Authorization to Plan
Proposal for the Degree Program
Bachelor of Arts in Applied Mathematics

University of Hawai‘i-West O‘ahu

Submitted by Mathematics Faculty

Michael Furuto
Kamuela Yong
Esther Widiasih

March 2016
UHWO AUTHORIZATION TO PLAN (ATP) AN ACADEMIC PROGRAM

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

1. **Division/Concentration**
   Division of Mathematics and Natural Sciences

2. **Chair/Convener of Planning Committee**
   Dr. Jacqueline Honda, Acting Vice Chancellor for Academic Affairs

3. **Program Category:**  _X_ New ___Modified ___ Interdisciplinary

4. **Degree or Certificate Information:**
   a. Degree or Certificate Proposed:
      
      B.A. Applied Mathematics (BAAM)
      
   b. List similar degrees or certificates offered in UH System:
      
      UHM  B.A. Mathematics
      UHM  B.S. Mathematics
      UHH  B.A. Mathematics

5. **Planning**
   a. Planning period (not to exceed one year or reapplication if necessary)
      March 2016 – September 2016
      
   b. Activities to be undertaken during the planning phase
      
      • Establish BAAM planning committee, including at least one representative from each of the community colleges, UHM/UHH, and State of Hawai‘i Department of Education (DOE). The planning committee will: 1) Plan the program focus, purpose, and fit of the degree within the UH system, 2) Develop student learning outcomes, 3) Outline the curriculum, and 4) Begin preparing the BAAM and BASM program proposal (for eventual submission to the BOR and to the UHWO curriculum committee).
      
      • Promote and represent the math program with service organizations such as: Hawai‘i Council of Teachers of Mathematics, Society of Industrial and Applied Mathematics, American Mathematical Society, and Mathematical Association of America.
      
      • Mathematics and Science faculty at UHWO will: 1) Finalize the curriculum specifics, 2) Develop a budget, 3) Make recommendations about additional faculty or other personnel needed to implement the program, and 4) Prepare new course forms and accompanying student learning outcomes for the UHWO Curriculum Committee.
      
      • Recruit lecturers, faculty, and students for the program. Provide counseling for students pursuing careers in mathematics, and develop brochures for the program.
      
      • Mathematics and Science faculty at UHWO will finalize the program proposal and present it to the UHWO Curriculum Committee. If approved, the program will be implemented as soon as the courses are ready to be offered.
      
   c. Submission date of program proposal: Fall 2016
d. Workload/budget implications during planning period

The planning will be conducted by the voluntary BAAM planning committee, mentioned above. At the discretion of the UHWO administration, one current mathematics/science faculty member may be granted 0.25 FTE for leading the planning process. No other impact on workload or budget is anticipated during the planning period.

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

The purpose of the proposed BAAM degree is to increase the number of college graduates in Science, Technology, Engineering, and Mathematics (STEM), focusing on developing life-long learners enriched by career competencies and educational opportunities that address state, regional, and international needs (UHWO Catalog, 2015-16).

The UHWO BAAM degree will serve as the core of the applied math program, with comparable requirements as the existing BA in Mathematics in UHM and UHH as well as other existing undergraduate Applied Mathematics programs from comparable institutions, such as San Jose State University or Colorado State University. Some of the required credit hours will be drawn from existing courses outside of, but related to math, for example, courses in biology, chemistry, information security, economics, finance and business. Arguably, the additional credit requirements will not only strengthen the quality of the graduates, but will also bolster existing programs, and most importantly, it will do so at no additional cost. The expansion of courses to other fields is in line with the vision to future workforce in the Mathematical Sciences, as called by The National Research Council of the National Academies Report, “The Mathematical Sciences in 2025.”

The BAAM program is designed to prepare its students for successful careers in areas requiring a strong foundation in mathematics, including secondary education, as well as for success at the graduate level in mathematics or related disciplines. Students completing this broad curriculum are well prepared to participate in the workforce particularly in the mathematical and computational sciences careers, filling critical workforce needs in the state, and in the nation.

