the prior written approval of both the appropriate Division Chair and Dean.									