The degree is intended to familiarize students with a wide range of areas within the core and applied mathematics, to motivate mathematical ideas by how they are used, to instill an appreciation for the rigor and structure of mathematics, and to train future workforce to develop mathematical maturity, logical as well as inquisitive minds, having key problem solving and communication skills.

Indeed, the BAAM program is designed to give students a broad background in modern mathematics and its applications, with an eye first and foremost toward preparing students for the workforce, and second, for a graduate program. Upper-division mathematics courses in this program represent a core leading to further work in mathematics and its related areas or careers in mathematical sciences. Applications may be pursued in areas such as mathematical modeling, systems theory, finance, operational research, and statistics, which are widely used in computer science, business, and the physical, life, and social sciences.

Upon completion, students will be able to demonstrate the following knowledge and skills:

- A general understanding of the different areas of mathematics and how they interrelate, and the importance of mathematics in a scientifically-oriented society.
- Classical theorem-proving skills, including the ability to reason mathematically and to apply the rigor necessary to construct proofs, proofs by contradiction, and proofs by induction.
- A mathematical maturity, including having the initiatives to find things on their own, feeling comfortable obtaining their own sources, having an intellectual independence and the ability to critically analyze mathematical work, and the skills to solve problems using variety of techniques, including logical argument.
- A refined understanding of the problem-solving process, including the ability to formulate definitions and give examples and counterexamples, and to make inferences and generalizations.
- A working knowledge of technology appropriate to the field, such as the use of math typesetting software like LaTex, and math programming language like Matlab.

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

UHWO Needs and Rationale
The overarching goal of the Applied Mathematics program is to bring to life UHWO’s Vision to educate students to be engaged global citizens and leaders in society (UHWO Catalog, 2015-16). In the nine years since UHWO transitioned to a four-year liberal arts university, the number of students enrolled in mathematics courses has grown 3,400% from the initial population. Furthermore, the number of unique mathematics courses increased from one in Fall 2007 (MATH 103 College Algebra) to twenty-five in Spring 2016. According to UHWO institutional and general education graduation requirements, every student needs to complete a college-level mathematics course. Therefore, based on historical data, the number of students enrolled in mathematics courses is expected to increase as UHWO continues to expand (UH IRO, 2016).

UH System Needs and Rationale
The UHWO Applied Mathematics program development is in alignment with the mission and priorities of the UH System as outlined in the UH Strategic Directions 2015-2021. In particular, the Hawai`i Graduation Initiative (HGI) Action Strategy 4 aims to solidify the foundation for UHWO with a specific tactic to “Develop complementary academic and strategic plans that promote UH mission differentiation with applied baccalaureate degrees.” Furthermore, the Applied Math program also will also support the goal of Hawai`i Innovation Initiative (HI2) by providing workforce training for the economic sector based on research and innovation.

Arguably, the two existing BA in Mathematics programs offered by UHM and UHH focus first on preparing students for graduate programs, and workforce training second. In contrast to these existing programs, the focus of the UHWO applied math program will be first on workforce training and second on graduate program preparation, thus, making the program differentiation apparent.

While there are currently over 190 universities offering undergraduate applied mathematics programs, there are none in the UH System. Clearly, there is a need for such program, and UHWO will be the perfect institution to start one.
Preparing mathematics students for the work force aligns with the goals of UH as it recently received grants totaling $6.8 million to strengthen the local economy, education, and employment opportunities in STEM disciplines. Dr. David Lassner, President of the UH System, said, “This initiative will prepare our students so that they have the skills and expertise our state needs in high-wage and high-demand STEM fields” (UH News, 2016), and “STEM jobs tend to be higher paying than many others and are a cornerstone of building a stronger diversified innovation economy for Hawai‘i” (STEM News, 2015).

Hawai‘i and U.S Needs and Rationale
Increasing the number of STEM graduates is vital to the state’s ability to respond to emerging and high growth industries. These administrative and system wide efforts reflect strategic STEM priorities, and provide support for building the mathematics program at UHWO.

A BAAM degree offers students a variety of job opportunities such as mathematicians, actuaries, operations research analysts, statisticians, and in the education sector. These job categories show strong growth, where projections both nationally (N) and in the state (S) are estimated between average (8%-14%) and much faster than average (23% or more) from 2010-2020 (Career Kokua, 2013).

<table>
<thead>
<tr>
<th>2013-2014 Career Kokua Occupations</th>
<th>Much Faster (23%+)</th>
<th>Faster (15-22%)</th>
<th>Average (8-14%)</th>
<th>Slower (3-7%)</th>
<th>Little Change (0%-2%)</th>
<th>Decline (Below 0%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Science Teachers (Postsecondary)</td>
<td></td>
<td>N</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actuaries</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operations Research Analysts</td>
<td>N</td>
<td></td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statisticians</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

There is obvious need for mathematics positions as reflected in data from the Department of Labor. Long-term occupational projections between 2010 and 2020 indicate substantial growth among employment numbers in mathematics postsecondary teachers (median wage [2012]: US = $65,000, Hawai‘i = $60,900), actuaries (median wage [2012]: US = $93,700, Hawai‘i = $91,400), operations research analysts (median wage [2012]: US = $72,100, Hawai‘i = $72,100), and statisticians (median wage [2012]: US = $75,600, Hawai‘i = $56,100). All job categories demonstrate considerable growth both nationally and locally.

<table>
<thead>
<tr>
<th>Mathematical Science Teachers (Postsecondary)</th>
<th>Employment</th>
<th>Percent Change</th>
<th>Annual Job Openings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
<td>2020</td>
<td></td>
</tr>
<tr>
<td>Hawai‘i</td>
<td>210</td>
<td>230</td>
<td>13%</td>
</tr>
<tr>
<td>United States</td>
<td>1,756,000</td>
<td>2,061,700</td>
<td>17%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actuaries</th>
<th>Employment</th>
<th>Percent Change</th>
<th>Annual Job Openings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
<td>2020</td>
<td></td>
</tr>
<tr>
<td>Hawai‘i</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>United States</td>
<td>21,700</td>
<td>27,500</td>
<td>27%</td>
</tr>
<tr>
<td>Operations Research Analysts</td>
<td>Employment</td>
<td>Percent Change</td>
<td>Annual Job Openings</td>
</tr>
<tr>
<td>----------------------------</td>
<td>------------</td>
<td>----------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>2010</td>
<td>2020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hawai‘i</td>
<td>220</td>
<td>240</td>
<td>11%</td>
</tr>
<tr>
<td>United States</td>
<td>64,600</td>
<td>74,000</td>
<td>25%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statisticians</th>
<th>Employment</th>
<th>Percent Change</th>
<th>Annual Job Openings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>2020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hawai‘i</td>
<td>120</td>
<td>130</td>
<td>7%</td>
</tr>
<tr>
<td>United States</td>
<td>25,100</td>
<td>28,600</td>
<td>14%</td>
</tr>
</tbody>
</table>

Both nationally and locally, leaders have continuously emphasized the necessity of educating students in STEM fields. At the Third Annual White House Science Fair, President Barack Obama proclaimed, “One of the things that I’ve been focused on as President is how we create an all-hands-on-deck approach to science, technology, engineering, and math… We need to make this a priority to train an army of new teachers in these subject areas, and to make sure that all of us as a country are lifting up these subjects for the respect that they deserve” (Education to Innovate, The White House, 2013).

Locally, by 2017, Hawai‘i is projected to need 16,000 more employees each year in STEM-related disciplines. However, Hawai‘i currently ranks 47th in the nation in the number of STEM degrees awarded per 100,000 residents (KHON2, 2016). State of Hawai‘i Governor David Ige emphasized the need to keep in-state residents in Hawai‘i by creating a “continuous academic pathway in STEM fields from middle school through college” (Pacific Business News, 2016). With its emphasis on quality teaching, UHWO is ideally positioned to develop an Applied Mathematics program to keep in-state residents in Hawai‘i – allowing interested students to remain in their communities and enrich both their educational aspirations and workforce opportunities, rather than attend one of the 190 universities outside of the UH System that offer a degree in Applied Mathematics.

The Applied Mathematics program remains consistent with UHWO’s mission to serve diverse students from underserved areas, including leeward and central O‘ahu by offering degrees to support “the continuing development of the region through both innovative educational offerings and public service activities.” Among the three UH campuses, UHWO serves the highest proportion of Hawaiian and part-Hawaiian students at 28% (UH Campus Profile, 2016). Through offering a degree in Applied Mathematics with an emphasis on quality education, UHWO will be in prime position to attract diverse students interested in studying STEM disciplines. UHWO graduates will have various job prospects to serve on leeward O‘ahu or throughout the state of Hawai‘i.

8. Description of resources required
   a. **Faculty** (existing and new FTEs)
      UHWO currently has 3.0 FTE Assistant Professors in Mathematics. The expanding math courses for general education, and to support other programs, including upper-division, and continued building of the math program requires an additional 3.0 FTE of Mathematics Faculty. By Fall 2016, 1.0 FTE Assistant Professor in Mathematics hire is expected under the current UHWO Academic Development Plan (ADP, 2010). We will need an additional 1.0 FTE Assistant Professor in Mathematics in Fall 2018, and 1.0 FTE Assistant Professor in Mathematics in Fall 2020.
b. **Library resources** (including an evaluation of current resources and an estimate of the cost of additional resources required)
   Librarian Sarah Gilman arranged for UHWO to purchase electronic access to Math journals. New library resources, identified during the planning process, are anticipated.

    c. **Physical resources** (space, equipment, etc.)
        Office space will be required for the Mathematics Faculty, and storage space for equipment necessary to support the program. U.S. DOE Title III and National Science Foundation (NSF) grants have allowed UHWO to acquire the equipment required to support the mathematics program.

    d. **Other resources required** (staff, graduate assistantships, etc.)
        A Mathematics Coordinator to support teaching, learning and service activities is critical for the success of the program. A 1.0 FTE is necessary to coordinate the work of the tutors and Peer Academic Leaders (PALs), administer and maintain the results of the mathematics placement tests, hire lecturers for developmental courses, articulate courses with the community colleges and the high schools, and address the needs of a growing campus.

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

    a. **Annual costs to implement the program:** Please see Cost Revenue template below.

    b. **Projected enrollment** and estimated tuition revenue: See Cost Revenue template below.

    c. **How will the program be funded?**
       The program will be funded with tuition revenues, fees, and additional grants. UHWO has previously received two U.S. DOE Title III grants that heavily supported the development of STEM facilities, and currently has an NSF Tribal Colleges and Universities Program (TCUP) grant to support STEM education, research, and outreach for students of Native Hawaiian descent.

    d. **Does the current or proposed budget (Department/College/Campus) include funds or a request for funds for the proposed program?** Please provide details.
       The UHWO ADP includes a request for Math Faculty positions.

    e. **Given a “flat budget” situation, how will the proposed program be funded?**
       Tuition revenues generated by a new degree program and the new campus facility and additional funding for development of STEM degree program available through the NSF should provide the necessary funding.
f. Mini Cost Revenue Template:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>FY 17-18</th>
<th>FY 18-19</th>
<th>FY 19-20</th>
<th>FY 20-21</th>
<th>FY 21-22</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROGRAM COSTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faculty w/o fringe</td>
<td>$0</td>
<td>$37,500</td>
<td>$80,000</td>
<td>$140,000</td>
<td>$140,000</td>
</tr>
<tr>
<td>Other personnel costs w/o fringe</td>
<td>$40,000</td>
<td>$40,000</td>
<td>$45,000</td>
<td>$45,000</td>
<td></td>
</tr>
<tr>
<td>Library</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment/Supplies</td>
<td>$4,000</td>
<td>$4,000</td>
<td>$4,000</td>
<td>$4,000</td>
<td>$4,000</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL Expenses</td>
<td>$4,000</td>
<td>$81,500</td>
<td>$124,000</td>
<td>$189,000</td>
<td>$189,000</td>
</tr>
</tbody>
</table>

| REVENUES | | | | | |
| Projected Enrollment | 0 | 10 | 21 | 33 | 36 |
| No. of Courses | 0 | 4 | 8 | 14 | 14 |
| No. of Credits | 0 | 12 | 24 | 42 | 42 |
| SSH | 0 | 120 | 252 | 456 | 498 |
| Tuition Rate/Credit | $306 | $312 | $318 | $324 | $330 |
| Total Revenue from Tuition | $0 | $37,440 | $80,136 | $147,744 | $164,340 |
| Other Sources of Income | $250,000 | $50,000 | $50,000 | $50,000 | $50,000 |
| TOTAL Revenues | $250,000 | $87,440 | $130,136 | $197,744 | $214,340 |

1 The Mathematics Coordinator position is currently being supported part-time by the NSF TCUP grant, which culminates in 2018. To facilitate the growing program, it will then be imperative to include the Mathematics Coordinator in the new ADP as a full-time position that is contingent upon receiving an annual grant of $50,000.

2 Upon completion of the NSF TCUP Grant, to continue supporting the growing program we will apply for additional grants.

10. Impact on current courses or programs

The BAAM program will help support several other programs, such as the Middle-level and Secondary Mathematics, Information Technology, and Facilities Management. It will also complement the existing BA in Mathematics programs at UHM and UHH.

11. If this program is multidisciplinary, provide evidence of commitment for support from the colleges, departments, programs, and/or individuals expected to participate.
   a. Letter of support from Dr. Mary Heller (Chair of Education Division).
   b. Letter of support from Dr. Rick Jones (Science Education/Facilities Management).
   c. Letter of support from Dr. Matthew Chapman (Information Technology).
   d. Letter of support from Dr. Eric Wen (Accounting).
   e. Letter of support from UH Mānoa Mathematics Department.
March 10, 2016

Dear University of Hawai‘i Council of Chief Academic Officers,

As the Chair of the University of Hawai‘i – West O‘ahu (UHWO) Division of Education, I am very pleased to provide strong support for the Division of Mathematics and Natural Sciences’ proposal to establish two, very important degrees: the Bachelor of Arts in Applied Mathematics (BAAM) degree and the Bachelor of Science in Applied Mathematics (BSAM).

The BAAM and BSAM degrees are designed to prepare students for successful careers in areas that require a strong foundation in mathematics, including middle-level and secondary education, as well as for success at the graduate level in mathematics or related disciplines. Students graduating in the field of Applied Mathematics will be well prepared to strengthen the local economy, education, and employment opportunities in STEM disciplines.

Degree offerings in Applied Mathematics, with an emphasis on quality education, place UHWO in a prime position to attract a diverse population of students interested in studying STEM fields. Graduates will have many career opportunities to fill Hawaii’s state-wide, critical workforce needs, especially on the Leeward O‘ahu and the Wai‘ane Coast.

The Hawai‘i Department of Education reports a critical need to employ teachers who are licensed in middle-level and secondary mathematics. Far too many emergency hired, unlicensed teachers are currently staffing math classes in our middle/intermediate and high schools. Therefore, it is essential that UHWO work to increase the number of highly qualified teachers in middle-level and secondary mathematics. The establishment of the BAAM and BSAM degrees will complement and support our Bachelor of Education with concentrations in Middle-level and Secondary Mathematics Education.

Among the degree requirements for BAAM, BSAM, and B.ED, many courses overlap, including: MATH 241 Calculus I, MATH 242 Calculus II, MATH 243 Calculus III, MATH 307 Linear Algebra and Ordinary Differential Equations or MATH 311 Introduction to Linear Algebra, MATH 321 Introduction to Advanced Mathematics, and MATH 371 Elementary Probability Theory. As a result of our students enrolling in these courses together, our programs and institution will grow stronger.

Without question, the establishment of the BAAM and BSAM degrees at UHWO will be beneficial to our students, our institution, and our community as we endeavor to advance STEM disciplines. Thank you for your time and consideration.

Best regards,

[Signature]

Dr. Mary F. Heller, Professor & Chair
Division of Education, Office E-225
University of Hawai‘i West O‘ahu
Email: mheller@hawaii.edu

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An Equal Opportunity/Affirmative Action Institution
To the University of Hawai‘i Council of Chief Academic Officers

Letter of Support: University of Hawai‘i West O‘ahu proposal for Bachelor of Arts or Bachelor of Science in Applied Mathematics

I am writing this letter in support of the approval of the recent proposal being put forward by the University of Hawai‘i West O‘ahu for the establishment of Bachelor of Arts and Bachelor of Science degrees in Applied Mathematics.

As a member of the Science Education faculty, I can attest to the need of establishing a mathematics degree, especially as this will support the Education Division’s degree programs in Middle Level and Secondary Mathematics Education and help University of Hawai‘i West O‘ahu graduate highly qualified and fully licensable teachers to fill the numerous STEM vacancies in the state of Hawai‘i.

Establishing Bachelor of Arts (BAAM) and Bachelor of Science (BSAM) in Applied Mathematics degrees will provide the University of Hawai‘i West O‘ahu’s math education majors the ability to meet a critical need for upper division mathematics courses on our own campus. Teacher candidates enrolled in these programs are required to complete a rigorous curriculum and have a minimum of 36 semester hours of Mathematics in the Middle Level program and 38 semester hours of Mathematics in the Secondary program that will allow them to meet and exceed the national performance standards set by the National Council of Teachers of Mathematics (NCTM). The ability to keep our Mathematics Education students on campus makes it much easier for the University of Hawai‘i West O‘ahu to meet the critical need, producing highly qualified middle school and secondary math teachers for the Hawai‘i Department of Education Schools, particularly in the Central and Leeward communities on O‘ahu, areas of critical need in the state.

In addition to my faculty role in the Education Division, I am also the Interim Director of UHWO STEM Center of Excellence, and have been instrumental in the development of West O‘ahu’s BAS in Facilities Management program that is foundationally heavy in Engineering, Science, and Mathematics courses. From these additional perspectives I am even more convinced that the University of Hawai‘i West O‘ahu needs Bachelor of Arts and Bachelor of Science in Applied Mathematics degrees, not only to promote STEM education for our students, but to also provide innovative programs that will secure a mathematically, technologically, and scientifically literate workforce and will strengthen University of Hawai‘i System strategic goal of “Increasing UH Degrees in STEM Fields”.

Mahalo for your consideration of this Program Proposal and service to the students of Hawai‘i.

Sincerely,

Richard M. Jones, Ed.D., Associate Professor Science Education
University of Hawai‘i – West O‘ahu, E-125
91-1001 Farrington Hwy.
Kapolei, HI 96707
808-689-2340
richard.jones@hawaii.edu
University of Hawai‘i Council of Chief Academic Officers

Letter of Support for the University of Hawai‘i -West O‘ahu proposal for Bachelor of Arts / Bachelor of Science in Mathematics

Please accept my recommendation for approval and strong support of the proposal to establish a Bachelor of Arts (BA) / Bachelor of Science (BS) degree in Mathematics at the University of Hawai‘i -West O‘ahu (UHWO).

As the program lead for three information technology and security concentrations under our Bachelor of Applied Science (BAS) degree, I recognize that it is paramount to promote STEM education for our students in western Oahu. As our national, state, and university leadership have emphasized, it is our responsibility to promote STEM education for our students.

The establishment of the mathematics concentration will specifically complement and support our BAS concentrations in information technology (IT); computer, electronics, and networking technology (CENT); and information security and assurance (ISA). Mathematics is foundational to these technical career fields, and advanced mathematics is increasingly required for professional positions in cyberspace career fields.

The standards for the Computer Science Series for the U.S. Government’s Office of Personnel Management now include in their basic requirements, at least 15 semester hours in any combination of statistics and mathematics, that include differential and integral calculus. As another example, cyber career fields in the Federal Bureau of Investigations (FBI) also require a bachelor’s degree with 30 semester hours in a combination of mathematics, statistics, and computer science, which again must include differential and integral calculus.

The establishment of the mathematics concentration at UHWO will be extremely beneficial to our students as we continue to prepare them to enter the cyber workforce and be leaders locally, regionally, and globally. Mahalo for your consideration and service to our students.

Respectfully,

Matthew A. Chapman, Ph.D.
Assistant Professor of Information Technology
University of Hawai‘i -West O‘ahu
91-1001 Farrington Highway
Kapolei, Hawaii 96707
mchapman@hawaii.edu
(808) 689-2333
In Support of Bachelor Degrees in Applied Mathematics at UH–West O‘ahu

Dr. Eric Wen
Business Division, Room D128

March 17, 2016

To University of Hawai‘i Council of Chief Academic Officers:

Some fields of business are becoming more and more quantitative, and therefore undergraduates in business should have as strong a foundation in mathematics as possible. Taking upper-division courses in applied mathematics would allow business students to prepare for a quantitative future. In addition, the business division may be able to offer upper-level classes that could be of interest to students of applied mathematics.

For example, one approach to understanding derivative securities models them as stochastic processes. Using a technique called Ito’s Lemma, one can obtain a partial differential equation that describes the time-evolution of the variance of the stochastic process. Students who wish to work in this area of accounting and finance should study probability, stochastic processes, and partial differential equations. Having an applied math department that could provide these courses as prerequisites could allow faculty in the business division to offer upper-level courses in derivative securities, which could also be open to the applied math majors as electives.

Furthermore, businesses are generating more and more data, and therefore will need skilled professionals to analyze, visualize, and understand this information. Math courses in linear algebra, probability and applied statistics would provide a solid foundation for these future “data professionals.” Furthermore, courses in discrete math can also provide the foundation for algorithmic thinking which allows students to develop programs to probe and understand the data. Again, if business students at UHWO could take these prerequisites through the applied math department, then business faculty could provide upper-level courses in “data analytics” or “data science,” which, again, could also be open to the applied math students as electives.

For these reasons I encourage you to support bachelor degree programs in applied mathematics at UHWO. If you have further questions, please do not hesitate to contact me.

Sincerely,

Eric Wen, Ph.D.
Assistant Professor of Accounting
ericwen@hawaii.edu
689-2399
Reviewed by: (The ATP has completed the campus approval process prior to review by Council of Chief Academic Officers)

Campus Chief Academic Officer:
Comments and Recommendations:

Dr. Jacqueline Honda  
Print Name: ____________________________  Signature: ____________________________  Date: 3/21/16

Chancellor: X Approved  ___ Disapproved

Dr. Doris Ching  
Print Name: ____________________________  Signature: ____________________________  Date: 3/22/16

Council of Chief Academic Officers (Systemwide Consultation):
Comments/Recommendations:

Print Name: ____________________________  Signature: ____________________________  Date: ___/___/___